

Prosthetic Rehabilitation of a Maxillectomy Patient with Restricted Mouth Opening Using an Altered Cast Technique: A Case Report

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DOI: <https://doi.org/10.52403/ijshr.20240207>

ABSTRACT

Deformity in the maxillofacial region caused by surgical resection of a tumor have an adverse effect on the patient's ability to swallow, masticate, phonate, and psychological state. These patients may have restricted mouth opening capacity due to several surgical procedures and scar contracture resulting from radiation therapy. Therefore due to restricted access to the oral cavity prosthetic rehabilitation of these patients becomes a challenging task.

A precise impression of the resection defect is necessary for accurate obturation. This is not practical for patients who have restricted mouth opening, hence this crucial first step in the making of a good prosthesis is frequently accomplished by altering the conventional impression method. This clinical report details the prosthetic rehabilitation of a patient who was diagnosed with Adenoid cystic carcinoma of the left maxillary sinus. Patient underwent maxillectomy for tumor removal, which was worsened by trismus as a result of the procedure and radiation therapy. For orofacial rehabilitation and defect obturation, the patient was restored with a removable dental prosthesis with a hollow

bulb obturator. An altered cast technique was used in the final impression making. This rehabilitation approach was successful in restoring lost function and appearance of the patient.

Keywords: Maxillectomy, Hollow Obturator, Altered cast technique

INTRODUCTION

The main aim of the maxillofacial prosthodontist in complete rehabilitation for a patient who has undergone maxillectomy is to restore speech, deglutition, and mastication to normal, and to restore the patient's orofacial features. [1] Surgical reconstruction is the ideal course of action for any anatomic abnormality. Nonetheless, prosthetic reconstruction must be used to restore anatomy, function, and aesthetics when surgical reconstruction is not feasible. [1] Unlike surgical rehabilitation, which takes longer, obturator fabrication allows for a quicker process and easier access to the surgical site for the purpose of detecting tumor recurrence following obturator removal. [2]

An obturator is a maxillofacial prosthesis that is used to seal an alveolar or soft tissue structure that has been surgically removed,

as well as an acquired tissue opening, usually of the hard palate. [3] A surgical obturator is inserted during the surgical procedure, followed by an interim obturator while the incision heals, and a final obturator three to six months post surgery.[4] Considering the patient's comfort in mind, the final prosthesis should be lightweight, simple to construct, and should have excellent stability, support, and retention. [5]

Patients undergoing maxillectomy frequently experience limited mouth opening as a result of the combined effects of radiation and surgery. Inflammation and damage to the masticatory muscles and other adjacent tissues can result in trismus. [3] For these patients, prosthetic rehabilitation becomes challenging because of a number of clinical and technological issues. [2]

Although management strategies like use of dynamic opening devices, [6] surgery, [7] and denture design modifications [8] have been put out, there is a lack of research on the clinical management of the issues related to providing dental prosthesis for individuals with trismus. If left untreated, trismus can develop into a chronic condition that leads to a progressive atrophy of the elevator muscles. [9]

Conventional dental treatment is very difficult for these individuals, necessitating a different approach for treatment. In order to simplify the impression making technique and develop a successful prosthesis, a technique resolving impression challenges is described and demonstrated in the following case report. The prosthodontic rehabilitation and obturator fabrication for a partly edentulous patient with an acquired unilateral maxillary deformity is described in this case report. An altered cast technique was used in the final impression making and the outcome was fairly excellent.

CASE DESCRIPTION

- A 26 year old woman was referred from the department of ENT, Goa medical college and hospital, to department of

Prosthodontics crown and bridge, Goa dental college and hospital, diagnosed with Adenoid cystic carcinoma of left maxillary sinus, for assessment and treatment planning. (Figure 1)

- Maxillary and Mandibular preoperative alginate impressions (Zhermack, Tropicalgin) were made for the planning and fabrication of immediate surgical obturator. Type III dental stone (DPI - Dental products of India) was poured into the impressions and the preoperative casts were obtained. (Figure 2)
- After consulting ENT surgeon the area to be resected was marked and trimmed on the maxillary cast. These cast was duplicated to be used as study cast for future prosthesis fabrication. The immediate surgical obturator was then fabricated using the trimmed original cast. (Figure 3)
- On the day of surgery, following the hemimaxillectomy, a single gauze pad soaked in antibiotic ointment was used to pack the affected region. The surgical technique was subsequently completed by placing the immediate surgical obturator and fixing it to the surrounding mucosa with 3-0 silk sutures, thereby dividing the nasal and oral cavities. (Figure 4)
- After the surgical procedure, the patient reported back for a follow-up visit seven days later. The immediate surgical obturator was removed at this point.
- To ensure that the surgical margins would heal without interference, interim obturator was inserted in place of the immediate surgical obturator on the day it was removed. Interim obturator was fabricated on the preoperative trimmed original cast. It was lined with a soft tissue conditioner (Lynal, Dentsply Sirona). (Figure 5)
- The patient was examined every four weeks, to evaluate tissue maturation, assess the retention, stability, and support of the interim obturator, and address any treatment adaptability issues

- that were documented in the clinical record. Depending on the tissue circumstances, the obturator was relined and trimmed as necessary to promote retention.
- During this period, patient also underwent a course of radiotherapy (dose 48 Gray) for a period of 31 days.
 - Prosthetic rehabilitation of the patient (Aramany's class I defect) began one year post radiotherapy. A cast partial maxillary hollow bulb obturator prosthesis with clasps was planned for this patient.
 - On examination the defect area had healed completely, but patient had developed trismus with maximum mouth opening of 15mm, which made insertion of impression trays difficult. (Figure 6)
 - To improve the mouth opening, patient was given a customised cone shaped heat cured polymethylmethacrylate acrylic resin (DPI- Dental Products of India) mouth opening device. (Figure 7)
 - The appliance had to be positioned between the patient's right side lower and upper posterior teeth. Rotating the handle of mouth opening device produced the stretching effect. These exercises were to be done five times a day, with six repetitions in each session, and the stretches were to be held for six seconds.[10]
 - Even after using the mouth opening device for two months, the mouth opening increased only upto 19 mm, it was not possible to remove a single piece impression from the oral cavity. Consequently, it was decided to go ahead with altered cast technique.
 - The study cast was surveyed and the prosthesis was designed. An Impression was made using polyvinyl siloxane impression material (Zhermark elite HD + soft putty and light body) after mouth preparation and the secondary cast was obtained.
 - Secondary cast was surveyed for examination and design of the cast framework.
 - The secondary cast was duplicated to generate the refractory cast, which was then used for investing and casting once the design was transferred from the secondary cast to the refractory cast.
 - Trial of the cast framework (Co-Cr Mo alloy) was done. The fit of the metal framework over the soft tissues and teeth was assessed. (Figure 8)
 - A self cure acrylic resin (DPI-Dental products of India) customised tray was fabricated using the metal framework. After which, the tray was border molded with green stick (DPI Pinnacle dental tracing stick) and the impression was made using impression compound (Y-dents impression composition) to get the required extension. (Figure 10)
 - In the lab, the secondary cast was altered. Part of the cast corresponding to the resection defect was trimmed. Retention grooves were created along the inner borders of the non-resected part of the cast. (Figure 11) The obturator cast framework was placed on it along with the impression of the resection defect.
 - To produce a definitive cast, the impression with the altered secondary cast was beaded, packed, and poured using type III dental stone. (Goldstone dental stone) (Figure 12,13) [11]
 - The final conventional steps i.e. jaw relation and try-in of waxed up cast metal framework was completed. (Figure14,15)
 - Heat cure denture base acrylic resin (DPI - dental products of India) was used in the processing of the prosthesis. The lost salt technique was used to make the prosthesis hollow. [12] After finishing and polishing the maxillary hollow bulb obturator was delivered. (Figure 16,17)
 - Instructions were given post-delivery.

- Patient was also instructed to continue using the mouth opening device to improve the mouth opening.
- Patient was recalled after 24 hours, 7 days, 1 month, 2 months and necessary adjustments were made.
- The patient was given hygiene instructions, and it was advised that they come for follow-up appointments every three to six months, or as needed, to assess the state of the oral mucosa and assess how well the denture fits, particularly the obturator fit at the entry of the resection defect.
- The patient was satisfied and content with the treatment received.



Figure 1: Preoperative extraoral view



Figure 2: Maxillary and Mandibular preoperative casts



Figure 3: Immediate surgical obturator



Figure 4: Placement of immediate surgical obturator

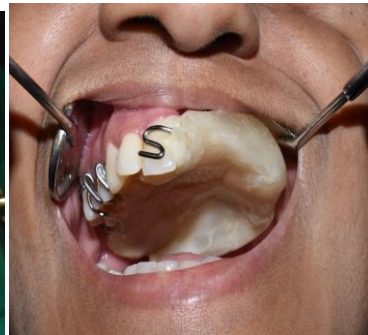


Figure 5: Interim obturator



Figure 6: Reduced mouth opening post radiotherapy(15mm)



Figure 7: Customised heat cure acrylic Mouth opening device



Figure 8: Cast partial denture framework trial

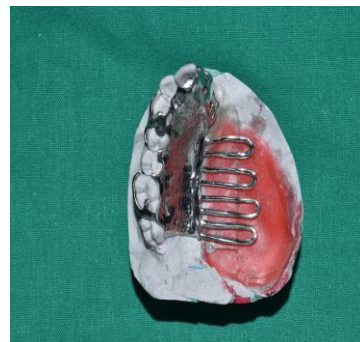


Figure 9: Cast partial denture framework on the secondary cast



Figure 10: Special tray fabrication for border molding the defect area

Figure 11: Trimmed secondary cast

Figure 12: Beading and boxing of the altered secondary cast with impression



Figure 13: Definitive cast with the framework

Figure 14: Jaw relation

Figure 15: Try in



Figure 16: Final prosthesis



Figure 17: Post prosthesis delivery



Figure 18: Pre operative



Figure 19: Post surgery and radiotherapy



Figure 20: Post prosthesis delivery

DISCUSSION

Prosthetic rehabilitation of patients with oral cancer after surgery or radiation is a clinically difficult scenario.[8] According to recent reports, patient's quality of life and obturator prosthesis function are closely correlated.[13] Obturators make a quick, one-stage reconstruction possible, improving the patient's quality of life, as for many of these patients, surgery may only be palliative.[14]

Surgery performed before radiation therapy and radiation fields that affect the temporomandibular joint and the muscles of mastication both commonly results in trismus.[1]

Various mouth opening devices can be used post surgery to treat trismus. A significant improvement in mouth opening was reported by Li et al. after they designed an EZBite mouth opening device and carried out a 12-week structured open mouth training programme.[15] TheraBite is a mechanical device with a lever mechanism that allows to adjust the amount of tissue stretch and helps in mouth opening by simply squeezing the handle. [16] "Dynasplint trismus system," is another appliance which lengthens the connective tissue by applying a low-torque, for an extended stretch. [17]

In this case, a customised cone shaped heat cured polymethylmethacrylate acrylic resin mouth opening device was fabricated for the patient to improve the mouth opening. The patient's depressor group of muscles is employed by the tapered acrylic cone to separate their jaws, making it simple to see their development. The strength of the patient's depressor muscle limits the stretching power that may be delivered with this device.[10]

Patient had a Aramany's class I defect, i.e. resection was performed along the midline of the maxilla; the teeth were maintained on right side of the arch.[18] Therefore, it was decided to obtain a direct retention from the labial surface of the right side anterior teeth with an I-bar on the central incisor. Posterior retentive clasps were planned on the buccal surface of the molars, and bracing palatally.[19]

It was not possible to capture the soft and hard palatal portions in a single impression due to the small mouth opening of 19 mm; thus, an altered cast technique was considered as a modification to the conventional impression procedure. Simplified tray manipulation, less patient stress, the option to use a custom-fabricated tray for appropriate impression material thickness, accurate intraoral placement, and tray stability are all benefits of the altered cast technique utilised in this case report.[1] Despite trismus, a precise impression of the resection defect and the non-resected portion of the maxilla could be made by utilising the altered cast technique.[20] Oral function, speech, and aesthetics were all improved by the maxillary hollow bulb obturator, which guaranteed sufficient closure of the resection defect with appropriate obturator retention, stability, and support. [20]

CONCLUSION

A prosthodontist contributes significantly to the orofacial rehabilitation of individuals with orofacial defects by carefully studying their functional and aesthetic requirements. The loaded impression tray is the biggest component that must be placed intraorally during prosthodontic therapy. A large mouth aperture is necessary for correct tray insertion and alignment during impression

procedure to obtain an accurate impression. In cases of severe trismus these can be accomplished by altering the impression technique.

Both the patient's and the clinician's expectations were taken care of with the suggested treatment strategy of using a altered cast technique for the final impressions in order to fabricate an obturator prosthesis

Declaration by Authors

Acknowledgement: None

Source of Funding: None

Conflict of Interest: The authors declare no conflict of interest.

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How to cite this article: Sadhvi G Naik, Kennedy Mascarenhas, Meena Ajay Aras, Vidya Chitre, Aradhana Nagarsekar. Prosthetic rehabilitation of a maxillectomy patient with restricted mouth opening using an altered cast technique: a case report. *International Journal of Science & Healthcare Research*. 2024; 9(2): 45-52. DOI: [10.52403/ijshr.20240207](https://doi.org/10.52403/ijshr.20240207)
