Rehabilitation of Post Surgical Maxillectomy Defects Using Interim Obturators—A Case Series

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Abstract Prosthetic rehabilitation of extensive maxillectomy defects are exigent given the difficulties faced due to loss of palatal bone, teeth and surrounding supporting tissues which help in retention, support and stability of the prosthesis. An interim maxillary obturator is a prosthesis which is made after surgical resection of a portion or all of one or both maxilla where initial healing is completed. Frequently many or all teeth in the defect area are replaced by this prosthesis. It plays a vital role in preventing the facial disfigurement and irritation to the surgical site thereby enhancing the healing and restores the functional capabilities such as speech, mastication, deglutition etc. To gain better retention and stability, preservation of the unaffected regions is needed which can be achieved by proper surgical planning and designing of the prosthesis. This case series describes rehabilitation of three extensive maxillectomy defects with hollow open and closed interim obturators.

Keywords Interim obturator · Hollow bulb · Surgical obturator · Squamous cell carcinoma

Introduction

Oral cancer is the eleventh most common cancer worldwide [1]. The highest oral cancer rates are found in Melanosia, South-Central Asia, Central and eastern Europe for both males and females [2]. India has one of the highest incidences of oral cancer with around 30 % of new cases annually with the age standardized incidence rate of 9.8 per 100 000 populations [3]. The major risk factors for oral cavity cancers are smoking, alcohol and smokeless tobacco products and HPV infection

[2]. Worldwide smoking accounts for 42 % of oropharyngeal cancer [2]. In India, Taiwan and other neighboring countries smokeless tobacco and betal quids are the major risk factors for increasing incidences of oral cancer [4, 5]. The primary treatment protocol is surgical resection of the involved site along with radiation therapy and chemotherapy which often causes facial disfigurement and difficulties in mastication, deglutition and speech resulting in a high level of morbidity with significant psychological implications [6]. The prime purpose of an obturator is to separate the oral cavity from nasal cavity and form a pressure resistance seal against the oral mucosa to prevent leakage of air and fluid from nasal cavity which helps in speech and swallowing functions. Proper surgical planning is utmost important for treatment success as it helps not only to eradicate the affected tissue but also gives the best possible aesthetic and functional repair. Successful prosthetic planning utilizes the remaining palate and dentition to maximize the retention, stability and support of the obturator [7]. Surgical planning for prosthetic rehabilitation minimizes post surgical complications and helps preserve and increase the supporting areas for the obturator. These procedures include lining the defect with split thickness skin graft to improve the support and form a scar band on the lateral and postero lateral part of the defect which helps in retention of the prosthesis. Preservation of the palatal mucosa medially and rotating it towards the Vomer also increases support of the prosthesis [7]. An osteotomy cut through an extraction site near to the defect preserves the bone near the primary abutment which helps in prosthetic outcome [7]. The standard treatment protocol for oral rehabilitation of maxillectomy cases are: Surgical obturator placed at the time of surgery, Interim obturator after 7–10 days after surgery and definitive obturators given 3–6 months post surgery. An interim obturator supports the soft tissues after surgery and prevents irritation of the mobile, non-cicatrized, bleeding tissues and minimizes the scar contraction and facial disfigurement, helps in mastication and speech. It is worn till the wound healing is

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completely satisfactory. Different obturator designs are followed such as solid bulb obturator, open and closed hollow obturators, inflatable obturators, and two-piece hollow obturator prostheses [8, 9]. This case series reports rehabilitation of three extensive maxillectomy cases with the hollow bulb interim obturators. Informed consent was obtained from all three individual patients included in this case series.

Case One

A 39 year old male patient reported to the department of ENT with complaints of left nasal block, swelling over the left side of the face with shooting pain that disturbed sleep, left eye proptosis and watering of the eye for over 2 months. He was a smoker for last 10 years. Magnetic resonance Imaging (MRI) revealed a growth in the left maxilla involving the left orbit extending anterolaterally to the buccal pad of fat, superiorly eroding the floor of the orbit involving the superior oblique and inferior rectus muscle, posteriorly extends upto pterygopalatine fossa and foramen, and inferiorly extends up to hard palate not crossing the mid-line (Fig. 1). Biopsy with Caldwell loop approach under MAC confirmed it as poorly differentiated squamous cell carcinoma (T3N0M0) extending up to the floor of the left orbit. Surgical resection of left maxilla with left orbital exenteration followed by split thickness skin grafting was planned. After obtaining patient's consent planned surgical outline was marked on the preoperative cast and surgical obturator was fabricated with self-cure acrylic resin. After surgery and placement of the graft a surgical pack was placed which was supported by the surgical obturator. Two weeks later surgical site was inspected for graft acceptance, no bleeding was present. Defect was classified as class 1 (Aramany classification). Patient was on nasogastric tube and had difficulties in speech and deglutition. The defect was large vertically due to

Fig. 1 Pre-operative MRI showing the tumor extension

the orbital exenteration leading to mid facial collapse with a depressed cheek, hollowed eye and unintelligible speech. It was necessary to give buccal fullness to the left cheek along with support to the orbital area. A two piece closed hollow bulb interim obturator without artificial teeth was planned. An impression was made in two stages due to the huge size of the defect. Bulb portion of the defect was recorded using putty addition silicone elastomeric material with the help of a custom made acrylic handle to record the full depth of the defect and it was picked up by irreversible hydrocolloid material (Figs. 2 and 3). Impression was removed from mouth separately because of the size of the bulb, which was too large to be removed together. The bulb portion and the pickup impression were reoriented outside and cast was poured (Fig. 3). A hollow bulb was made using self-cure acrylic resin (Trevalon Hi, Dentsply India, Gurgaon, India) with orientation locks on it which engages the key hole in the palatal plate which served as a palate (Fig. 4). The bulb supported the orbital portion, restored the cheek fullness. The palatal plate lined with soft liner supported the bulb, formed a non-pressure seal with the surrounding tissue which improved swallowing and speech dramatically (Fig. 5). The obturator was periodically adjusted for 8 months till the healing process completed and the final obturator with orbital prosthesis was fabricated.

Case Two

A 52 year male patient reported with pain and swelling in the region of upper right molar tooth for past 1 month. He was chewing tobacco for past 30 year. Sub mucous fibrosis (SMF) of right and left buccal mucosa and trismus was present. An ulcero-proliferative growth on the right upper third molar region involving palato-alveolar margin was present with decreased sensation in the right side of face along the distribution of maxillary nerve. The MRI revealed a growth in the palato-alveolar margin of the right upper third molar region involving anterolateral wall of maxilla and erosion of inferolateral wall of the right orbit along with involvement

Fig. 2 Custom made acrylic stent and impression of bulb with the help of the stent

Fig. 3 Impression of the bulb with alginate pick up impression reoriented

of pterygoid muscle on the right side. The biopsy confirmed it as well differentiated squamous cell carcinoma of the right maxilla. Surgical resection along with radiation therapy was planned. Pre-operative diagnostic impression was made with sectional trays due to limited mouth opening for the surgical obturator. Right side extended maxillectomy upto tooth 22, involving the floor of the orbit along with split thickness skin grafting was done. The surgical pack was supported by the surgical obturator. After 2 weeks evaluation of the surgical site was done and the defect was classified as class IV (Aramany classification) crossing midline till left lateral tooth (Fig. 6) leaving behind small amount of palatal mucosa and fewer number of teeth for the obturator support. As trismus made it difficult to use a regular tray for the impression for interim obturator fabrication, the surgical obturator was used as a tray and two stage putty wash technique was used. Using heat cure acrylic resin a closed hollow bulb interim obturator was fabricated (Fig. 7). Patient was taught to drink liquid with the palatal plate (Fig. 7) on and sent for radiotherapy which he discontinued in the middle. Patient went back home even after counseling about the danger he is putting himself in. After 1 month he started having pain near the bulb of the prosthesis. On examination unhealed ulcer was present at the superior end of the defect at the infra orbital site. Patient still did not want radiotherapy so a new modified interim obturator with anterior teeth was given for long term use as final obturator making was delayed (Fig. 8). Patient was comfortable in the periodic reviews done every month for last 6 months.

Fig. 4 The palatal plate and the inner bulb

Case Three

A 50 year old male patient reported with ulcerative lesion in the anterior part of the hard palate for last 3 months (Fig. 9). History of smoking and tobacco chewing for 20 years. Biopsy confirmed it as moderately differentiated squamous cell carcinoma extending till the anterior inferior wall and inferior part of the medial wall of the left maxilla and also the inferior turbinate of the left side and till the floor of the right maxilla involving almost all palate (Fig. 9). Bilateral partial maxillectomy was done and surgical obturator along with surgical pack was inserted which was sutured to the surrounding mucosa because there was only single tooth (27) left with very little palate support. The prosthodontic rehabilitation was extremely difficult as mouth opening was also reduced. Two weeks post surgery the site was inspected for satisfactory healing and impression was made with putty and medium body addition silicone elastomers. The surgical obturator was used as the tray because regular tray was difficult to use due to reduced mouth opening. Nasal turbinates were left intact in this case which created trouble in extension of the impression and also of the bulb (Fig. 10). A complete hollow bulb was fabricated by joining two sheets of self-cure acrylic resin (Fig. 11) which was relined with soft liner. The obturator was very light as weight of the prosthesis was a prime concern here with no undercuts or enough teeth present to gain retention. After 8 months of using this interim obturator during which patient underwent radiotherapy a second open hollow bulb interim obturator was fabricated with only anterior teeth present (Fig. 12). Patient was comfortable with this interim obturator as this did not put pressure on the remained nasal turbinates during eating and drinking liquid and the improved esthetics.

Discussion

The volume and configuration of the defect, positioning of the remaining soft and hard tissues, and weight of the prosthesis are the major factors influencing the retention and stability of the prosthesis [7, 10]. The left maxillectomy with orbital exenteration created a huge defect with limited mouth opening in the

Fig. 5 Post operative defect and the obturator lined with soft liner in place

Fig. 6 Post operative defect extension

Fig. 7 First interim obturator

case one which required fabrication of a two piece interim obturator. Previous case studies have also stated that a two piece obturator is preferred to make the insertion of the prosthesis easy in such cases [11]. Literatures have shown that lighter prosthesis (closed and open hollow bulbs) provides favorable retention and stability [10–12]. Wu and Schaaf showed that hollow bulb obturator decreases the weight from 33.06 to 6.55 % depending on the defect size [13]. Studies have also shown that closed hollow obturator extends into the defect effectively and also prevents collection of fluids and food and keeps it clean [14]. Hence the interim obturators were made as closed hollow bulb in all the three cases keeping the benefits in mind. Rehabilitation

was challenging in case 3 due to bilateral partial maxillectomy with very little palatal support and the presence of nasal turbinate. A complete hollow closed bulb obturator was made with two sheets of self-cure acrylic resin which was joined together and lined with soft liner which gave favorable result. Previous reports have used the same technique with success [15]. Retention was gained from the lone standing upper left second molar with a wrought wire clasp and the soft tissue undercuts which were engaged with the help of soft liner. After 6 months of radiotherapy a final interim obturator with anterior teeth and lined with soft liner was made but it was open hollow because of problems encountered due to nasal turbinates. It has been seen

Fig. 8 Final interim obturator

Fig. 9 Pre-operative ulcerative lesion in premaxilla and post operative defect extensions

Fig. 10 Modified surgical obturator and Putty with medium body impression using the surgical obturator as tray

Fig. 11 First total hollow interim obturator

Fig. 12 Final interim open bulb hollow obturator in place

that soft liner can be used to engage severe deep undercuts as in this case [16, 17]. Immediate interim obturators were given without artificial teeth in order to prevent the masticatory force on the surgical site which may delay the wound healing during their radiation therapy. For case two teeth were given 3 months post-surgery as patient did not want to continue with radiotherapy or chemotherapy at all. In all the three cases the interim obturator stimulated the functional anatomy of maxillary sinus and added resonance to the speech.

Conclusion

Closed or open hollow bulb interim obturators in single and two pieces restored the masticatory efficiency and added resonance to the speech and improved overall quality of life of the patients. It also helped the patient go through the rehabilitation process comfortably.

Compliance with Ethical Standards

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. Formal consent was not required for this type of case report.

Informed Consent Informed consent was obtained from all individual participants included in this study.

Conflict of Interest Authors Minati Choudhury, Shanmuganathan N, Padmanabhan T. V. Shailee Swarup, Manita Grover, Mahalakshmi Arumugam declare that they have no conflict of interest.

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