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Rehabilitation of a Maxillary Defect Using a Cast Ball-Retained Hollow Obturator Supported by a Lone Standing Tooth: A Case Report

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ABSTRACT

Maxillectomy defects can result in oroantral communication which leads to significant difficulty in mastication and deglutition, impaired speech, and facial disfigurement. This case report describes the fabrication of a definitive hollow obturator supported by cast ball attachment on a lone standing tooth in an operated case of Hodgkins lymphoma of the maxillary sinus. A lone standing premolar was retained and used effectively as an abutment in this patient with compromised basal seat. The definitive obturator significantly enhanced the patient's recovery by improving chewing efficiency, refining speech clarity, and boosting overall quality of life.

Keywords: maxillofacial prosthodontics, maxillary defects, Semi-Precision attachment, hollow bulb obturator, lost salt technique,

INTRODUCTION

Oral rehabilitation of head and neck cancer is an integral part of patient care. Hodgkin's lymphoma of the head and neck region appear as cervical lymphadenopathy. Patients who present with extra nodal involvement usually have disease located in the Waldeyer tonsillar ring. Other sites of extranodal involvement are rare. [1]

Partial or total maxillectomy is usually indicated of such malignancies, frequently resulting in a communication between the nasal and oral cavities. When direct closure and/or reconstruction is not indicated or impossible to perform, such defects are closed with prosthetic obturators. [2]

An obturator prosthesis is classified as surgical, interim, or definitive and reflects the intervention time period used in the maxillofacial rehabilitation of the patient.[3] Once the maxillary defect has healed and become stable, a definitive obturator can be used for rehabilitation. [3]

Interaction between surgeon and prosthodontist is necessary to fabricate an obturator prosthesis which is functionally satisfactory in terms retention, stability and support. An effort to salvage teeth that would preclude total edentulism and help in the retention of the obturator has been recommended. [4]

This case report discusses one such case of definitive hollow obturator retained by cast ball attachment on a lone standing tooth for an operated case of Hodgkins lymphoma of maxillary sinus.

CASE PRESENTATION

An 81-year-old female patient reported to the Department of Prosthodontics with a loose pre-existing maxillary hollow obturator and inability to eat. The obturator showed signs of disintegration such as foul smell, discolouration and staining.

The patient had a history of Hodgkin's lymphoma in relation to left maxillary sinus for which she had undergone hemi maxillectomy surgical resection 11 years ago resulting in Aramany's class 1 defect. The defect extended from maxillary left labial, buccal sulcus region, left alveolus and anterior part of right alveolus, and almost 3/4th portion of the hard palate. The defect had communication with the nasal cavity and featured gentle undercuts along its lateral walls [Figure.1].

Figure 1: Intraoral occlusal view showing maxillary defect

The teeth present were 12,13,14,43,44 and root pieces of 18,38,41,42,48. The patient demonstrated normal mandibular function, with normal mouth opening range and full jaw movements.

After radiographic examination a decision was made to extract all teeth except for 14, which displayed bone level up to the middle third of the root and had no mobility.

The treatment plan included fabrication of a hollow maxillary obturator with cast ball attachment and mandibular complete denture. After explaining the treatment plan, informed consent was obtained.

The primary impressions were made with irreversible hydrocolloid impression material (Zhermack Tropicalgin, Badia Polesine, Italy). Tooth 14 underwent elective endodontic treatment [Figure.2] and was prepared for a dome-shaped coping. Using a direct–indirect technique, a post-and-coping pattern was made incorporating a Rhein 83 attachment, which was fabricated in-lab and cemented with GIC (GC Fuji PLUS) [Figure.3] [5,6].

Figure 2: Elective endodontic treatment done irt 14 to serve as an abutment for cast ball attachment

Figure 3: Rhein 83 OT cap ball attachment with post cemented intraorally

The functional impression of maxillary defect was made with modeling compound (Green stick compound, Hiflex, Prevest DenPro, USA) and light-body addition silicone material (Zhermack Elite HD+, Badia Polesine, Italy) using a custom tray [Figure.4].

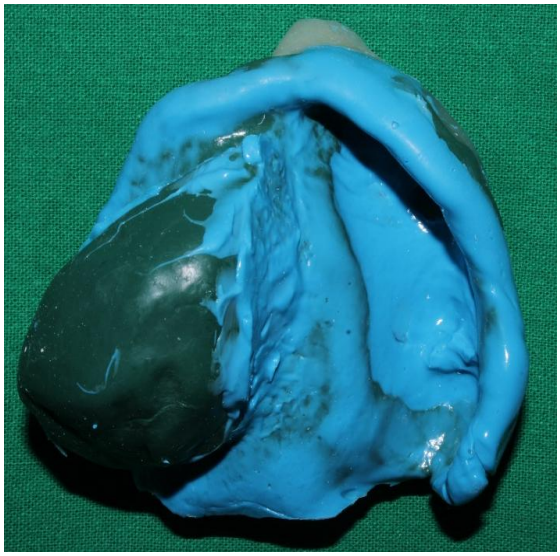

Figure 4: Maxillary secondary impression

Jaw relationship was recorded. Try-in was accomplished with the posterior teeth in centric balance taking into consideration the esthetic and phonetic requirements.

To reduce weight of the prosthesis, a hollow complete denture was planned using lost salt technique [7,8].

The denture was acrylized, and finished in usual manner. Salt was flushed out from the denture by making a hole with a round bur distal to last molar [Figure.5].

The decreased weight of the prosthesis was verified by placing it in water [Figure.6] and checking its weight before and after salt removal [Figure.7].[9] The denture insertion was done and the occlusion was verified.

A pickup of the nylon retentive cap was done into the denture using autopolymerising resin (DPI-RR, Dental Products of India, Mumbai) [Figure.8].

The dentures were inserted and were evaluated to have satisfactory retention [Figure.9]. Denture delivery was done [Figure.10]. Post-operative denture care instructions were given and patient was instructed not to masticate on the defect side. [10] Follow up intraoral radiograph was taken after one month to evaluate the lone standing premolar [Figure.11].

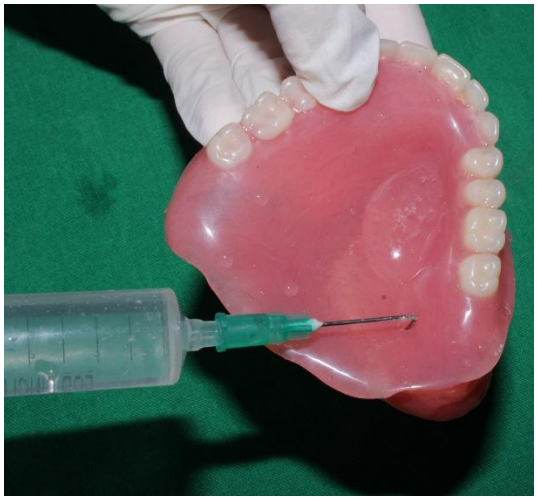

Figure 5: Salt flushed out from the denture by making a hole distal to last molar

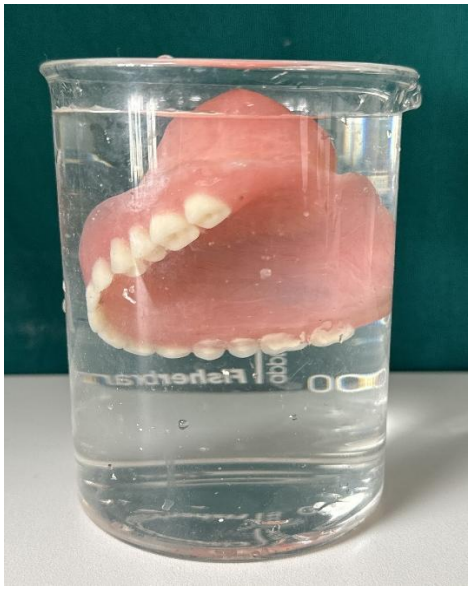

Figure 6: Hollowness of the obturator is verified by its ability to float in water

Figure 7: Obturator weight verified on a weighing scale before and after removal of salt

Figure 8: Nylon retentive cap picks up done into obturator prosthesis

Figure 9: Pre-treatment and Post treatment photograph

Figure 10: Final prosthesis after finishing and polishing

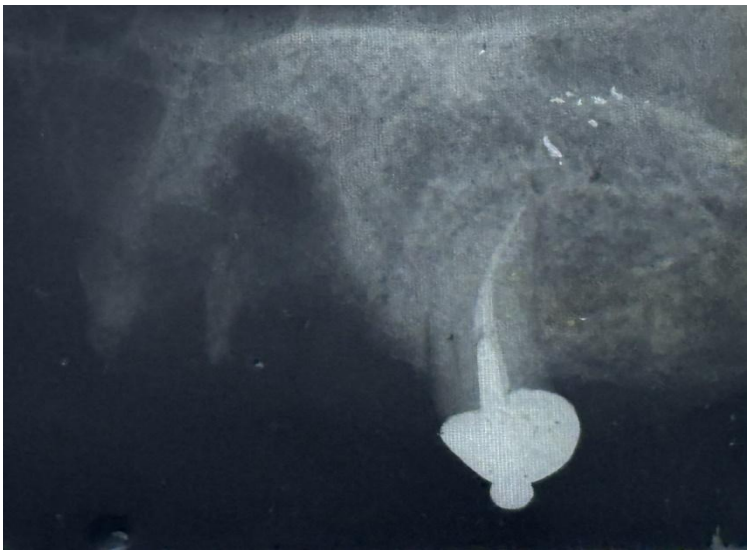

Figure 11: Radiograph of 14 after 1month showing stable bone level

DISCUSSION

As with all maxillofacial prostheses, the presence of teeth enhances the prosthetic prognosis. Efforts should be directed towards preserving existing teeth or their roots to enhance the retention, stability, and support of the prosthesis. [3]

In this case all the teeth except for 14 displayed severe bone loss and mobility and were deemed unsalvageable, the situation was also compounded by the inadequate tissue undercut hence the decision was made to retain the solitary right maxillary premolar to enhance the retention of the prosthesis.

The fulcrum line or axis of rotation is the result of difference in the compressibility between the periodontal ligament apparatus of the abutment teeth and the mucosa covering the edentulous ridge. The compressibility of the mucosal tissues contributes to this rotational movement, impacting the stability and support of the prosthesis. In a large maxillary defect, the movement around this fulcrum line will be significantly greater and more variable and must be considered while designing the prosthesis. [3,4] In patients without teeth who have undergone total maxillectomy, the prosthesis tends to rotate along the medial edge of the defect. The portion of the obturator that is perpendicular and farthest from this axis experiences the most movement. [3,4] Concerns arose that retaining a single right premolar might shift the rotation axis to this tooth, causing the prosthesis to pivot around it. To counteract the fulcrum effect a final prosthesis featuring a resilient extra-radicular attachment was used.

Various hollowing methods are documented to prevent harmful forces from being transmitted from a heavy prosthesis to the underlying tissues. [8-10] In this case, the lost salt technique was chosen for its simplicity and cost-effectiveness. Salt, used as a spacer, is heat-sensitive and dissolves during the curing process, preserving the prosthesis's integrity. However, this technique has drawbacks, such as inconsistent thickness in the hollow section and potential reactions between salt and heat-cured acrylic resin, leading to porosities in the denture. [10]

Superior obturator extensions can be solid, open hollow, or closed hollow. Closed hollow bulb obturators are advantageous as they prevent fluid and food accumulation, which can cause odors and added weight, while allowing for maximum extension.[3] However, the open obturator design maybe less obtrusive in the nasal cavity and permit more normal airflow, nasal resonance, and speech. In this case a closed hollow obturator was preferred due to the above-mentioned advantages. [3]

In large defects retention is supplemented by the undercuts in the defect. [4] Lateral undercuts formed superior to the scar band at the skin graft-mucosal junction contracts longitudinally during healing, it does so like a purse string, should be engaged as it improves retention significantly. Stress is well-tolerated by the skin graft and oral mucosa lining the cheek surface of the defect. [4] In this case split thickness skin graft was taken from the right supero-medial aspect of thigh to be grafted to the defect site, which did provide a lateral undercut to engage the prosthesis.

In this case extra radicular Stud attachment was used.[6] This resilient attachment allowed vertical and rotational movement of the elastic retentive cap around the sphere-shaped component. [6]

The occlusion was designed to achieve balanced centric occlusion. Mandibular teeth were restored optimally to eliminate occlusal discrepancies, facilitating the restoration of the maxillary defect. [11]

The patient was followed up for one month with a radiograph before relocating to another state, making in-person follow-ups difficult. However, telephonic follow-up was conducted for up to six months, during which the patient reported no complaints.

CONCLUSION

Rehabilitating a hemi-maxillectomy patient poses a significant challenge in achieving

adequate retention, stability, and support. However, with in-depth clinical expertise and a thorough understanding of patient-specific requirements, a successful prosthetic restoration becomes attainable. A lone standing premolar with ball attachment was utilised effectively as an accessory retentive aid in this patient with compromised basal seat in the maxillectomy patient. Patient will be followed on regular intervals in order to monitor the health of the tissues and the function of the obturator/dentures.

Declaration by Authors

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