

CASE REPORT

Prosthetic management of acquired dentate maxillectomy defects: A clinical case series

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Acquired maxillectomy defects produce hypernasal speech, food, and liquid regurgitation into the nasal cavity, impaired deglutition and mastication, and cosmetic deformity. Furthermore, patients with acquired maxillary defects face psychosocial stigma, which has a negative impact on their quality of life. Prosthetic rehabilitation of such defects is required for stomatognathic system restoration and oroantral communication obturation. This case series discusses the fabrication of surgical, interim, and definitive obturator prostheses to restore the acquired dentate maxillectomy defects of three cancer patients. All patients had their treatment in the prosthodontics department of the RUHS College of Dental Sciences. The surgical obturator prosthesis was made before surgery, whereas the interim and definitive obturators were made one month and six months after surgery, respectively. The surgical obturator formed a shield between the surgical pack and the oral cavity. After the surgical obturator and packing were removed, an interim obturator was inserted for three to six months to allow the surgical site to heal. After the surgical site had healed, the fabrication of the definitive obturator began. Prosthetic rehabilitation with obturator prostheses sealed the acquired tissue defects of the palate and restored swallowing, speaking, chewing capacity, and cosmetic value, as well as significantly improved the quality of life of these patients.

Keywords: surgical obturator, interim obturator, definitive obturator, dentate maxillectomy, obturator

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Introduction

Palatal defects can be caused by congenital anomalies, trauma, disease, pathologic alterations, radiation burns, or surgical treatment [1]. Patients with such defects are at risk of developing hypernasal speech, nasal discharge, and impaired masticatory function. Such defects necessitate the use of a specialized prosthesis to form an oronasal seal, which an obturator prosthesis can offer [2].

Prosthodontic therapy for individuals with acquired maxillectomy defects can be divided into three phases, each with a different goal [3,4]. The first phase is known as surgical obturation, and it comprises the insertion of a prosthesis during surgery. The major goal of early surgical obturation is to restore and preserve normal oral functioning during the initial postoperative period. The second phase of postsurgical prosthodontic treatment is interim obturation. This phase's goal is to give the patient a comfortable and effective prosthesis until the healing process is complete. The interim obturator phase begins when the surgical obturator and packing are removed [4,5]. The surgical site is usually well healed and dimensionally stable 3 to 6 months after surgery. Healing completion allows for definitive obturation, or the third phase of prosthetic rehabilitation [4,6]. This clinical case series describes the prosthetic rehabilitation of three patients with surgical, interim, and definitive obturators. After receiving written consent from each patient, all patients were prosthetically rehabilitated in the prosthodontics department of the RUHS College of Dental Sciences, Jaipur.

Case 1: Surgical Obturator

A 70-year-old male patient presented to the department with the chief complaint of swelling over the palate that had been present for one year. Extraoral examination revealed no obvious facial asymmetry. Intraoral examination revealed ulcerative growth on the right side of the palate extending from the left central incisor (21) to the right maxillary first molar (16) (Figure 1). For 30 years, the patient had been a heavy smoker. There was no known medical or dental history revealed. Ultrasonography (USG) guided fine needle aspiration cytology (FNAC) of submandibular lymph nodes revealed metastatic squamous cell cancer. The histology result revealed a well-differentiated squamous cell carcinoma. The patient was advised to have the fabrication of a surgical obturator done before surgical resection.



Fig. 1. Ulcerative growth on the right side of the palate extending from 21 to 17.

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Clinical Procedure:

The primary impression of the maxillary arch with adequate vestibular depth on the resected side was made with irreversible hydrocolloid impression material (Zelgan 2002; Dentsply Sirona) and poured into type III dental stone (Kalstone; Kalabhai Karson Pvt. Ltd.) to obtain primary cast (Figure 2). A sufficient extension of vestibular depth is necessary to determine the approximate location of the skin graft-mucosa interface. The cast was subsequently sent to the surgeon to mark the most likely resection outline (Figure 2). The teeth in the resection area were removed, and the occlusal portion of the remnant alveolar ridge within the planned defect area was reduced by about 2 millimetres. This additional reduction is required to allow adequate intraoral space for the surgical obturator while avoiding premature occlusal contact with the opposing dentition during function. In the anterior region, the labial and occlusal portions of the residual alveolar ridge were trimmed minimally to reduce tension on the skin and lip closure. Major interdental and soft tissue undercuts were blocked out and the cast was duplicated following the cast procedure. On the duplicate cast, the surgical obturator was waxed and processed (Figure 2,3). This enables the processed obturator to be retrieved and adjusted for ease of seating on the original cast before polishing. The baseplate wax (Modelling Wax; PYRAX) was adapted to the outlined duplicate cast. The wax-up needs to touch all remaining teeth up to their contour height, but not to approach the

area of occlusal contact in the dentate patient. Having the mandibular cast articulated with the wax-up cast is advantageous. To ensure there is sufficient resin thickness to support interdental wiring, wax is carried to the height of the contour of the tooth. 18-gauge stainless steel wire retainers were placed on the left maxillary second premolar (25) and first molar (26) without interfering with the obturator's seating during surgery or the opposing teeth's occlusion (Figure 2). Following processing and retrieval, the obturator was adjusted to enable easy seating on the original cast and trouble-free insertion following surgery. In addition, the interproximal extensions of the prosthesis were perforated with small dental burs to allow it to be wired to the teeth after surgery. Following excision and placement of the surgical dressing, the finished surgical obturator was sterilized and inserted (Figure 3).

The prosthesis and packing were removed 10 days post-surgery. The prosthesis was cleaned and adjustments were made. Intermediate denture lining material was added to the tissue surface of the surgical obturator to improve adaptation, seal, and comfort. The patient was recalled at an interval of one week and was advised to clean the prosthesis with mild soap, water, and a soft brush after every meal. Thereafter, the patient was examined every week and the prosthesis was relined to accommodate tissue changes secondary to healing. The patient was instructed to clean the surgical defect with gauze pads soaked in warm water to remove mucous or crust.



Fig. 2. A. Primary Cast with resection outline B. Wax Up on trimmed primary cast



Fig. 3. A. Surgical Obturator fitted over cast B. Surgical Obturator in Situ

Case 2: Interim Obturator

A 60-year-old male patient presented to the department with the primary concern of difficulty speaking and nasal regurgitation of fluid. Extraoral examination revealed a flattened right-side face (Figure 4). Intraoral examination revealed a right-sided partial maxillectomy defect due to verrucous carcinoma six months back (Figure 4). The defect was classified as an Aramany class I defect. 11-17, 21, 22, 23 & 26 were missing in the maxillary arch, and 35-37, 45-47 were missing in the mandibular arch (Figure 4). The patient was then scheduled to have an interim obturator.

Clinical Procedure



Fig. 4. A. Pre Prosthetic Profile View B. Intraoral Aramany Class I Defect C. Partial edentulous mandibular arch

The primary impression of the maxillary arch was made with irreversible hydrocolloid impression material (Zelgan 2002; Dentsply Sirona) and poured into type III dental stone (Kalstone; Kalabhai Karson Pvt. Ltd.) to obtain the primary cast (Figure 5,6). After blocking off undercuts with wax, the custom tray was built over the primary cast using auto polymerizing acrylic resin (ColtoCure C; Coltene). The tray's extensions were checked in the mouth and recontoured. The border moulding was done using green-stick compound (Tracing Sticks; DPI). The master impression was made using elastomeric impression material (Photosil; DPI). During the impression procedure, the lips and cheeks were manipulated, and the patient was instructed to execute eccentric mandibular movements. The pickup impression was then made with irreversible hydrocolloid

impression material (Zelgan 2002; Dentsply Sirona) and poured with type III dental stone (Kalstone; Kalabhai Karson Pvt. Ltd.) to produce the master cast (Figure 7). The denture base was adapted over the master cast after blocking out undercuts with wax. A wax occlusal rim was then attached to the denture base, and vertical and centric records were obtained. After mounting the casts on the articulator, the teeth were arranged. The try-in was completed, and it was then processed with heat-cured acrylic resin (ColtoCure H; Coltene) using the conventional method (Figure 8,9). The obturator was finally placed in the patient's mouth once it had been finished and polished (Figure 10,11). To assess the effectiveness of the prosthesis,

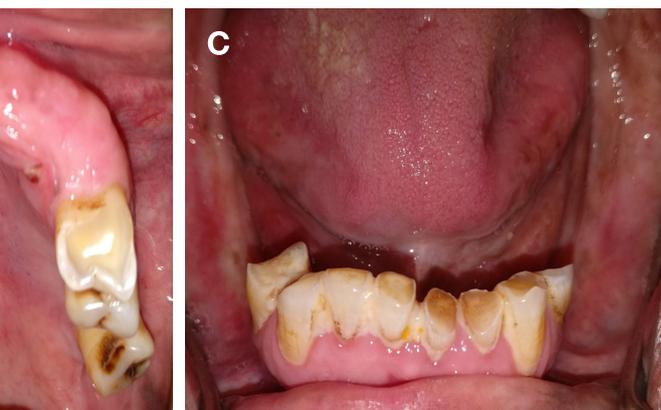


Fig. 5. Primary Impression made with irreversible hydrocolloid impression material

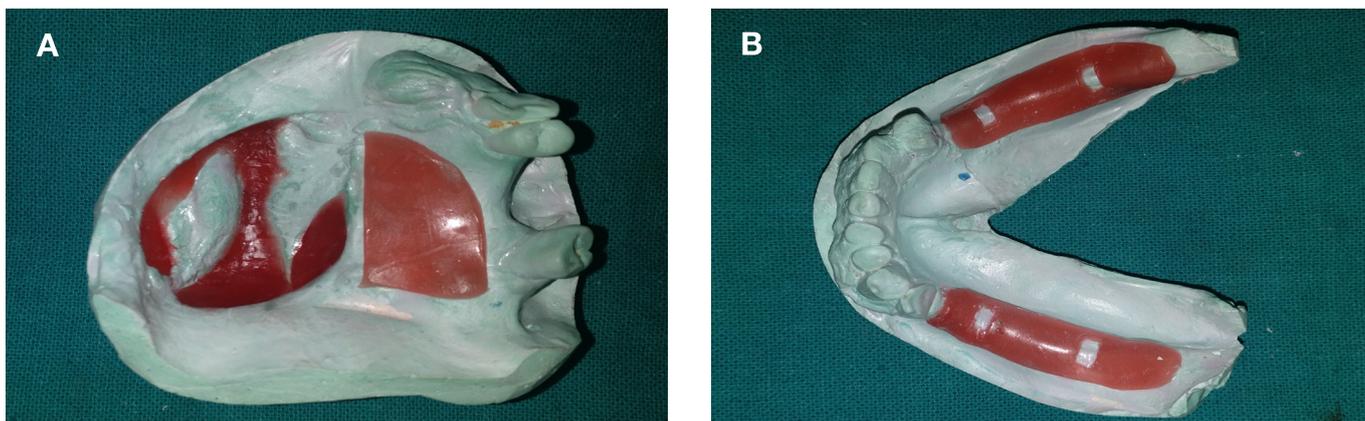


Fig. 6. A. Maxillary Cast with blocked out defect and spacer on part of residual palate B. Spacer Design on the mandibular arch

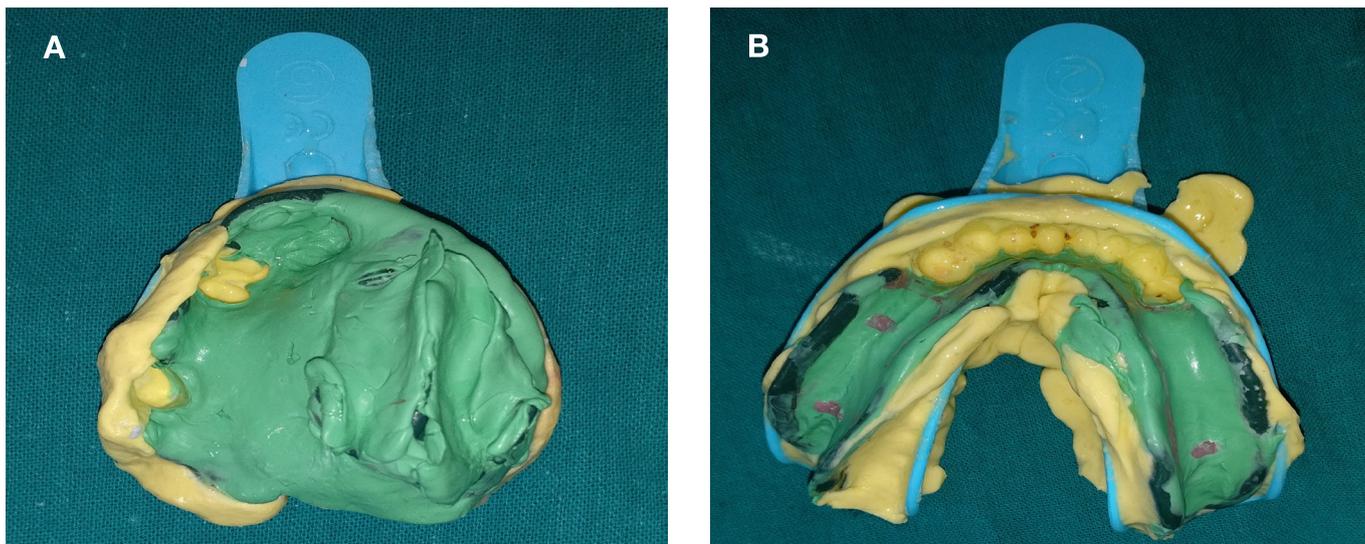


Fig. 7. A and B. Maxillary and mandibular master impression using elastomeric impression material with pickup impression in the irreversible hydrocolloid impression material



Fig. 8. Try in A. Front View B. Right lateral C. Left lateral



Fig. 9: Finished and Polished Interim Obturator A. Polished Surface B. Intaglio Surface C. Front

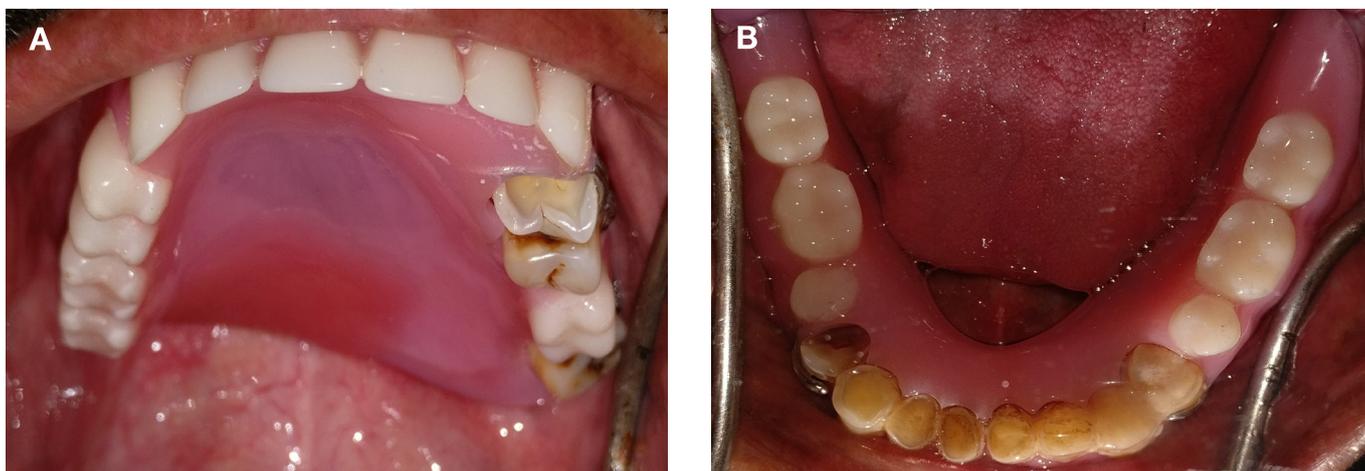


Fig. 10. A. Interim Obturator and B. Mandibular RPD In Situ

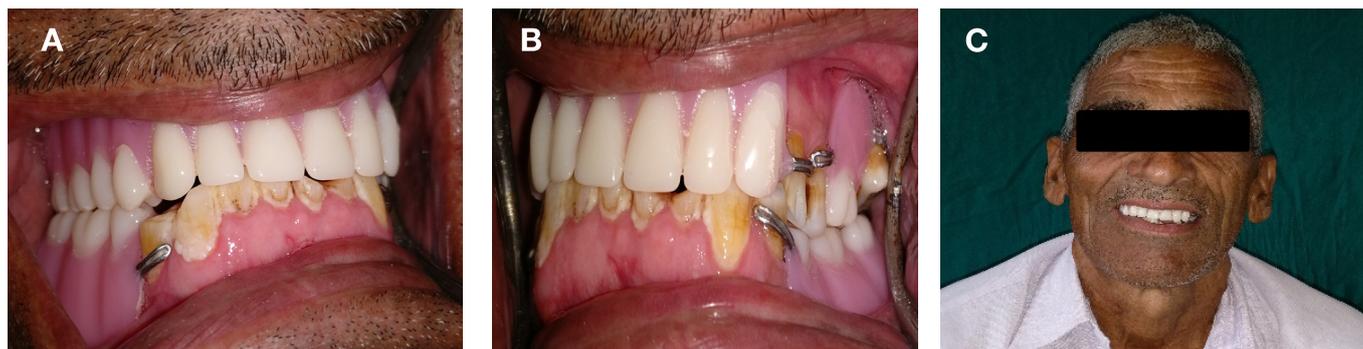


Fig. 11. A. Interim Obturator In Situ A. Right occlusion view B. Left occlusion view C. Post prosthetic Profile View

the patient was asked to speak and swallow fluids. The assessment confirmed that the prosthesis had been properly adapted and extended. The patient was instructed on how to insert and remove the prosthesis. The patient was advised to clean the prosthesis with a soft brush after each meal. The patient was recalled at one-week, two-week, and one-month intervals to assess the progress of healing within the defect and adjust the obturator prosthesis to reflect those changes.

Case 3: Definitive Obturator

A 20-year-old female patient visited the department with chief complaints of difficulty in speech, nasal regurgitation of fluid while swallowing, and rehabilitation of her missing teeth. No gross facial asymmetry was seen during extraoral examination (Figure 12). An intraoral examination revealed a right-sided partial maxillectomy defect due to mucoepidermoid carcinoma 6 months ago (Figure 12). The defect was classified as an Aramany class II defect. 14-17 were missing in the maxillary arch. As the intraoral defect was healed completely, she was advised to rehabilitate with a definitive obturator.

Clinical Procedure

The medial and anterior undercuts were blocked out with gauze lubricated with petrolatum before making the primary impression, as these undercuts are rarely engaged by the prosthesis. The stock tray was loaded with the irreversible hydrocolloid impression material (Zelgan 2002;

Dentsply Sirona). To effectively record these undercuts, impression material was placed in the posterior and lateral undercuts before seating the tray in the mouth. The impression was removed, and a primary cast was made. The framework was designed after a surveyor surveyed the primary cast. The framework was designed to provide maximal support from the residual palate as well as tripod support from the abutments. The Y bar clasp on the 13 and two embrasure circumferential clasps between 24 and 25 and 26 and 27 provided direct retention. The rest seats of 24, 25, 26, and 27 were prepared to receive the rest of the cast metal framework using the principles of Aramany's Class II obturator design. Before fabricating the custom tray, the undesirable undercuts recorded in the primary cast were blocked out with wax. A one-thickness baseplate wax was used to provide relief to the skin graft-mucosa junction and the tissue surface of the defect. Some of the residual palate was also relieved, and the custom tray was made with auto polymerizing acrylic resin (ColtoCure C; Coltene), ensuring that it extended to the full height of the defect's lateral wall and about 10 mm on the posterior wall, with the minimal extension on the medial wall (Figure 13). The tray's extension was validated in the mouth. The tray's overextension was checked using disclosing wax. Border moulding began with low fusing modelling compound (Tracing Sticks; DPI) because it allows for more working time. The soft palate extension of the defect was moulded first, followed by the lateral, posterior, and anterior aspects of the defect. Elastomeric impression

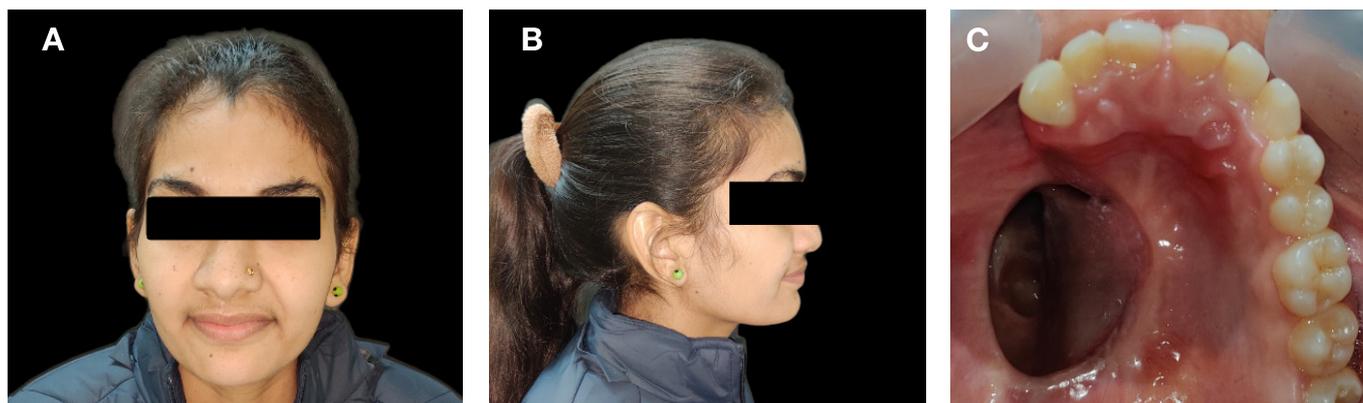


Fig. 12. A. Front Profile View B. Lateral Profile View C. Intraoral Aramany Class II defect

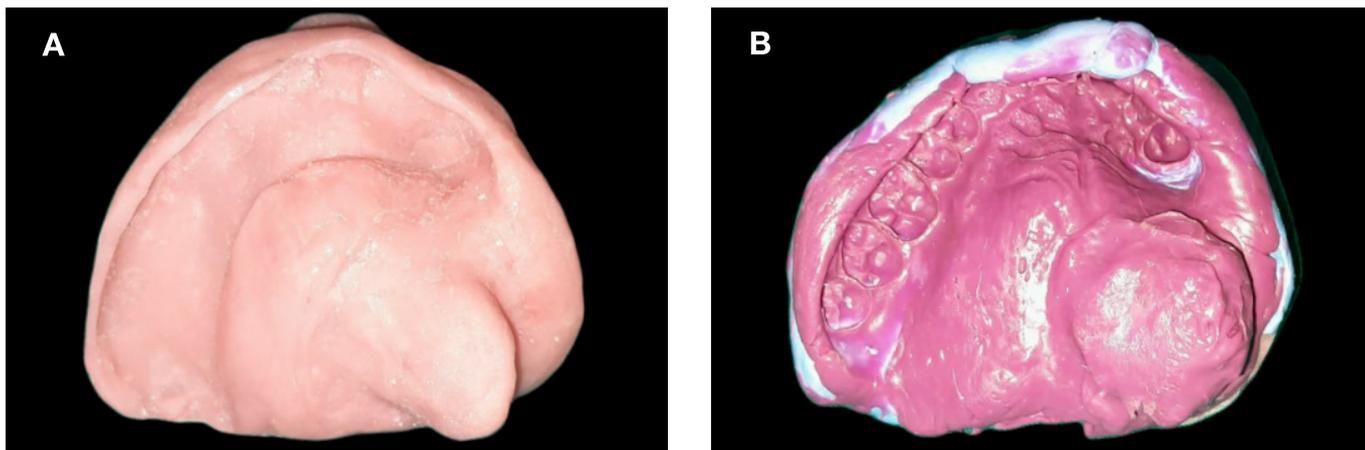


Fig. 13. A. Custom Tray B. Master Impression

material (Aquasil Ultra Monophase; Dentsply Sirona) was used to make the master impression (Figure 13). Before making the master impression, the modelling compound was relieved by about 0.5 mm. The lips and cheeks were manipulated, and the patient was instructed to perform an eccentric mandibular movement. A master impression was poured into type III dental stone (Kalstone; Kalabhai Karson Pvt. Ltd.) to obtain a master cast. A tripod layout was designed to fabricate the cast metal framework. The design of the cast metal framework was transferred to the refractory cast, and a cast metal framework was fabricated and verified in the mouth for optimum fit and retention (Figure 14-16). An occlusal rim was added to the framework.

The vertical dimension was established and centric records were obtained with bite registration paste (Occlufast Rock; Zhermack) as a recording medium to avoid displacement superiorly on the defect side. Teeth were arranged on the metal framework, followed by a wax try-in to meet the patient's aesthetic preference, before being processed with heat-cured acrylic resin (ColtoCure H; Coltene) using the conventional approach (Figure 17). After it had been finished and polished, the obturator was finally placed in the patient's mouth (Figure 18-20). Denture care instructions were provided, and the patient was recalled at regular intervals for the first six months to accommodate dimensional changes caused by the defect's continued organization.

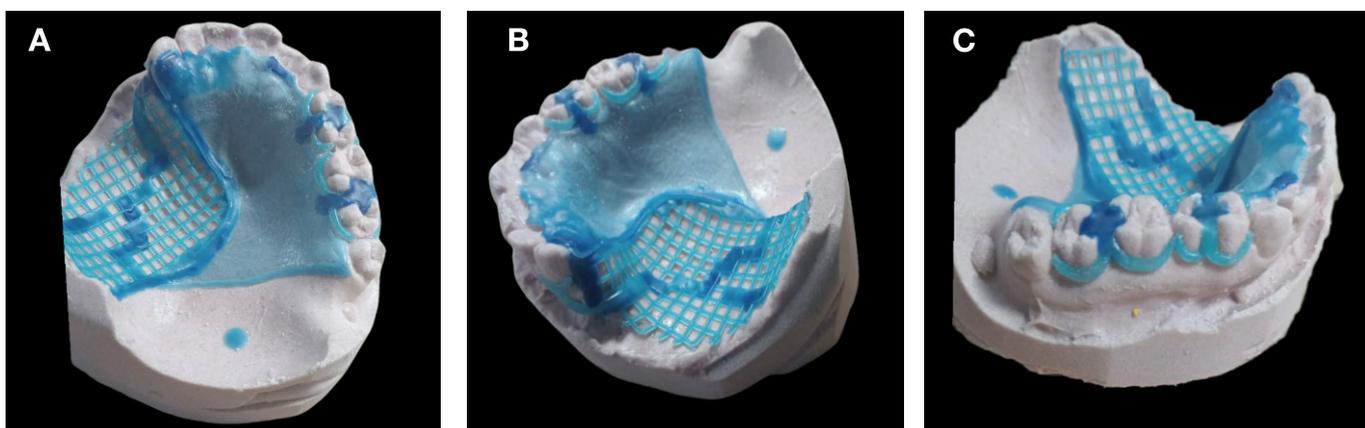


Fig. 14. Waxed Up Framework Design on Refractory Cast A. Occlusal view B. Right view C. Left view

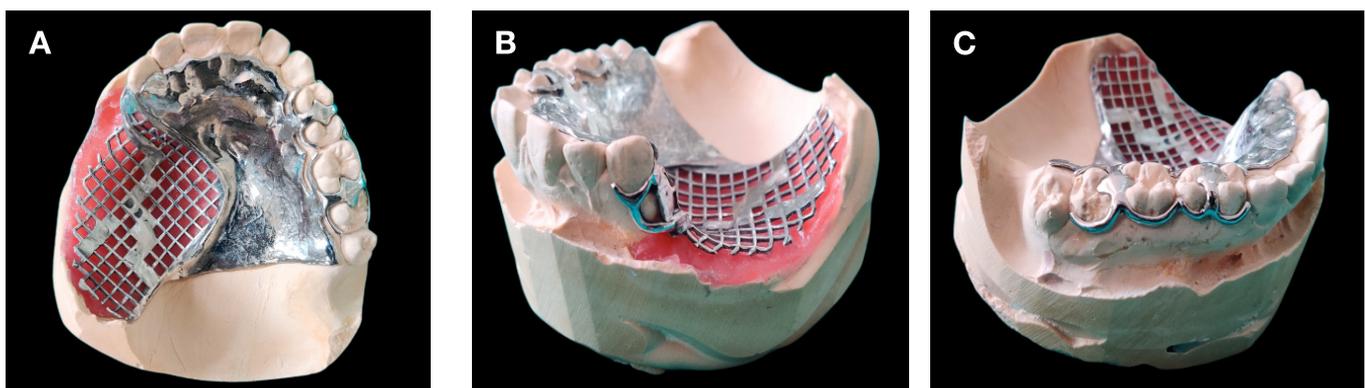


Fig. 15. Cast Framework on Master Cast A. Occlusal view B. Right view C. Left view



Fig. 16. Cast Framework Try in

Discussion

Large palate defects are difficult to restore to normal function surgically. Prosthetic obturation is the preferred method of treatment because of the quality of function it restores [7]. The prosthetic obturators served to restore the surgical defect, palatal contour, tongue space, missing dentition, and midfacial contour and offer retention, stability, and support without jeopardising the health of the remaining dentition and supporting tissues [1]. The obturator prostheses have several advantages, including the ability to visualise the defect site, which may reveal cancer recurrence, a reduction in the length and cost of hospitalization, the ability to avoid a second surgery, and the immediate restoration of facial morphology and oral functioning [3,8]. Surgical repair allows the definitive reconstruction of



Fig. 17. A. Jaw Relation B. Try In



Fig. 18. Definitive Obturator A. Occlusal view B. Right view C. Left view



Fig. 19. Definitive Obturator in Situ

communication and often yields successful results for the restoration of small defects [3,9]. However, surgical repair is associated with prolonged hospital stays and a higher risk of morbidity in the flap donor area. For these reasons, various researchers have advocated obturators as the gold-standard treatment, while surgical repair is an alternate method for individuals who have maxillary defects as a result of tumour ablation [3,10]. Even though the surgical repair establishes a permanent barrier between the oral and nasal cavities, the maxillary defect no longer has retentive characteristics. Furthermore, various properties of the free flaps, such as hard resilience and lack of salivation, also impact retention and stability of the prostheses, causing



Fig. 20. Definitive Obturator in Situ A. Right View B. Front View C. Left View

physiological distress to patients and thereby affecting their quality of life [11,12].

Communication between the prosthodontist and the surgeon is essential to achieve these objectives. It is the prosthodontist's job to communicate to the surgeon the prosthodontic advantages of preserving as many alveolar processes and teeth as feasible without jeopardising the complete resection of the tumour [3,4]. When the typical midline hemimaxillectomy is modified to preserve the alveolar process or, even better, teeth on the surgical side, the prognosis of prosthodontic treatment improves considerably because the functional fulcrum line shifts to a more favourable location. An endeavour should be made to save as much of the hard palate as possible while keeping the tumour under control. A significant portion of the maxilla, particularly the anterior maxilla on the tumour side, is frequently found to be disease-free. The preservation of the anterior maxilla greatly improves the prosthodontic prognosis by improving the stability and support of the prosthesis [3]. A further recommendation for the surgeon is to make the line of resection through the socket of an extracted tooth rather than attempting to cut between adjoining tooth roots. This will significantly improve the prosthodontic prognosis [4]. Interproximal cuts cause the tooth adjacent to the defect to lose alveolar support, which might lead to tooth loss post-surgically. The tooth next to the defect is important as an abutment for the obturator prosthesis, and its alveolar support must be preserved. If the remaining tooth immediately adjacent to the defect lacks appropriate alveolar support, it should be extracted before designing and fabricating the definitive obturator prosthesis. It is preferable to avoid the necessity for further extractions following the initial loss of teeth and maxilla [3,4].

Although the surgical obturator is not essential for maxillectomy surgery, it does provide potential benefits to the patient when compared to surgery performed without an obturator [4]. During tumour resection, the surgical obturator provides the surgeon with a stable, clean scaffold for supporting the surgical dressing, which in turn supports the facial flap and keeps pressure on the skin graft placed over the denuded internal surface of the facial flap [1]. During the initial healing phase, it forms a barrier between the surgical dressing and the oral cavity, so that the patient cannot feel the extent of the defect or dressing with his

tongue [13]. Surgical obturators also allow patients to eat and drink without the use of a nasogastric tube, allowing them to speak normally and alleviating the initial feelings of loss that patients experience when they realise the extent of their surgical defects [14-16]. Surgical obturators also shorten the length of stay in the hospital. In most cases, patients are discharged from the hospital 3 to 5 days after surgery [3,4].

The interim obturator prosthesis links the surgical obturator with the definitive obturator. Both surgical and interim obturators aim to keep the patient comfortable and functional until a definitive prosthesis is available [4]. There are various reasons why an interim prosthesis should be made. First, the addition of interim lining materials regularly increases the thickness and weight of the prosthesis, and these interim materials tend to become rough and unclean with time. Second, if teeth were extracted during the resection, adding anterior and possibly posterior denture teeth to the obturator can be quite helpful to the patient's psychosocial condition. Third, if retention and stability are inadequate, re-establishing occlusal contact on the defect side may be helpful [1]. Fourth, when the definitive prosthesis needs to be repaired, relined, or rebased, a well-made interim obturator can be used as a backup prosthesis [17].

In most cases, a definitive obturator prosthesis can be made within 3 to 6 months of surgery. The timing will be determined by the extent of the defect, the prognosis for tumour control, the usage and timing of post-surgical radiation and chemoradiation, and the effectiveness of the existing obturator [18]. By 3 to 6 months after surgery, the majority of patients' psychological health will have improved. They acknowledge that speech, mastication, and deglutition will not be affected to a greater extent. Most dentulous patients become physically and mentally prepared for the comprehensive restorative treatment that may be required before a definitive obturator can be fabricated [3,4].

Obturator prostheses should be worn at night to manage sinus secretions and saliva. In cases where the prosthesis is removed overnight, the soft tissue periphery of the surgical site changes due to tissue oedema, which makes it difficult for the patients to reposition the prosthesis the next day. Additionally, mastication is often difficult for patients who have large surgical defects and must be done on the non-surgical side [19].

Conclusion

Dentulous patients with a reasonable distribution of dentition and favourable defects in the hard palate are very effectively restored with the removable obturator prostheses. This case series followed the fabrication of surgical, interim, and definitive obturators for three patients. The partition between the nasal and oral cavity, palatal contour, speech, and swallowing were restored, and mastication was accomplished with the residual maxillary dentition. All patients were satisfied in terms of aesthetics, phonetics, and retention of the prostheses, resulting in an increased quality of life.

Authors' contribution

VN - Conceptualization, Methodology, Resources, Software, Writing – original draft, Writing – review & editing.
JP - Conceptualization, Writing – original draft, Writing – review & editing.

BS - Methodology, Resources, Writing – review & editing
KKM - Methodology, Resources, Writing – review & editing

Conflict of interest

None to declare.

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