Case Report

Use of a Removable Silicone Bung for Increased Seal and Retention of an Obturator in the Prosthetic Rehabilitation of a Unilateral Maxillary Defect: A Clinical Case Report

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INTRODUCTION

Maxillary defects are created by surgical treatment of benign or malignant neoplasms, as well as congenital malformation and trauma and their occurrence is also associated with the enucleation of maxillary cysts (1). Squamous cell carcinomas account for two thirds of the malignant neoplasms of the upper gingiva and hard palate. Lesions in these areas account for 1-5% of total occurrence in the oral cavity.[1] Adjacent structures are vulnerable to metastasis during the confirmation of the diagnosis. With this eventuality, the recommended treatment for these types of lesions is alveolectomy, palatectomy, partial or total maxillectomy. These treatment outcomes depend on the location and aggressiveness of the actual lesion, its histiotype, patient's age and general health status (1). Patients with acquired maxillary defects differ from those with congenital defects due to the abrupt alteration in physiologic processes associated with surgical resection of the maxillae (1). The post-surgical effects have affect the form and function of normal stomatognathic system. The quality of life of the patient is therefore reduced as the end state can be particularly severe (2). Patients can experience hypernasal speech, regurgitation of food or fluid into the nasal cavity, impairment of mastication and deglutition. The facial contour of the patient can also be affected, particularly when it involves one or both sides of maxilla with or without associated paranasal sinuses (2). "Rehabilitation of these acquired maxillary defects can be accomplished by using various types of micro-vascularized flaps for smaller defects or by prosthetic means for larger defects" (2).

An obturator is prosthesis that closes a palatal defect in both dentate and edentulous patient (3). Early management with an option such as this, is therefore important in retaining function and enhancing aesthetics and thus possibly safeguarding the patient's self-esteem (4).

Keyword:

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The choice between options is influenced by the site, size, etiology, severity, age and the patient's wishes. However, the success of the prosthodontic option depends upon treatment planning and collaboration between the surgeons, prosthodontist with consideration of patient expectations. “Prosthodontic rehabilitation of total or partial maxillectomy in patients includes the separation of oral and nasal cavities to allow adequate deglutition and articulation, support for the orbital contents to prevent enophthalmos and diplopia, support of the soft-tissue to restore the midfacial contour and an acceptable aesthetic result” (5). “It is positioned within the closure of a congenital or acquired tissue opening, primarily located in the hard palate and/or contiguous alveolar or soft-tissue structures” (6).

The time period that has passed from surgery decides the classification of the obturator. A patient can therefore receive an immediate surgical obturator (feeding plate); temporary or interim obturator and definitive obturator (7).

After surgical treatment, an immediate surgical obturator is placed right away. This is used to reduce any of the complications to be had (8). Soft-tissue is supported by this obturator, and the contracture of the resulting scar, minimized. There is also a reduction of disfigurement (maintains some measure of palatal contour) while protecting the surgical packing from contamination (9). A regular diet can then be resumed and, the wound remains protected from trauma. Pressure is maintained either directly or indirectly on any split thickness skin graft (10). Furthermore, it restores speech to a reasonable level and obviates the use of naso-gastric tubes. “They can also be used to correct lip and cheek contour and to reduce the flow of exudates into the mouth” (11).

According to Keyf (3) “the temporary or interim obturator is constructed from a cast poured from a post-surgical impression. A closed but hollow bulb may extend into the defect the defect replicated on the palatal region and soft tissue areas”.

“The definitive obturator is fabricated approximately six months after surgery from a post-surgical maxillary cast, at a time when the surgical site has completely healed and minimal dimensional changes are unlikely.” As such this type of obturator has a metal framework, which acts as the palate and supports the teeth and a closed hollow bulb (12).

The obturator design hinges upon the specific surgical defect which would range from the very undemanding to an extensive defect. Thus a universal classification of maxillectomy defects results in the adjustment in objective in the design of the prosthesis. According to one systematic review of literature describing a search for such classifications, there is no universally accepted classification system which serve both the surgeon and the prosthodontist simultaneously (13). Individual criteria necessary for such a classification was described and it was found that those from the prosthodontist perspective considered treatment planning for the defect long after surgery. The criteria included dental status, oroantral or nasal communication, contiguous structures involvement, superior-inferior extension, anterior-posterior extension and medial-lateral extension.

Knowing the dental status allows for treatment planning, tooth facilitated or implant retention of the prosthesis, while the absence of an air space (nasal or antral) communication removes the difficulty of the design in providing physical separation between the oral cavity and other spaces. The involvement of contiguous structures presents a difficulty in planning the extent and retention of the intra-oral prosthesis over a wider area of skeletal and soft tissue. The superior extension allows for determining the ideal height necessary for peripheral seal while

anterior-posterior extension attracts issues of re-establishing esthetics, namely lip support, midfacial support, lip competency and also pharyngeal and soft palate functioning. Lastly, medial-lateral extension dictates the amount of surface area available for support and retention, in cases where the dental status is poor and implants are precluded. It also indicates the amount of tissue that the prosthesis is to cover.

Various materials have been used for fabrication of obturators including hard acrylic resins such as PMMA, flexible or thermoplastic acrylic resins. In addition acrylic soft liners and silicone soft liners are used (14, 15). As early as the 1930's, compression moulding technique has been used widely throughout the world for making intraoral removable prosthesis. There is no doubt that this technique has served patients for many years, but it is disadvantageous with regard to some aspects such as polymerization shrinkage, residual monomer, discomfort due to the hardness of the material and the inability to atraumatically engage undercuts. Patients have already undergone surgery, and many experience mental and physical agony. In addition, the residual tissue is also highly compromised. The challenge for the prosthodontist is to utilize the remaining tissues in the best way possible by using a material which can easily engage the retentive undercuts, avert the disadvantages of acrylic material and be easily acceptable to the patient (15).

Rehabilitation of course is not without possible negative outcomes. However these can be outweighed by the positive aspects of providing an obturator prosthesis to the patient. One such disadvantage is the colonization of the obturator prosthesis by microorganisms with the possibility of prosthesis related infection. At the delivery of any prosthesis management of this possibility is of paramount importance. It becomes ever more critical with the rehabilitation of compromised tissues. As mentioned previously, various materials are used to fabricate the

obturator prostheses. Candida species colonisation presents a problem for soft liners and silicone (16) while in addition to the presence of the common Streptococci, microflora of nose and sinus such as Staphylococcus spp, corynebacteria, Haemophilus spp. and neisseriae(17, 18) are also present in the biofilm. These can be potentially virulent in the immunocompromised (16, 19).

CASE REPORT

Patient History

A 24 year old female student of Indo-Trinidadian descent with an unremarkable medical history presented to the UWI School of Dentistry for prosthetic rehabilitation following a low left hemimaxillectomy and level one left neck dissection in the removal of a high grade mucoepidermoid carcinoma (MEC) with nodal involvement (2012). She is a non-drinker and non-smoker. Prior to this, the patient underwent left maxillary resection and cryosurgery for an "Ameloblastoma" (2007) (report was unavailable). There was suspicion of recurrence; however the diagnosis of MEC was confirmed upon histopathological review of the surgical specimen removed at second admission. The specimen included left maxillary tuberosity with upper third molar, pterygoid plates and left sinus with polyps. The submental and left submandibular salivary glands were also removed. An immediate surgical obturator with soft reline was fitted after maxillectomy. Subsequently several interim obturators were fabricated (fig 1-3 shows one such obturator that was fabricated two months after second surgery), the most recent obturator was fabricated in 2013, however the patient underwent radiotherapy in that same year followed by removal of a recurrent/secondary mass in 2014 and thus required yet another replacement.

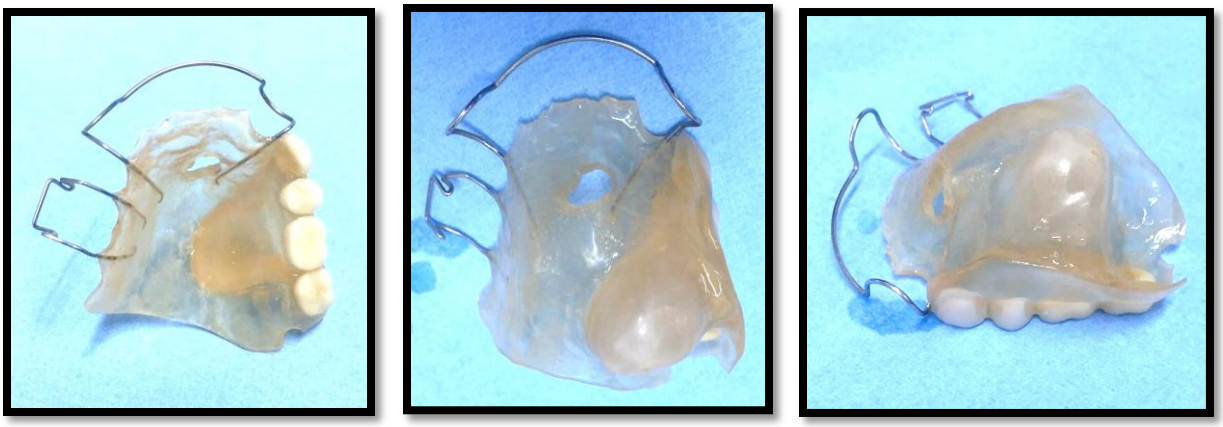


Fig 1: Interim Obturator fabricated 2 months after surgery - Outer surface view.

Fig 2: Interim Obturator fabricated 2 months after surgery - Inner fit surface view.

Fig 3: Interim Obturator fabricated 2 months after surgery - Side view.

Clinical Findings

At the time of referral to the prosthodontic department, the patient was not actively wearing an obturator. The patient commented that the intermediate obturators provided for her never completely prevented the inflow of from the oral cavity to nasal air space and as such "practiced to keep liquids down". They past obturators were generally stable and comfortable to the patient. However, post radiotherapy and a third surgery, the obturator in use became ill fitting and irritating to the inflamed and then healing soft tissues.

The patient required only prophylaxis and minor restorative work prior to the commencement of fabricating another obturator. Figures 4 and 5 show views of the defect at presentation.

Fig 1: Lateral view of defect.

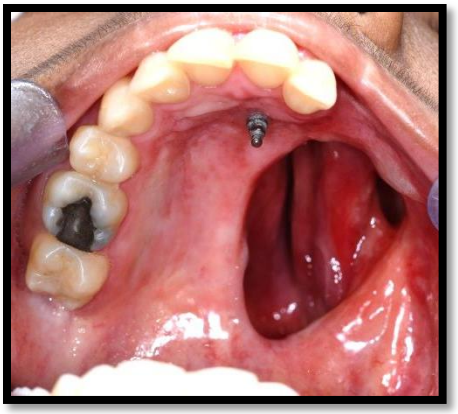


Fig 2 : Maxillary occlusal view of defect.

DISCUSSION

Post surgically, the patient is seen to have a resultant Type II defect according to the classification by Okay et. al 2001, or a Vertical Type II and Horizontal Type II according to Brown et al 2010. The intraoral view shows that the defect does not involve the premaxilla. However the left canine was involved. It is seen not to cross the midline and the vertical extent does not include the orbit. Of the two classifications the latter seems to more precisely define this defect.

Table 1: A pair of classifications for maxillectomy defects that may be found to be the most mindful of prosthodontic considerations.

Contributor	Classification
Okay et al 2001 (20)	Ia- Defects of any portion of hard palate excluding tooth bearing maxillary alveolus Ib- Defects of premaxilla or any portion of alveolus or dentition posterior to canines II- Defects include any portion of hard palate, alveolus and only one canine tooth. Also includes transverse palatectomy involving less than 50% of hard palate III- Defects include resection of any portion of hard palate, alveolus and both canine teeth. Also includes transverse palatectomy involving greater than 50% of the hard palate IV- Subclasses f and z denote involvement of orbital floor and any portion of zygoma respectively.
Brown et al 2010(21)	<u>VERTICAL</u> I- Maxillectomy not causing an oronasal fistula II- Maxillectomy not involving orbit III- Maxillectomy involving orbital adnexae with orbital retention IV- Maxillectomy with orbital enucleation or exenteration V- Orbitomaxillary defect VI- Nasomaxillary defect <u>HORIZONTAL</u> I- Palatal defect only, not involving dental alveolus II- Less than or equal to 1/2 unilateral III- Less than or equal to 1/2 bilateral or transverse anterior IV- Greater than 1/2 maxillectomy

An impression of the defect was made using polyvinyl siloxane putty in a stock tray and a light body wash placed into the defect and over the occlusal surfaces of all teeth present, secondary to placing ribbon gauze into the defect. The resultant impression accurately captured the vertical and horizontal extensions of the defect and all excess material was removed on withdrawal of the ribbon gauze.

A study cast was poured, upon which an extension of the proposed obturator into the defect was delineated (Figure 6). Undercut areas were blocked out and the cast duplicated. The initial temporary acrylic base was fabricated and occlusal rims added to this.

A traditional record of the occlusion was obtained. Initially, there was difficulty in retaining the baseplate against the defect to complete this step. As such an Adams clasp was inserted in order to increase retention while adjusting the occlusal rim.

During final processing the undercuts within the defect were again blocked out on the working cast and the acrylic extended only partially into the defect.

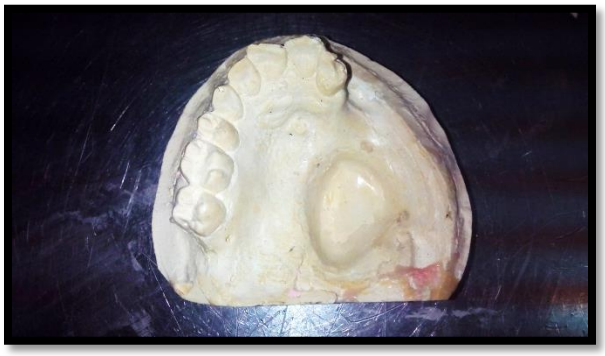


Fig 6: Study cast showing full extent of palatal defect.

Post processing, the first duplicate cast was scored within 3mm of the borders of the defect to produce a minimal undercut (Figure 7). Silicone was injected into this defect and the processed obturator seated carefully with pressure until the silicone was completely set.

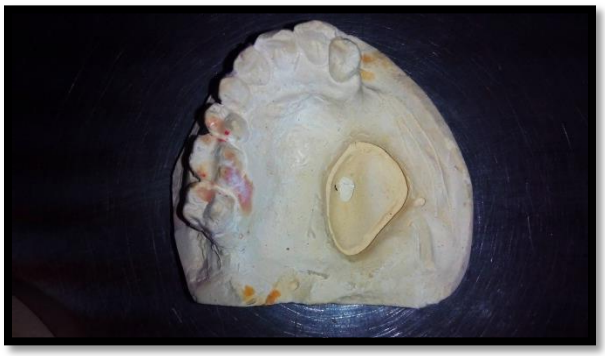


Fig 7: Study cast showing defect after partially blocking out undercut in order to fabricate the obturator.

The resultant final prosthesis therefore consisted of a hard acrylic base that adapted closely to the dentition and palatal tissues (Figure 8).

The method of fabrication allows the bung to be removed for cleaning such as with chlorhexidine gluconate (short period of soaking). This should limit the growth of any potentially infectious microorganisms.

Upon writing this report, the patient had been wearing the new obturator for a period of six (6) weeks. There was a complaint of muscle stiffness while wearing the prosthesis. However she has commented on the increased comfort of fit and adequacy of the seal produced as compared to her previous obturator which did not have the silicone bung (Figures 9-14 show the obturator in situ in patient's oral cavity with replacement of teeth and improvement of esthetics). Minor adjustments to the acrylic were made to remove excessive width of the flange area as well

as sharp areas on the tissue bearing side. Additions to the tooth bearing acrylic in the region of the canine as well as removal of the anterior (south end) clasps were done to improve esthetics (patient's wish), although at the expense of retention.

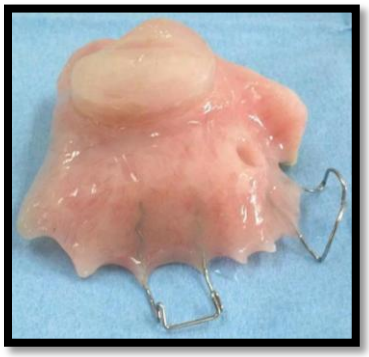
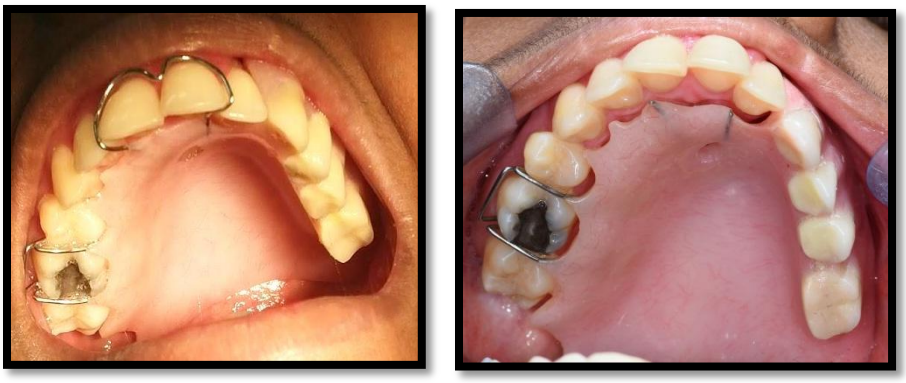


Fig 3: Obturator showing silicone bung



Figs 4 and 10: Obturator in situ – palatal view

Figs 11, 12, 13 and 14: Obturator in situ – anterior views.

CONCLUSION

The use of the silicone bung served to increase retention and provide an adequate seal while maintaining comfort for the patient. While not without its disadvantages, this simple addition may make it possible for better fit of intermediate acrylic obturators in a cost effective manner. It could be especially useful where the injection moulded polymer obturator is not available or is difficult to obtain due to prohibitive cost.

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