Rehabilitation of squamous cell carcinoma defect with two-piece hollow bulb obturator prosthesis – A case report

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INTRODUCTION

Individuals affected with carcinoma suffer functional and psychological ailment leading a compromised life. Management of oral malignancy involves surgery, chemotherapy and or radiotherapy. Surgically excised palatal carcinoma leaves an open communication between oral and nasal cavity. This report describes clinical management of patient restored with two-piece hollow bulb obturator prosthesis.

CASE HISTORY & EXAMINATION

A 72 year-old male patient was referred to the department of maxillofacial prosthodontics for restoration of hemi-maxillectomy defect. History revealed patient had been suffering from squamous cell carcinoma for the past 2 years and had undergone surgical resection of the tumor 9 months ago. He had been wearing an interim single piece acrylic obturator for the past 6 months. He complained of frequent
displacement of heavy pre-existing prosthesis. Clinical examination disclosed Aramany class I hemi-maxillectomy on left side with remaining natural teeth on right from central incisor to second molar (Figure 1). Hard palate, residual alveolar ridge, and teeth were resected from the left midline (Figure 2). All teeth were present on the opposing mandibular arch. A limited mouth opening was evident. Intraoral defect examination showed satisfactory healing, with vertical extension till the nasal floor. Remaining natural teeth were periodontally compromised with gingival recession, but no tooth mobility prevailed (Figure 3).

An evident clinical case of Aramany’s class I hemimaxillectomy was diagnosed. Feasible treatment options were tooth and tissue supported, and implant supported obturator prosthesis. Patient was apprehensive about surgical treatment for placement of implant and hence the second treatment modality was eliminated. Previous denture wearing experience revealed difficulty wearing of single piece solid interim obturator. Hence, with existed clinical status, a two-piece closed hollow bulb definitive obturator prosthesis was planned and sequence of treatment was explained to the patient. On obtaining an informed consent, patient was educated and motivated on use of the dental prosthesis. The obturator was planned to be constructed as two separate pieces, one the antral and other the oral part.

3 | TREATMENT

Dental prosthesis mandates a model for fabrication and cannot be constructed directly inside the oral cavity. An accurately recorded impression helps in making of model to proceed with denture process. Two intraoral impressions are required to establish appropriate fit of the prosthesis. Preliminary impression was made with irreversible hydrocolloid (Zelgan, Dentsply) with a metal stock impression tray after blocking out the undercuts with petrolatum applied gauze pads (Figure 4). For master impression, a two-stage procedure was followed in sections due to restricted mouth opening. Two custom impression trays were constructed, one exclusively for the defect proper and other involving dental portion (Figure 5). Outline of the defect area was marked on the primary cast followed by placement of 3 mm wax spacer (DPI Modelling wax). Custom tray was fabricated with self-cure poly methyl methacrylate (PMMA) resin (DPI RR Cold cure). Three acrylic studs of 2 × 2 mm dimension were made on the external surface of defect part of custom tray. Corresponding cut of same size was placed on internal surface of dental part of custom tray. This way both parts of trays were secured to each other. Medium-body poly vinyl siloxane (PVS) impression material (Aquasil Ultra Monophase, Dentsply) was used for final impression of defect area after single step peripheral tracing with PVS putty material (Virtual Refill putty, Ivoclar Vivadent). For final impression of dental portion, two-step putty light body PVS impression was made (Virtual Refill Light body, Ivoclar Vivadent) (Figure 6). On completion of both impressions, they were evaluated for any voids or discontinuity of material. They were then secured with aid of studs as single unit before cast preparation. Master cast was prepared with die stone gypsum material (Kalabhai, Ultrastone plaster).

In the master cast, extreme undercuts were blocked with dental plaster (Kalabhai, Kalstone plaster). A wax pattern of 2-4 mm was adapted onto the defect area of the master cast for fabrication of hollow shim (Figure 7). Heat-cure poly methyl methacrylate resin (DPI Heat cure) was used for its
making of the shim and its lid with conventional compression molding technique (Figure 8). Salt crystals were used for making the shim hollow. A minute opening was created at the junction between the lid and shim for injection of water to drain out the loaded salt from inside. After creation of hollow shim, the opening was sealed with self-cure PMMA. The shim was tried inside the patient's mouth for accuracy of fit and existed anatomic undercuts was utilized for retention of this part of obturator (Figure 9). With the closed hollow shim placed intraorally, an impression with irreversible hydrocolloid was made to obtain a diagnostic cast for fabrication of definitive obturator (Figure 10).

Diagnostic surveying was done to determine the retentive undercut areas on the abutment teeth, delineate the height of contours, mark bony undercut areas, locate path of placement of final prosthesis and charting for mouth preparation was done. Mouth preparation was done for a tripod design of cast partial denture framework including the support from anterior teeth. Two embrasure clasps, one mesial rest, proximal plate, T clasp for anterior most abutment, complete palate major connector covering palatal surface of teeth with occlusal rests, and mesh minor connector with retentive loops for acrylic resin was designed. Final impression was made with monophase poly vinyl siloxane impression material followed by cast preparation with die stone. On the master cast, beadings, blockage of unwanted undercuts, and relief was provided prior to making of refractory cast (Wirovest, Bego). Castable wax patterns (Bego wax and modelling range) were adapted and definitive framework was fabricated with chrome-cobalt alloy (Wironium plus, Bego) using conventional dental casting procedure. Finished cast partial denture (CPD) framework was tried in the patient's mouth (Figure 11). Denture base
and occlusal rims were fabricated for recording of maxillomandibular relationship between the arches (Figure 12). On completion of teeth arrangement with semi-anatomic acrylic teeth (Acryrock cross-linked, Ruthinium), trail denture was verified (Figure 13). Definitive obturator was made with heat cure PMMA (Figure 13).

4 | OUTCOME AND FOLLOW-UP

A definitive two-piece obturator prosthesis was delivered to the patient. The vertical walls on the intaglio surface of the obturator aided in mechanical retention of the hollow shim portion of the obturator (Figure 14). Pressure spots on fitting surface was located with indicator paste (Master-Dent pressure indicator paste) and was trimmed. A complete examination of the finished prosthesis was done to evaluate the fit, remove any rough, sharp, and irregular borders which might cause discomfort. Patient was trained on placement and removal of the two-piece obturator prosthesis (Figure 15).
A 24 hours recall was done to evaluate sore spots if any. Instructions on adequate oral hygiene and denture maintenance was given. Patient was recalled for a review every 3 months post placement of definitive prosthesis.

5 | DISCUSSION

An obturator prosthesis for maxillectomy defects conceals the oro-nasal and/or oro-pharyngeal communications to enhance deglutition, mastication, phonetics, and esthetics of patient. When the defect is huge, fabrication of solid prosthesis pose threat due to its heaviness against gravitational forces. With co-existence of limited mouth opening, insertion and removal of single piece intraoral prosthesis becomes difficult. To overcome these challenges, dentures were made hollow and as two piece. A resin shim was fabricated as suggested by Chalian and Barnett. Advantages of better retention, greater comfort, less stress transmission to adjacent tissues, and improved physiologic functions, was appreciated when the prosthesis was made hollow and as two piece. Closed bulb obturator was provided, to prevent accumulation of fluid or food debris thereby enhancing phonetics.

Heat polymerized PMMA resin was used for fabrication with cast partial framework because of its evident superior mechanical, physical, and biological properties. A chrome-cobalt metal framework provided more durability and was designed to ensure uniform stress distribution to remaining natural teeth and supporting structures within physiologic limits. Guide planes of 1-2 mm height was placed on mesial surface of right maxillary central incisor to control torque movement and limit multiple paths of insertion. Predictable retention and support were gained with involvement of two embrasure clasps on posterior abutments for direct retention, multiple occlusal rest seats for vertical support and modified complete palate major connector was given. Indirect retention was achieved in form of auxiliary rests and palatal extensions of major connector for supplemental bracing and stability.

The two parts of the obturator prosthesis were mechanically retained with the aid of 3-4 mm vertical wall extension on intaglio surface of oral part of the denture. The antral portion of denture fitted within the confines of the walls, thereby eliminating need of any additional methods of retention.
Tissue surface of the antral part of closed hollow bulb obturator extended vertically into the nasal cavity. The undercut in nasal aperture, lateral scar band, and anterior and lateral walls of the defect aided in the retention, and support of the prosthesis. Maximum support was taken from the residual maxilla and surrounding structures within the defect to retain the prosthesis. A composite path of insertion was avoided by construction of dentures as two piece.2,3

Irrespective of the stage of malignancy, after surgical resection immediate rehabilitation of maxillofacial defect is important to restore the quality of life of patients. Critical attention is paid to all reporting difficulties, which might need a multidisciplinary approach.3 Role of maxillofacial prosthodontists play a crucial role, when it comes to rendition of suitable type of dental prosthesis. Choice of right material and design of prosthesis aid in enhancement of better utility.14,15 Periodic review of the patient is critical to ascertain and rectify any discomfort caused due to the dental prosthesis.

CONFLICT OF INTEREST
None declared.

AUTHOR CONTRIBUTION
KVA: Has made substantial contributions to conception and design of prosthesis. Has performed all the clinical and laboratory procedures involved in the fabrication of the dental prosthesis. Been involved in drafting the manuscript or revising it critically for important intellectual content. Agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved and Will be the first and the corresponding author.

DMG: Has made substantial contributions to conception and design of prosthesis. Has supervised and guided in each step involved in making of denture. Has critically associated in manuscript write up, evaluation and correction. Has agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. Co-author has met the criteria for authorship.

INFORMED CONSENT
An informed consent was obtained.

DATA AVAILABILITY STATEMENT
Data sharing not applicable to this article as no datasets were generated or analysed during the current study.

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