

Rehabilitation of Acquired Maxillary Defects: A Case Series

Dr. Udfer Hameed Mir, Dr. Umayya Ahmed Teli, Dr. Sandeep Kour Bali,
Dr. Shazia Mir, Dr. Shabir Ahmed Shah, Dr. Qazi Shazana Nazir

Abstract:- Prosthetic rehabilitation of patients having acquired defects of maxilla presents a challenging task. Surgical resection of palatal tumors results in oro-antral communication which causes reflux of food into the nasal cavity, problems in speech, swallowing, and mastication. The optimal re-constructive treatment of palatal defects continues to remain contentious. Various treatment options includes, prosthetic obturators, vascularised & non-vascularised grafts and various flaps. Among several treatment options, prosthetic obturators are preferred because it takes less time in fabrication, being cost effective and moreover, there is no fear of graft failure. This case series describes management of three different acquired maxillary defects using surgical obturators with certain modifications.

Keywords:- Obturator, Rehabilitation, Aquired Defects, Maxilla.

I. INTRODUCTION

One of the most significant midface structures, the maxilla is essential for speech, swallowing, and mastication. The surgical removal of malignancies in the maxillary arch and paranasal sinuses is the primary cause of palatal defects (1). However, significant bony and soft tissue deficiencies in the palate can also be brought on by trauma, fungus infections, and, more recently, osteonecrosis brought on by the use of bisphosphonates (1). Approximately 3% of head and neck malignancies and 0.5% of all malignant diseases are rare neoplasms known as malignant tumours of the maxillary sinus (2). Every year, there are 0.51 cases of maxillary sinus cancer per 100,000 people (2). The majority of maxillary sinus cancers (70% of cases) have the most prevalent histologic type, squamous cell carcinoma (2). Surgery to remove the tumour is the most common form of treatment for patients with a maxillary malignancy. This frequently results in an oronasal and/or oroantral deficiency, which causes severe functional issues with speech, deglutition, and mastication. Therefore, the reconstruction of maxillectomy defects is a particular challenge for head and neck surgeons (3-4).

A multidisciplinary approach is often needed to rehabilitate such patients (5). The prosthodontist has two main goals in the complete rehabilitation of maxillectomy patients, namely to restore the functions of chewing, swallowing & speaking and to achieve a normal orofacial appearance (6-8). The prosthesis used to close a palatal defect in an edentulous or/ dentulous mouth is called an obturator. The advantage of obturators over surgical reconstruction is the ease of examination of the surgical site after removal of

prosthesis which helps in detection of tumor recurrence (9-10).

Obturator is defined as prosthesis used to close a congenital or acquired tissue opening, primarily of the hard palate and/or contiguous alveolar structures (GPT-9) (11). There are three different types of obturators viz., immediate surgical obturator, interim obturator, and definitive obturator (12-13). The immediate surgical obturator is made from the impression taken prior to surgical excision of the lesion and placed immediately after surgery. An interim obturator is usually placed 7 up to 10 days after the operation (14). While the temporary prosthesis is placed, the surgical site heals and becomes stable. The surgical site is well healed and stable between 3 and 6 months after surgery (15). Completion of healing allows for the third phase of prosthetic therapy- the definitive obturator.

This case series describes various methods to make obturator prosthesis more comfortable for the patient thus increasing compliance and patient satisfaction, and to reduce the postoperative shrinkage of tissues using various modifications, thus increasing the aesthetic outcomes.

II. CASE 1

A 75year old male patient was referred to the Department of Prosthodontics Government Dental College Srinagar J&K with the request of fabricating immediate surgical obturator for complete maxillectomy. On initial examination he presented with completely edentulous mouth with extensive growth of maxillary arch along with central ulcerations of palatal area (Fig.1a).

Preliminary impression was made using alginate impression material and cast was obtained (Fig.1b). The margins of the proposed surgical resection was outlined by the concerned surgeon on the presurgical maxillary cast. And accordingly, the cast was altered. The immediate surgical obturator was fabricated similar to a record base. Arch bars and peripheral loops were added to the obturator for retention as complete maxillectomy was to be performed. For retention, mandibulo-maxillary fixation (MMF) screws were inserted into the bone and the tie wires joined the arch bars with the screws (16). The prosthesis was then waxed, invested, and processed in pink heat activated acrylic resin and was finished and polished (Fig.1c). The prosthesis was then stored in a disinfectant prior to surgery. After the tumor resection went according to plan, the prosthesis was placed and fixed at the surgical site with some modifications. Instructions were given that the obturator should only be removed from the patient's mouth in an emergency. The patient was recalled one week

after the operation, the prosthesis was removed, cleaned and the necessary adjustments made.

After 2 weeks, interim obturator was fabricated for the patient. Maxillary defect after 2 weeks (Fig.1d). The maxillary preliminary impression were made with alginate using immediate surgical obturator as tray and casts were poured from the impression. An acrylic resin maxillary custom tray was fabricated and final impression was made with silicone medium body impression material (Fig.1e). The impression was boxed and the master cast was poured in type IV dental stone (Fig.1f). Considering the friability of tissues, it was decided to use only the simplest type of prosthesis without replacement of teeth. To make it hollow, the obturator was made in two pieces and later joined together. Wax was adapted on the defect side of the cast (Fig.1g) and separate wax pattern for lid fabrication (Fig.1h). Acrylization was done in two parts (Fig.1i) using pink heat cure acrylic resin. And then fused using cold cure acrylic resin along the margins (Fig.1j). The obturator prosthesis had adequate retention because of undercuts in the defect area. But these undercuts were posing problems with insertion and removal of prosthesis. The obturator was then reduced on intaglio surface and relined with soft liner (Fig.1k). The prosthesis was then placed in patients mouth and necessary instructions given. Patient is being continuously monitored and is comfortable with the prosthesis along with improvement in speech and swallowing.

III. CASE 2

A 45year old male patient was referred to the Department of Prosthodontics Government Dental College & Hospital Srinagar J&K. He had to undergo surgery for squamous cell carcinoma on the anterior maxillary region. On intraoral examination, ulcerative growth was seen in maxillary anterior region (Fig.2a) with partially edentulous arch. It was decided to make an immediate surgical obturator for the same.

For this purpose impression was made and cast obtained (Fig.2b). Following this, mock surgery was performed on the cast as directed by the concerned surgeon. The steps for making the immediate obturator were similar, except for the addition of lip plumber to prevent postsurgical contraction, thus improving aesthetics (Fig.2c). The prosthesis was then delivered to the surgical area and was immersed in a disinfectant prior to surgery. Following surgery, obturator was placed after required adjustments. After 2 weeks, interim obturator was fabricated with anterior teeth replacement without bulb (Fig.2d). Lip plumber was added to interim prosthesis as well as there is continuous shrinkage of tissues for several months postsurgery. Teeth were added only for aesthetics and were placed out of occlusion to prevent trauma on surgical side. The interim prosthesis was placed and post insertion instructions were given (Fig.2e,f). The patient was being monitored and necessary adjustments done till definitive obturator was made.

After 3 months, impression was made of maxillary arch along with defect area using elastomeric impression material

and cast was obtained (Fig.2g). The presented defect was similar to the Aramany's Class VI situation (17). After verification of the jaw relation, the trial denture was waxed, invested, and processed with pink heat cure resin. After acrylization, final prosthesis was trimmed and polished (Fig.2h). The prosthesis was made hollow by lost salt technique and bulb was lined by permanent soft liner (Fig.2i) thus improving patient comfort and mastication. The patient is on regular recall checkups and is contented with his prosthesis with adequate lip support.

IV. CASE 3

A 62 year old male patient reported to the Department Of Prosthodontics Government Dental college & Hospital Srinagar J&K for prosthetic rehabilitation. The patient had undergone partial maxillectomy due to pleomorphic adenoma. Patient complained of regurgitation of fluids and also wanted replacement of teeth. On intraoral examination, partially edentulous arch was observed along with left maxillary defect with healthy margins (Fig.3a). The presented defect corresponded to the Aramany's Class II situation (17). The treatment plan included fabrication of maxillary denture for the patient with hollow bulb obturator for palatal defect using acrylic hollow shell technique.

Primary impression was made using alginate (Fig.3b). The cast obtained was used for making secondary impression using silicone impression material. Following bite registration and try-in, relief wax was adapted on defect area (Fig.3c) of the secondary cast. Onto which hollow acrylic shell was fabricated using cold cure acrylic resin (Fig.3d). Wax-up of denture was done without hollow acrylic shell (Fig.3e). The shell was placed during packing stage (Fig.3f). After acrylization, final prosthesis was trimmed and polished (Fig.3g) and inserted in patient's mouth (Fig.3h). Instructions after insertion were given. During follow-up visits, the obturator bulb was periodically modified to maintain patient comfort and function.

V. DISCUSSION

Patients with maxillary defects complains about difficulty in swallowing, fluid reflux and speech problems (18) which were also seen in the above cases after surgical resection of the tumor. Obturator prostheses are commonly used for the rehabilitation of patients with such maxillary defects. Obturators are traditionally classified into immediate, interim and definitive. As already mentioned, rehabilitation of maxillary defect can be done surgically as well as in combination with prosthesis, here prosthetic option was chosen because it facilitates cancer surveillance, achieving immediate results and being cost effective as well (9,10).

Immediate surgical obturators are those which are made before surgery and inserted in the operating room at the time of surgery. The surgical obturator provided an artificial palate, ensuring restoration of oral function, especially speech and deglutition. In case 1, Since the patient was completely edentulous and complete maxillectomy was to be performed, arch bars were added on anterolateral side of obturator so that

tie wires can be placed. For retention mandibulo-maxillary fixation (MMF) screws were inserted into the bone and the tie wires joined the arch bars with the screws. The mandibulo-maxillary fixation screws are minimally invasive and are placed over the buccal cortex. The screws are 2.5mm in diameter and 12mm in length, making them bicortical so they can provide sufficient transverse stability to the obturator (16). Also peripheral loops were added to the obturator for enhancing retention.

An interim obturator is usually placed after 2 weeks of surgical resection, which helps in improving speech and aesthetics by adding teeth to the obturator (14). When the soft tissues round the defect have stabilized, a definitive obturator will be fabricated. A definitive prosthesis can be fabricated only after stabilization of the soft tissues around the defect which usually takes about 3 to 5 months depending upon the size of defect and other factors like radiation therapy and other co-morbidities (19).

The commonly used impression materials for impressions of patients with oro-nasal/sinus communication are alginate and silicone-based elastomeric materials (20). In all the cases, initial impression was made with alginate for making custom trays, the final impression was taken with polyvinylsiloxane in order to get more accurate impression thus improving the adaptation of the prosthesis to the surrounding tissues. Using a material with greater elastic recovery, such as vinyl polysiloxane would be more suitable for easy removal of the tray as there are many bony undercuts which helps in retention of prosthesis (20).

Open or closed hollow obturator can be made to reduce the weight of prosthesis. The closed bulb was successfully used in all the cases since it is more hygienic as there is no

accumulation of secretions. In literature, several methods have been narrated to fabricate hollow bulb obturators (21-27). Various materials such as sugar, salt and ice can be incorporated into the resin during the packaging stage to create a hollow bulb obturator. Other methods, are incorporation of an acrylic resin shell, and the placement of polyurethane foam into the defect area to produce the hollow obturator.

Three different techniques were employed for making hollow bulb obturators in the above three cases. In case 1, separate lid was made which was later joined whereas in case 2, lost salt technique was employed and in case 3, acrylic shell was used. On comparing these three techniques first technique was better in terms of reduced weight whereas, less laboratory steps were involved in second and third method. In lost salt technique, acrylic resin flowed over the incorporated salt during the packing stage, which increased its weight. Also added thickness of acrylic shell increased the weight of prosthesis in case 2. Silicone liner was used in case 1 and case 2, which significantly improved masticatory performance, comfort and reduced nasal leakage. The disadvantage of silicone rubber is its porous nature and poor long term durability, what necessitates its replacement from time to time (28-29).

VI. CONCLUSION

Rehabilitating the patient with maxillary obturator is the most common treatment option after maxillectomy. Retention is obtained by using available undercuts and clasping the available natural dentition. Closed hollow obturator is preferred as it is of light weight and hygienic. Further addition of silicone liner improves masticatory efficacy.



Fig 1a. Intra oral view



Fig 1b. Maxillary cast



Fig 1c. Surgical obturator with arch bars and retention loops

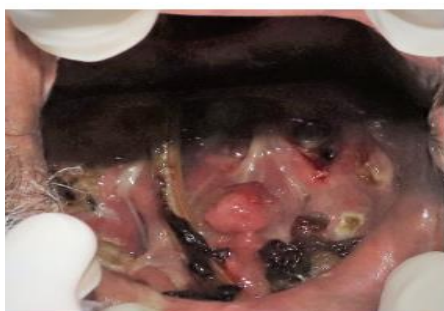


Fig 1d. Post maxillectomy



Fig 1e. Impression of defect



Fig 1f. Cast obtained



Fig 1g. Wax adapted on defect side

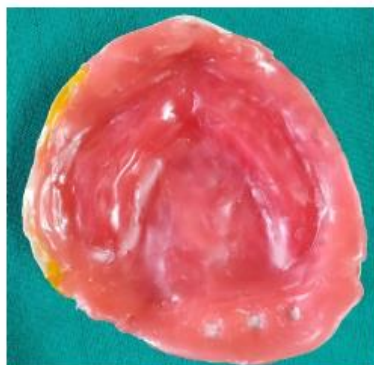


Fig 1h. Wax pattern for lid fabrication



Fig 1i. Acrylization done in two parts for fabrication of hollow obturator



Fig 1j. Two parts fused together



Fig 1k. Obturator placed

CASE 1



Fig 2a. Intra oral view



Fig 2b. Maxillary cast



Fig 2c. Surgical obturator with lip plumber



Fig 2d. Interim Obturator without bulb



Fig 2e. Post maxillectomy



Fig 2f. Interim obturator placed



Fig 2g. Cast obtained



Fig 2h. Definitive obturator with bulb



Fig 2i. Bulb lined with permanent soft liner

CASE 2



Fig3a. Intra-oral view of defect area

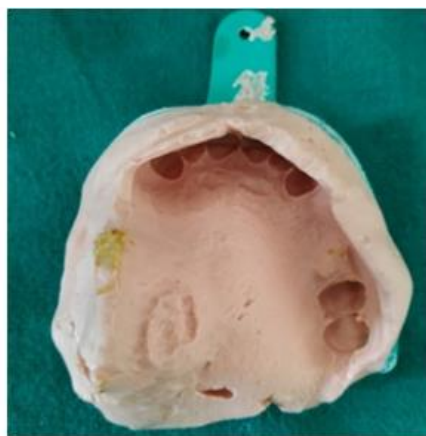


Fig3b. Impression



Fig3c. Wax Relief for fabrication of acrylic hollow shell



Fig3d. Acrylic hollow shell



Fig3e. Wax-up



Fig3f. Placement of hollow shell



Fig3g. Final prosthesis



Fig3h. Final Prosthesis placement

CASE 3

REFERENCES

- [1]. Beumer III J, Marunick MT, Esposito SJ. Rehabilitation of maxillary defects. In: Maxillofacial rehabilitation-Prosthodontic and surgical management of cancer related, acquired, and congenital defects of the head and neck. 3 ed. Quintessence; 2011. p.155-212.
- [2]. Won HS, Chun SH, Kim BS, Chung SR, Yoo IeR, Jung CK, Kim YS, Sun DI, Kim MS and Kang JH: Treatment outcome of maxillary sinus cancer. *Rare Tumours* 1: e36, 2009.
- [3]. Murakami M, Nishi Y, Umezono M, Kamashita Y, Nishimura M. Fabrication of a movable obturator following maxillary reconstruction with slit-shaped fenestration. *J Prosthodont.* 2015;24(3):254-9.
- [4]. Ishikawa S, Kikuchi N, Kobayashi T, Yamanouchi H, Tachibana H, Iino M. Significant improvement in temporary dental rehabilitation by not able miniplate application in the hard palate for a patient with a large anterior maxillary defect: a case report/technique article.
- [5]. Metha S, Kohli D, Solanki K, et al. Prosthodontic rehabilitation of hemimaxillectomy patient with permanent silicon based obturator. *JADCH.* 2011;2:55–8. *Head Face Med.* 2013;9:34.
- [6]. de Carvalho-Teles V, Pegoraro-Krook MI, Lauris JR. Speech evaluation with and without palatal obturator in patients submitted to maxillectomy. *J Appl Oral Sci.* 2006;14:421–6.
- [7]. Okay DJ, Genden E, Buchbinder D, et al. Prosthodontic guidelines for surgical reconstruction of the maxilla: a classification system of defects. *J Prosthet Dent.* 2001;86:352–63.
- [8]. Garhnayak M, Garhnayak L, Kumar Kar A, et al. Prosthetic rehabilitation of a unilateral maxillary defect with an intermediate Obturator. *IJDA.* 2002;2:378–82.
- [9]. Riaz N, Warriach RA. Quality of life in patients with obturator prostheses. *J Ayub Med Coll Abbottabad.* 2010;22:121–5.
- [10]. Moreno MA, Skoracki RJ, Hanna EY, et al. Microvascular free flap reconstruction versus palatal obturation for maxillectomy defects. *Head Neck.* 2010;32:860–8.
- [11]. The Glossary of Prosthodontic Terms. Ninth edition. *J Prosthet Dent.* 2017; 117:e1–e105.
- [12]. Adisman IK. Prosthesis serviceability for acquired jaw defects. *Dent Clin North Am* 1990;34:265-84.
- [13]. Desjardins RP. Early rehabilitative management of the maxillectomy patient. *J Prosthet Dent* 1977;38:311-8.
- [14]. Riley C. Maxillofacial prosthetic rehabilitation of postoperative cancer patients. *J Prosthet Dent* 1968;20:352-60.

- [15]. Robinson JE. Prosthetic treatment after surgical removal of the maxilla and floor of the orbit. *J Prosthet Dent* 1963;13:178-84.
- [16]. Chaudhary Z, Sharma R, Krishnan S. Maxillo Mandibular Fixation in Edentulous Scenarios: Combined MMF Screws and Gunning Splints. *Journal of Maxillofacial and Oral Surgery*. 2014 Jun;13(2):213-214.
- [17]. Aramany MA. Basic principles of obturator design for partially edentulous patients. Part I: Classification. *J Prosthet Dent* 1978;40:554-7.
- [18]. Barrios R, Montero J, González-Moles MA, Baca P, Bravo M. Level of scientific evidence of the quality of life in patients treated for oral cancer. *Med Oral Patol Oral Cir Bucal*. 2013;18(4):578-84. doi:10.4317/medoral.19052
- [19]. Shrinivasan J, Babu Rajan K, Suresh V. Fabrication of interim hollow bulb obturator using lost salt technique- A Case Report. *Journal of scientific dentistry*. 2011;1(1):37-40.
- [20]. Krishna CH, Babu JK, Fathima T, Reddy GV. Fabrication of a hollow bulb prosthesis for the rehabilitation of an acquired total maxillectomy defect. *BMJ Case Rep*. 2014;2014. doi: 10.1136/bcr-2013-201400.
- [21]. Didier M, Laccoureye O, Brasnu D, et al. New surgical obturator prosthesis for hemimaxillectomy patients. *J Prosthet Dent* 1993;69:520–3.
- [22]. Wang RR, Hirsch RF. Refining hollow obturator base using light-activated resin. *J Prosthet Dent* 1997;78:327–9.
- [23]. McAndrew KS, Rothenberger S, Minsley GE. 1997 Judson C. Hickey Scientific Writing Awards. An innovative investment method for the fabrication of a closed hollow obturator prosthesis. *J Prosthet Dent* 1998;80:129–32.
- [24]. Oh WS, Roumanas ED. Optimization of maxillary obturator thickness using a double-processing technique. *J Prosthodont* 2008;17:60–3.
- [25]. Habib BH, Driscoll CF. Fabrication of a closed hollow obturator. *J Prosthet Dent* 2004;91:383–5.
- [26]. Asher ES, Psillakis JJ, Piro JD, et al. Technique for quick conversion of an obturator into a hollow bulb. *J Prosthet Dent*. 2001;85:419–20.
- [27]. Deogade SC, Mantri SS, Naitam D, et al. A direct investment method of closed two-piece hollow bulb obturator. *Case Rep Dent* 2013;2013:326530.
- [28]. Brown KE (1970) Clinical considerations improving obturator treatment. *J Prosthet Dent* 24: 461-466.
- [29]. Taicher S, Rosen AG, Arbree NS (1983) A technique for fabrication of polydimethylsiloxane-acrylic resin obturators. *J Prosthet Dent* 50: 65-68.