Prosthetic Rehabilitation of a Maxillary Defect Caused by Ameloblastoma of Rare Occurrence: A Clinical Case Report

Abstract
According to WHO statistics, individuals of the Indian subcontinent have the highest prevalence of orofacial cancer. Surgery, radiation, chemotherapy, or combination therapies are commonly administered treatment modalities for the treatment of oral cancer. Rehabilitation after surgical resection of the maxillary area is often a challenging task for maxillofacial prosthodontists. The size and location of the defect usually influence the amount of impairment and difficulty in prosthetic rehabilitation. Communication between nasal and oral cavities causes difficulty in swallowing and speech and gives unesthetic appearance. Obturator prosthesis is commonly used as an effective means for rehabilitating hemimaxillectomy cases. This article presents a case of acquired maxillary defect due to ameloblastoma with unfavorable undercuts, which was successfully treated by an immediate obturator following surgical resection and followed by a one-piece closed hollow obturator, by utilizing the remaining palate and dentition to maximize the support, stability, and retention, which acts as a barrier to the communication between the oral and nasal cavities.

Keywords: Acquired maxillary defect, immediate obturator, one-piece closed hollow bulb, orofacial cancer, plexiform ameloblastoma

Introduction
Malignant neoplasms of the upper gingiva and hard palate nearly account for 1%–5% of their total occurrence in the oral cavity.[1] Ameloblastoma is a benign, locally aggressive tumor arising from the odontogenic epithelium. The lesion accounts for 1% of all tumors of the head-and-neck region and approximately 11% of all odontogenic tumors. The most common location of ameloblastoma is the posterior region of the mandible, with a mandibular-to-maxillary ratio of 5:1. Ameloblastoma of the maxilla is comparatively rare, and the molar area is the most commonly affected site compared to the premolar and anterior regions. Surgical resection is the most common modality of treatment for this kind of neoplasms.[2] The postsurgical effect usually has serious consequences as it disturbs both the form and function of the normal stomatognathic system.[1] Management of maxillary defects warrants all the facets of patient care from diagnosis and treatment to rehabilitation. Maxillofacial rehabilitation should not only involve the design and fabrication of the prosthesis, if possible, but also provide fail-safe mechanisms to ensure that the prosthesis is given a fair chance by the patient.[3] An obturator is a prosthesis used to close a congenital or acquired tissue opening, primarily of hard palate and/or contiguous alveolar/soft-tissue structures (Glossary of Prosthodontic Terms, Edition 8).[4] The principal function of an oral obturator is closure of palatal defects for the establishment of oronasal integrity. Fabrication of an obturator requires biologically inert, technically simple, and durable materials.[5] The primary objectives in rehabilitating a maxillectomy patient are to restore the function of mastication, deglutition, and speech and to achieve normal orofacial appearance. The most common prosthodontic treatment problems with maxillectomy patients are lack of retention, stability, and support. The size of the defect, the number of remaining teeth, the amount of the remaining bony structure, and patient ability to adapt to the prosthesis are few factors which affect the prognosis of the treatment. Prosthetic rehabilitation is planned depending on the type of surgical defect and the relationship of the defect area to the remaining abutment teeth. This

How to cite this article: Shivakumar HK, Rayannavar S, Chougule DS, Sharan S. Prosthetic rehabilitation of a maxillary defect caused by ameloblastoma of rare occurrence: A clinical case report. Contemp Clin Dent 2020;11:87-90.

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Access this article online
Website: www.contempclindent.org
DOI: 10.4103/ccd.ccd_233_19
type of prosthesis helps in separating the oral and nasal cavities to allow for adequate deglutition, speech, possible support of the soft tissue to restore the mid-facial contours, and acceptable esthetic results.\(^6\)

**Case Report**

**History**

A 40-year-old male patient, a teacher by occupation, who reported with an ulcerative growth on right maxilla [Figure 1] underwent a computed tomography (CT) scan. The CT scan revealed an expansile soft-tissue lesion arising in the right maxilla, causing thinning and erosion of the cortex with extension into the soft-tissue plane. The lesion showed minimal heterogeneous enhancement. Medially, the mass was extending into the osteomeatal complex and the right nasal cavity, causing deviation of the nasal septum toward the left. The mass was causing erosion of the hard palate and the medial wall of the maxillary sinus. The fat plane between the mass and the inferior turbinate was also lost. The fat plane between the mass and the surrounding muscles was maintained. The case was diagnosed as plexiform ameloblastoma after histopathological investigation.

**Treatment plan**

Surgical resection of the lesion was planned followed by restoration of the defect with a surgical obturator.

**Fabrication of immediate surgical obturator**

Presurgical alginate impression of both arches was made. Diagnostic casts were prepared, and the area to be resected was marked on a duplicated cast from 11 to 17 and scraped [Figure 2]. As root stumps were present with 24 and 25, the retentive components such as circumferential clasps and Adams clasps were prepared on 22, 23, 26, and 27. Wax-up of the cast was done [Figure 2]. A clear acrylic surgical obturator was fabricated.

Surgical procedure was carried out, and 24 and 25 root stumps were also extracted along with the lesion. An immediate obturator was inserted after carrying out the necessary adjustments [Figure 3], and instructions were given to the patient. A follow-up at regular interval was done, and as the patient was anxious about the wound site, oral hygiene maintenance was not up to the satisfaction, hence oral prophylaxis procedure was carried out and he was given proper oral hygiene instructions. Relining of the obturator was done with soft liners [Figure 3], and necessary modifications were done at each regular interval. Satisfactory healing of the soft tissues took place. After 6 months, a definitive prosthesis was planned.

**Definitive prosthesis**

A definitive prosthesis was planned with a cast metal framework as the defect resembled more near to Class I linear type of design according to the Aramany’s classification.\(^7\) As per the linear design, RPI (R=Rest, P=Proximal Plate, I=I bar clasp) concept applied on 23 region. The retentive arms and bracing arms are placed on the palatal and buccal surfaces of the 26 and 27 respectively. The occlusal rest on the distal of 26, mesial of 27 was planned.\(^8,9\) A primary impression with alginate was made and cast was poured. A custom tray was fabricated on this cast for medium body impression.

Mouth preparation was carried out as per the framework design, guide plane on the distal of 23, rests on 26 and 27, and cingulum rest on 23.

As the defect was multilocular, sectional impression technique was followed to record the defect with putty addition silicone [Figure 4]. Once the defect was recorded, medium body impression was made with the custom tray. The superficial section of the defect part had come along with the medium body impression, and rest of the sections were oriented outside [Figure 4]. Master cast was obtained using this impression [Figure 5], and blocking out of the unfavorable undercuts was carried out.

This blocked out master cast was used to obtain a refractory cast on which wax pattern was prepared using the pattern wax [Figure 5]. The usual burn-out procedure and casting of the framework was done. This finished metal framework was made to fit the cast [Figure 5], which was tried intraorally, and then jaw relation was recorded [Figure 6]. Teeth arrangement followed by try-in was done [Figure 6], and the trial denture was invested. After

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**Figure 1:** Presurgical intraoral picture

**Figure 2:** Diagnostic casts, scrapped teeth on the cast, and wax-up for immediate obturator

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dewaxing and before packing, the unfavorable undercuts were blocked out with the plaster of Paris. Closed bulb obturator was planned as per the Habib technique. The lid portion was packed first with heat-cured acrylic resin, a piece of tinfoil was placed over this portion [Figure 7], and the rest of the defect was packed and processed.

The processed obturator was retrieved and the lid was separated along the tin foil. The bulb was hollowed out from within an acrylic trimming bur [Figure 7], and the lid was sealed with self-cured acrylic resin. The finished final prosthesis was delivered to the patient with appropriate instructions [Figure 8].

Follow-up

Acquired palatal defects may cause major difficulties with speech, swallowing, and mastication. In turn, these functional problems may affect the quality of life of patients. The patient reported improvements in prosthesis retention and stability after definitive prosthesis compared to the performance of the immediate obturator, and his masticatory and speech functions, and esthetics particularly the midface, improved. During the follow-up, soft debris was observed; as the patient was too anxious on the maintenance of oral hygiene, he was instructed for proper oral hygiene maintenance and the use of denture cleanser to avoid stains on the prosthesis.

Discussion

Most patients with maxillofacial prosthesis have had an extensive amount of surgical and dental treatment. The prosthetic rehabilitation of the postmaxillectomy patients generally requires an immediate postsurgical prosthesis, an interim prosthesis, and a definitive prosthesis. This is a protracted process for the patient. Engagement of soft-tissue undercuts, including the scar band at the skin graft–mucosal junction, also plays a significant role.

This clinical report illustrates an Aramany’s Class 1 defect, which was rehabilitated by a closed hollow bulb obturator. The main objective was to decrease the weight and minimize the rotation of the prosthesis.

The weight of an obturator can be significantly reduced by hollowing out the bulb. Using this technique, the thickness of obturator walls and palate is reduced to <1 mm, resulting in a significant decrease in weight. The vertical and horizontal extension of the lateral walls of the obturator can be maximized without additional increase in weight. The degree of obturator movement is minimized by improving obturator–tissue contact superolaterally. Abutment teeth and soft-tissue undercuts will be subject to less stress to meet the primary goal of prosthodontic rehabilitation, “Preservation of the remaining structure.” In dentate patients, primary retention, support, and stability of an obturator depend on the number and distribution of the remaining teeth. These remaining teeth serve as abutments for the obturator and are subjected to constant, nonaxial, cantilever forces. One of the most important factors from retention and stability point of view is the hollow bulb design consideration of the

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**Figure 3:** Postsurgical intraoral view with immediate obturator in place and relined with soft liners

**Figure 4:** Intraoral view after complete healing and medium body sectional impression

**Figure 5:** Master cast, wax pattern on the refractory cast, and metal framework on the cast

**Figure 6:** Metal framework try-in, jaw relation, and denture try-in

**Figure 7:** Packing lid portion with a tin foil, lid separated after deflasking, and hollowing out of the bulb

**Figure 8:** Final finished prosthesis and denture in place
prosthesis. It contributes to lightness of the obturator, which further improves the cantilever mechanics of suspension, avoids overburdening of the adjacent soft tissue, and adds resonance to speech.[1]

The pattern of forces affecting the obturator prosthesis are complex because of their concurrent occurrence and their nature of mostly destabilizing the prosthesis. These destabilizing forces need to be controlled by effectively and strategically positioning the indirect retainers. In the Class I situation, the functional fulcrum line lies along the bony contours, next to the resected area, and to provide maximum retention, the indirect retainer should lie in the premolar region.[6] If the anterior teeth are not included in the design, a linear design is recommended. Miller states that a unilateral design requires bilateral retention and stabilization on the same abutment teeth. A diagonally opposed retention and stabilization system can be utilized. Support is located in a linear fashion, and retention is located on the buccal surfaces of the premolars and the palatal surfaces of the molars. Stabilizing components are placed on the palatal surfaces of the premolars and buccal surfaces of the molars.[6] In the present case, premolars were missing, so the cuspid was used. Patient benefits from the reduced weight of the obturator which offset the costs and also additionally by eliminating the laboratory charges for two-stage processing.[10] Employing a lower temperature and a longer processing cycle than that used to process the record base minimizes the dimensional change of the record base.

**Conclusion**

Patients with such a defect suffer from a lot of psychological trauma due to impaired functions and esthetics. Hence, we as dentists should try to restore the lost form and function of the oral and peri-oral structures that will help the patient to live a normal life. The one-piece hollow obturator provides better color matching and restores the lost hard and soft tissues along with speech, esthetics, mastication, and the confidence of the patient.

**Acknowledgments**

I express my deepest gratitude and indebtedness to all medical faculties in the department of surgery for their constant support and guidance throughout the treatment procedures, who helped me to fix up the appointments in coordination with medical assistance and made this oral rehabilitation possible.

**Declaration of patient consent**

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

**Financial support and sponsorship**

Nil.

**Conflicts of interest**

There are no conflicts of interest.

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