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POSTHETIC REHABILITATION OF A PATIENT FOLLOWING MAXILLECTOMY: A CASE REPORT

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ABSTRACT
One of the most challenging problem with prosthetic treatment of hemimaxillectomy patients is in getting adequate retention, stability, and support. The size and location of the defect usually influences the amount of impairment and difficulty in prosthetic rehabilitation. The obturator prosthesis is commonly used as an effective means for rehabilitating hemimaxillectomy cases. It helps in restoring the missing structures and acts as a barrier between the communication among the various cavities. In cases of large maxillary defects, movement of the obturator prosthesis is inevitable and requires a form of indirect retention to limit the rotation of the prosthesis.

KEYWORDS: Hemimaxillectomy, obturator, oroantral communication.

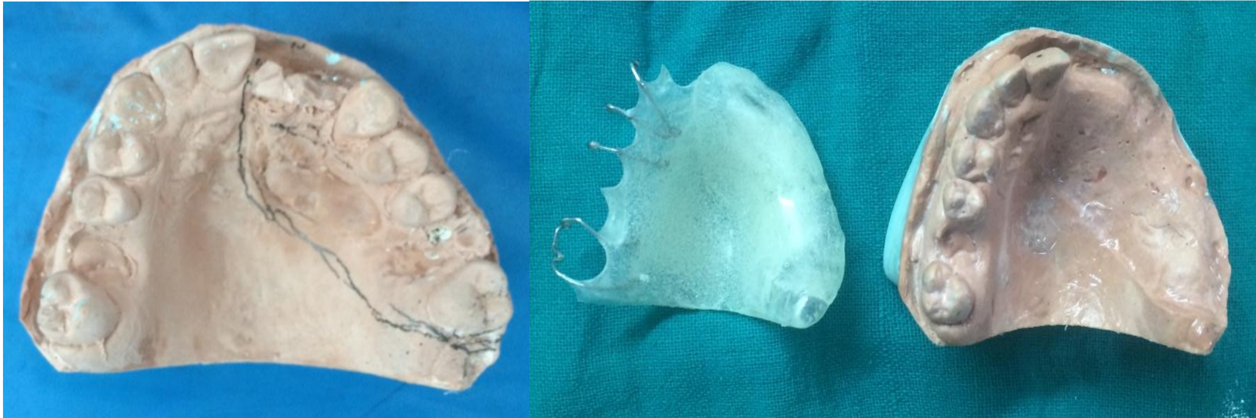
INTRODUCTION
The most common of all intraoral defects are in the maxilla, in the form of an opening into the antrum and nasopharynx. Defects in the maxilla may be divided into defects resulting from congenital malformations and acquired defects resulting from surgery for oral neoplasms. The opening produced maybe quite small or it may include any portion of the hard and soft palate, the alveolar ridges, and the floor of the nasal cavity. Postsurgical maxillary defects predispose the patient to hypernasal speech, leakage of fluid into the nasal cavity, and impaired masticator function.[1]

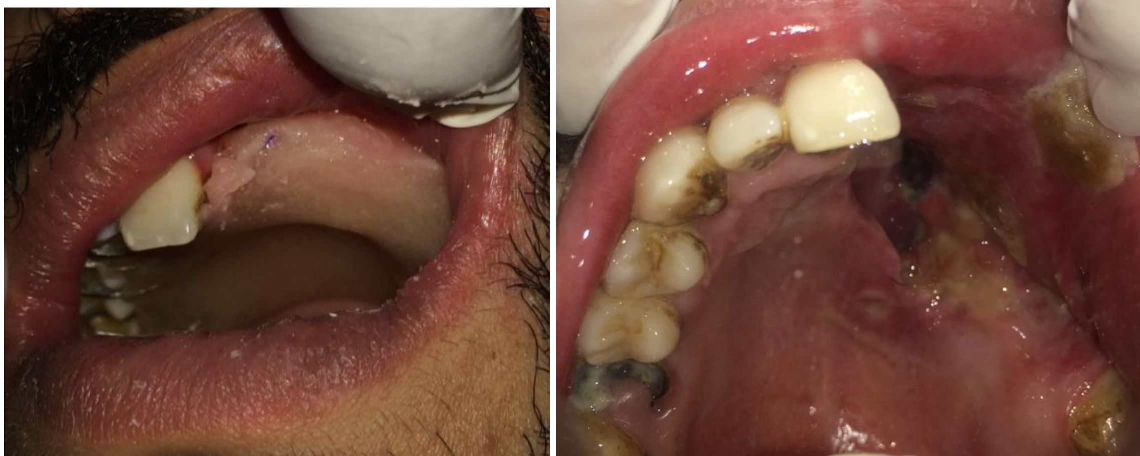
The prosthesis needed to repair the defect is known as a maxillary obturator. An obturator (Latin: *obturare*, to stop up) is a disc or plate, which closes an opening or defect of the maxilla as a result of a partial or total removal of the maxilla.[1] The goals of prosthetic rehabilitation for total and partial maxillectomy patients include separation of oral and nasal cavities to allow adequate deglutition and articulation, possible support of the orbital contents to prevent enophthalmos and diplopia, support of the soft tissue to restore the midfacial contour, and an acceptable esthetic result.[2] Prosthodontic management of palatal defects has been employed for many years. Ambroise Pare was the first to use artificial means to close a palatal defect as early as the 1500s. The early obturators were used to close congenital rather than acquired defects. Claude Martin described the use of a surgical obturator prosthesis in 1875. Fry described the use of impressions before surgery in 1927, and Steadman described the use of an acrylic resin prosthesis lined with gutta-percha to hold a skin graft within a maxillectomy defect in 1956.[3,4] The indications for the use of an obturator are.

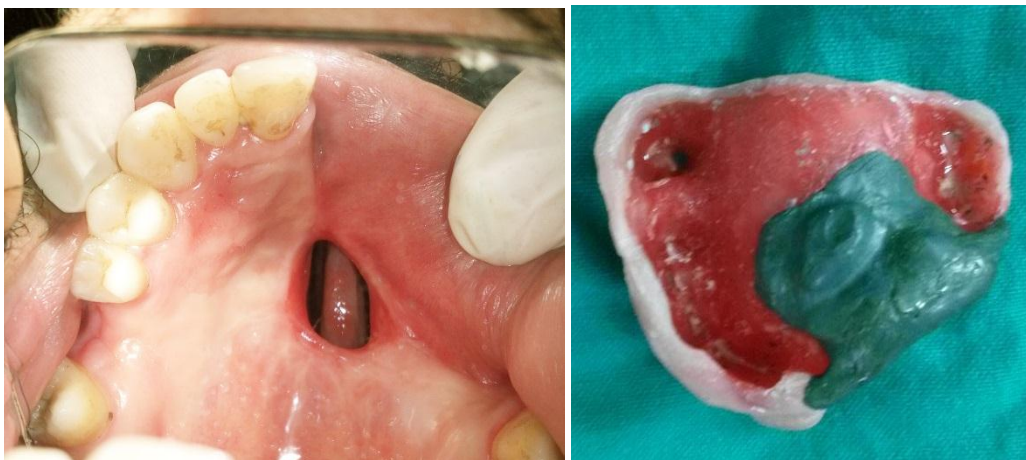
- To serve as a temporary prosthesis during the period of surgical correction
- To restore the esthetic appearance of the patient rapidly for social contact
- When surgical primary closure is contraindicated
- When the age of the patient contraindicates surgery
- When the size and extent of the deformity contraindicates surgery
- When the local avascular condition of the tissues contraindicates surgery
- When the patient is susceptible to recurrence of the original lesion which produced the deformity.[5]

CASE REPORT
- A patient aged 32 years reported with the chief complaint of pain and swelling in the left maxillary posterior region. The involved teeth expressed no pain or mobility. Clinical and radiographic examination was carried out. A biopsy was sent for investigation. The histopathologic result revealed osteonecrosis involving the left maxillary posterior area. The pre-operative impression was made using an irreversible hydrocolloid material (Hydrogum 5, Zhermack, Italy) in a perforated stock tray. The impression was poured with die stone (Gyproc, Prevest Denpro, Jammu, India) to produce the positive template/cast. The cast was sent to the surgeon

to delineate area of resection (Fig. 2), and an immediate surgical obturator was fabricated accordingly. The surgical obturator was inserted immediately after resection of the maxilla and held in position using Adam's clasps on the remaining natural teeth (Fig. 5). The primary maxillary cast was surveyed and undercut areas were blocked.







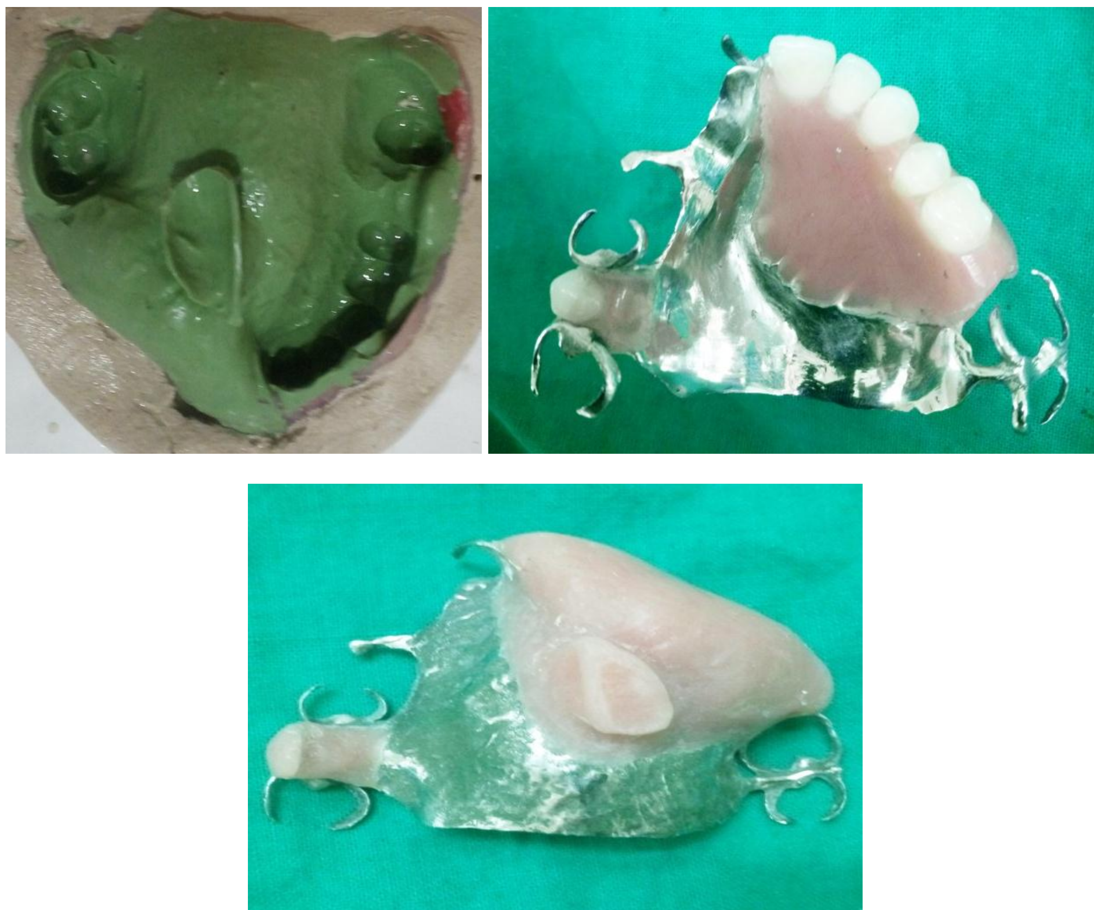


Figure 1

Intraoral view showing the site of defect

The treatment plan was fabrication of a definitive obturator.

Another appointment was arranged for one week later when a tissue conditioning material was applied to improve the fit and increase the comfort of the patient. After two weeks the clinical intra- and extra-oral examination revealed a good initial healing at the defect site. The fabrication of an interim obturator was initialized. The usual steps in fabricating the conventional acrylic partial denture were followed. The retention for this type of obturator was gained from the remaining teeth with wrought wire clasps on the teeth 11, 14, 16. A follow-up system was scheduled for three months later. Tissue conditioner was applied as needed. The patient was able to swallow and maintain good oral health effectively.

Six months later the patient presented with good healing. No significant disfigurement on the face was observed. The oral hygiene was improved. After ensuring that the healing of the wound had taken place (fig 5), the treatment plan for the construction of the definitive obturator (a cast-metal removable dental prosthesis) was rolled out. The primary impressions were made using irreversible hydrocolloid material (Hydrogum 5, Zhermack, Italy) and the primary casts were obtained. The maxillary cast was surveyed, the undercuts were observed and the necessary mouth preparations were done. For the design of the framework the tripodal design was selected. For this design the rest seats were prepared on the right and left molars and right first premolar. A custom tray was constructed on the primary cast with cold-cure acrylic resin (Superacryl Plus, SpofaDental, Markova, Czech). Green stick compound (Tracing Sticks, kemdent, UK) was used for border molding and the final impression (fig 6) was made using polyvinyl siloxane (PVS) (Oranwash L, Zetaplus, Zhermack, Italy). This was poured with dental stone type III to produce the secondary working cast, which was then duplicated to produce the refractory cast, on which the wax up of the framework was performed (fig 7). The framework was casted using cobalt–chromium alloy. This was tried in the patient's mouth to evaluate the fit with the underlining structures, with the help of pressure indicator paste (PIP, MIZZY Inc. USA). Bite rim blocks were constructed on the framework. Centric jaw relation record was obtained and the casts were mounted on a semi-adjustable articulator (Whip Mix, Whip Mix Corporation, Louisville, USA). Acrylic denture teeth (Trubyte, Dentsply, Gloucestershire, England) were arranged and the prosthesis was tried to verify the occlusion with the mandibular teeth, esthetic appearance, and support for the underling tissues. Then, the prosthesis was processed, finished, and polished in the usual manner (fig 8,9). At insertion, the pressure

indicator paste (PIP) was used to inspect for any pressure area(s). The denture was inserted and post-insertion instructions were given to the patient in the care and use of the obturator. The patient was re-viewed bimonthly for three months, then the visits were arranged to be every 3 months.

DISCUSSION

Rehabilitation of patients with acquired maxillary defects is relatively simpler than rehabilitation of defects in the mandible, and pleasing as well as accepted outcomes can be identified at the end of treatment. On the other hand, great efforts should be given in dealing with large defects to obtain the substantial requirements for retention and support of the prostheses.

Prosthodontic rehabilitation of maxillary acquired defects could be organized into three stages of treatment. For each step a different type of obturator is fabricated.

Immediate surgical obturator/plate

This type of appliance is constructed from an impression obtained prior to the operation day and inserted at the conclusion of resection of the maxilla. Many benefits of using immediate surgical plate can be gained including: provision of a stable matrix for the surgical packing; it can form a barrier between the oral cavity and wound during the initial healing; it enables the patient to speak and swallow more effectively. The major deficits and difficulties that occur after resection may have a psychological impact on the patient that may be alleviated by the presence of the surgical plate. For this case, the immediate surgical plate was fabricated before surgery and inserted at the day of surgery immediately after resection. No teeth were added and the retention was gained from the remaining teeth. Occlusion between the remaining upper and lower teeth, without any obstruction, was ensured.

Interim obturator

Two weeks after resection, the construction of interim obturator can be started. This type is totally acrylic incorporated with stainless steel wrought wire clasps engaging the remaining teeth for the purpose of retention. The patient should be seen every two weeks as the healing of the soft tissues in defect side exhibits more progress and lining materials can be placed. In this case, fabrication of the interim obturator was performed two weeks after the surgery. Retention was gained from the remaining teeth by incorporating wrought wire clasps in the form of Adam's and C-clasps. Acrylic denture teeth were added and a light contact with the opposing teeth was ensured.

Definitive obturator

The definitive obturator should not be constructed until the defect site is completely healed and is dimensionally stable. This may take from 3 to 6 months after surgery varying according to many factors e.g., prognosis of the tumor, size of the defect, healing progress and presence or absence of teeth. Designs for this type of obturators may vary based on the classification system of the defect. For this case, a tripodal design was selected. Support was gained from the remaining teeth and palate. Rests were placed on the molars on both the sides and right first premolar. Full coverage of the remaining palate was decided to ensure maximum distribution of the functional load.

A definitive obturator is not indicated until the surgical site is healed and dimensionally stable and the patient is prepared physically and emotionally for the restorative care that maybe necessary. The obturator maybe displaced superiorly with the stress of mastication and will tend to drop without occlusal contact. The degree of movement will vary with the number and position of teeth, the size and configuration of the defect, the amount and contour of the remaining palatal area, height of the residual alveolar ridge, the size, contour, and lining mucosa of the defect, and the availability of undercuts. Lack of retention, stability, and support are common problems of treatment for patients who have had a maxillectomy.

The height and contour of the residual alveolar ridge and the depth of the sulcus are important in both the edentulous and the dentulous patient. A large, broad ridge or a ridge with a square or ovoid shape usually provide better retention, stability, and support than the small, narrow ridge with a tapering contour. The teeth are the greatest asset for providing retention of the obturator prosthesis. If sound natural teeth remain, the bracing components of the prosthesis framework can be used to minimize movement in all three directions. The number, position, and periodontal status of the remaining teeth are the most critical factors in evaluating the amount of stress that the remaining teeth maybe able to absorb.

Obturator abutments adjacent to distal extension maxillary resection sites are subject to excessive rotational forces. Fixed splinting of some or all of the remaining teeth is indicated to provide dissipation of the stresses directed toward primary abutment teeth. When the remaining teeth are located unilaterally, the intracoronal retainer might provide some benefit in minimizing the amount of vertical movement of prostheses within the defect. Moreover, if the defect is small and the remaining teeth stable, intracoronal retainers might be considered. If the defect is large and some or all of the remaining teeth are weak, extracoronal retainers should be used. If the remaining teeth are not parallel with the walls of the defect, and if the palatal surfaces of the teeth are not adequate, guiding planes are provided to resist vertical displacement of the obturator and disengagement of the retentive clasp arms.[6]

The basic principles of the design of removable partial dentures should be reviewed when designing the framework for an obturator. Major connectors should be

rigid, occlusal rests should direct occlusal forces along the long axis of the teeth, guide planes should be designed to facilitate stability and bracing, retention should be within the physiological limits of the periodontal ligament, and maximum support should be gained from the residual soft tissues.

A lateral scar band results after surgical resection at about the level of the mucobuccal fold. Because of its lack of bone support, the lateral scar band also tends to stretch with continued use. This stretching may necessitate sequential additions to the prosthesis which maybe limited by cosmetic requirements and size and weight of the prosthesis. The height of the lateral wall of defect can be utilized for indirect retention. A high lateral wall of an obturator will undergo less vertical displacement with a given defect wall flexure than will a shorter prosthesis lateral wall.

The most important aspect of stability is occlusion. Maximal distribution of the occlusal force in centric and eccentric jaw positions is imperative to minimize the movement of the prosthesis and the resultant forces on individual structures. The stress created by lateral forces is minimized by the correct selection of an occlusal scheme, elimination of premature occlusal contacts, and wide distribution of stabilizing components.[9,10] Acrylic resin teeth with a reduced occlusal contact area are indicated. Altering the cusp angle of posterior teeth influences the stability of the prosthesis placed on an edentulous resected maxilla. It maybe necessary to accept an occlusion that is not bilaterally balanced in eccentric occluding positions for an edentulous maxilla or mandible. In edentulous patients, nonanatomic posterior teeth are preferred. The teeth are set in centric relation and adjusted to eliminate lateral deflective occlusal contact.

Dimensional changes in tissue continue to occur for at least a year secondary to scar contracture and further organization of the wound. The prosthesis is rebased to compensate for these changes. Changes in the tissues supporting a maxillofacial prosthesis maybe more rapid than in those supporting a more conventional prosthesis. Therefore, the occlusion and base adaptation must be re-evaluated frequently and corrected by selective grinding of the occlusion or rebasing of the prosthesis.

Though it is difficult to improve the quality of life for hemimaxillectomy patients compared with patients with conventional prostheses, this can be achieved with skill, knowledge, and experience of specialists. The problem experienced by hemimaxillectomy patients are reduced if a team approach is adopted and specialists are careful to apply skill and experience at all stages and keep the patient under regular review.

Quality of life of patients with maxillary defects could obviously be improved with the provision of a properly designed obturator. The prosthetic obturator can restore mastication, swallowing, esthetic particularly the midface, resonance and speech. Patients with maxillofacial defects who undergo rehabilitation can resume their social habits in the normal way.

4. CONCLUSION

A proper diagnosis and a well-designed treatment plan will result in pleasant outcomes. Rehabilitation with obturator prosthesis appears to be a functional and effective treatment modality. This paper discussed the prosthetic treatment of acquired maxillary defect with one piece definitive obturator.

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