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Rehabilitation of Maxillary Defect with Dyna Magnet Retained Two-Piece Obturator and Twin Table Occlusion: A Case Report

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KEYWORDS
Maxillofacial Defect, Obturator, Magnet Retained Prosthesis, Twintable Occlusion, Prosthetic Rehabilitation, Hemimaxillectomy, Hemimandibulectomy, Carcinoma.Phytoconstituents, Alopecia, Deforestation, Plant-Based Commodities, Conventional Pharmaceuticals Ect.

ABSTRACT:
Maxillofacial defects resulting from resection of Squamous Cell Carcinoma (SCC) can be challenging due to compromised aesthetics, speech, mastication, deglutition, and decline in the patient's overall quality of life. Obturator prostheses are crucial in restoring essential functions. Effective prosthetic rehabilitation, which overcomes challenges such as restricted mouth opening, compromised prosthesis retention, and restoration of oral function, is substantial for the treatment of these defects. This case report demonstrates the fabrication of an obturator using a magnet retention system with twin-table occlusion for a patient who had undergone hemimaxillectomy and hemimandibulectomy due to SCC.

1. Introduction

The sixth most common cancer worldwide is head and neck squamous cell carcinoma (SCC). The treatment protocol consists of extensive surgical resection followed by adjuvant radiation resulting in maxillofacial defects. In addition, post-surgical challenges such as radiation-induced tissue changes and restricted mouth opening are observed in these cases [1].
Prostheses such as obturators are often fabricated to close the cavity or defect in the hard and soft palate. They help in restoring aesthetics, easing deglutition, aiding mastication, and subsequently improving the patient's mental and physical well-being. However, prosthetic rehabilitation of these defects is significantly challenged by their size, location, and extent [2]. In addition, radiation-induced tissue changes and restricted mouth opening are some of the few factors to be considered in functional restoration. Considering this, the retention and stability of the prosthesis is a monumental challenge.
This case report outlines the fabrication of a two-piece obturator using magnets for better retention with twin table occlusion for a patient with a hemimaxillectomy and hemimandibulectomy defect due to surgical intervention of SCC.

Patient Information

A 52-year-old male patient visited the Department of Prosthodontics at DY Patil School of Dentistry, Navi Mumbai, seeking rehabilitation for a maxillofacial defects, that is hemimaxillectomy and hemimandibulectomy. Patient reported difficulties with speech, deglutition, and mastication.The patient underwentright hemimaxillectomy and right hemimandibulectomy due to squamous cell carcinomatwo years ago, which caused the maxillofacial defects.

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Clinical findings

The extra-oral examination revealed depression of the right suborbital region, right nasal alar area, and right angle of the mouth, causing restricted mouth opening of about 28 mm. The mandibular deviation from the midline measured approximately 7 mm.Intraoral examination showed a partial excision of the right maxilla, extending from the midline to the anterior edge of the soft palate. A palatal defect was present on the right side, measuring about 1.5cm in diameter. The missing teeth in the oral cavity were all the teeth of maxillary first quadrant and molars of mandibular fourth quadrant. An orthopantomogram confirmed the clinical findings (Figure 1).

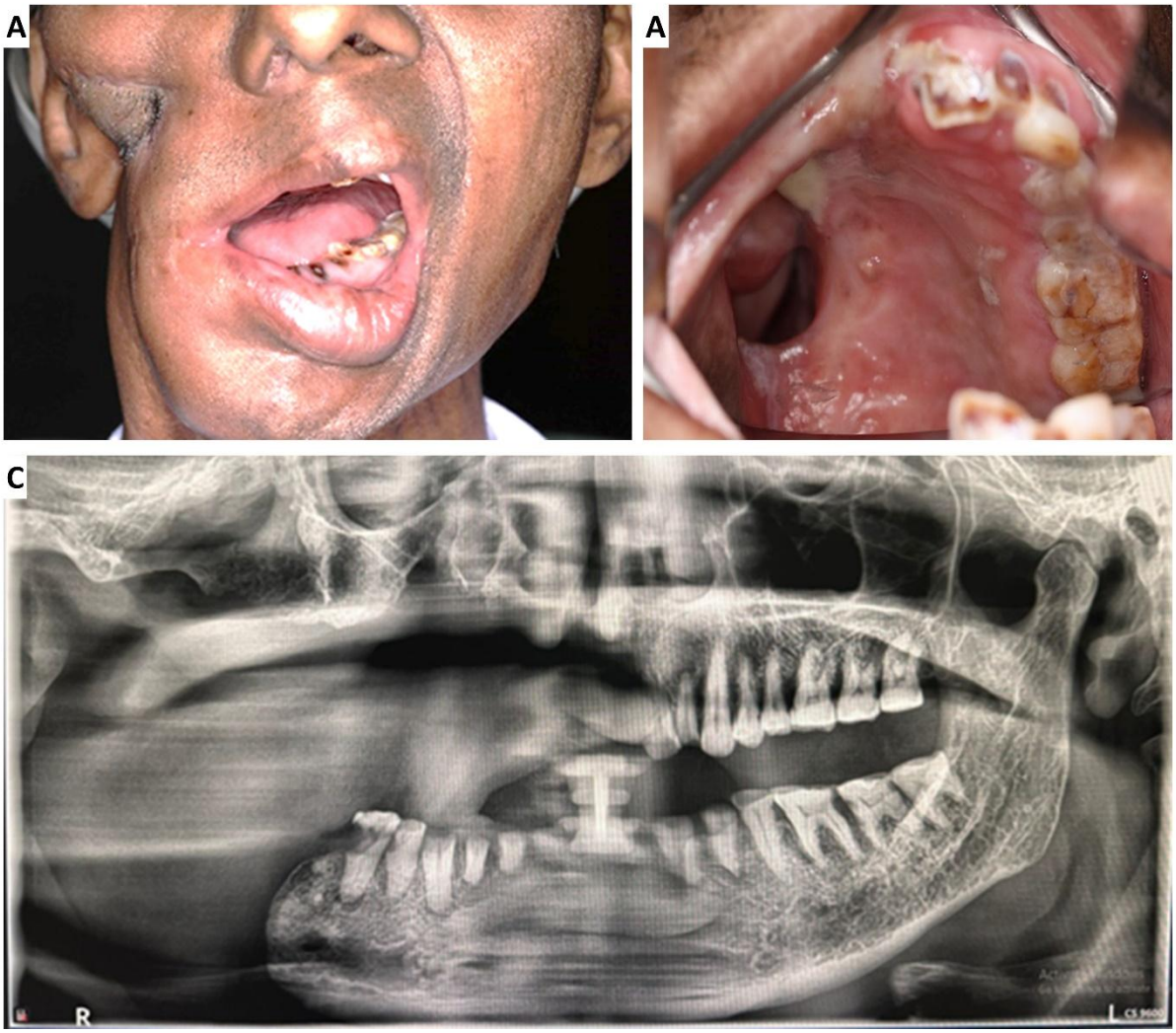

Figure 1: Pre-clinical photograph A) Extraorally and B) Intraorally; C) Orthopantomogram

Diagnostic Assessment

No active pathology was observed in the residual structures. The size of the maxillofacial defect and patient's restricted mouth opening necessitated a customized approach for prosthetic rehabilitation. Twin-table occlusion was planned to address the mandibular deviation.

Therapeutic Intervention

In the initial phase of treatment, both the maxillary and mandibular arches were scanned intraorally due torestricted mouth opening. A 3D-printed model was generated, and a custom tray fabricated for both arches.

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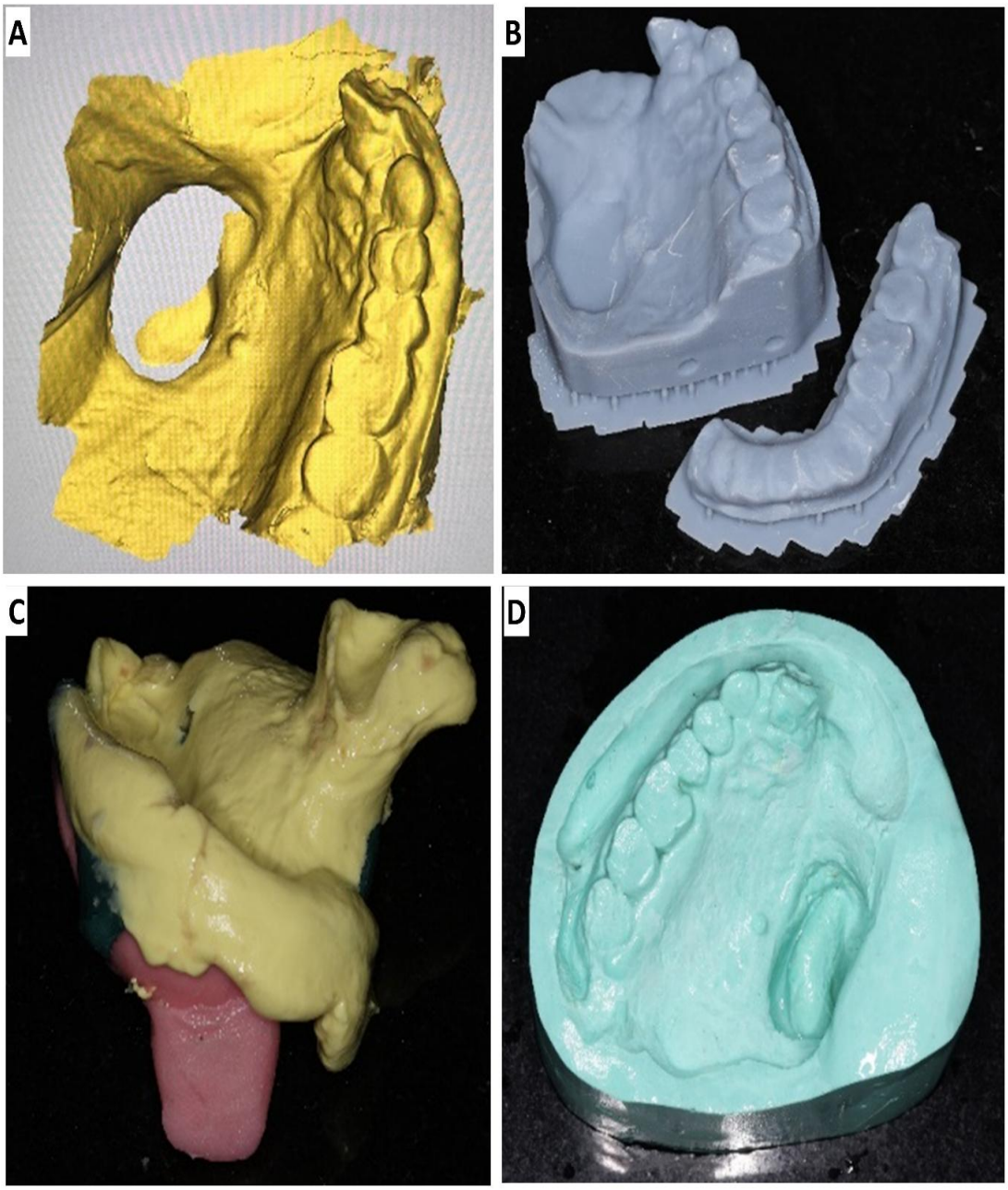

Border moulding was carried out in the maxilla and an alginate impression was recorded to facilitate upper prosthesis (Figure 2).

Two casts were reproduced from the impression: (a)One cast was used to fabricate a temporary palatal prosthesis, and (b) the second cast was used to fabricate the bulb component of the obturator.Firstcast was used to fabricate a heat cure acrylic plate with two Adam's clasps on the molars, and it was relined intraorally in the area of defect with long-term silicone-based relining material (Mollosil, Detax, Germany). A facebow transfer was recorded by adding a block of beading in the defect area to stabilize the bite fork. The jaw relations were recorded in the centric position with bite registration Alu wax (Maarc, India) and facebow transferred to a semi-adjustable articulator (Figure 3).

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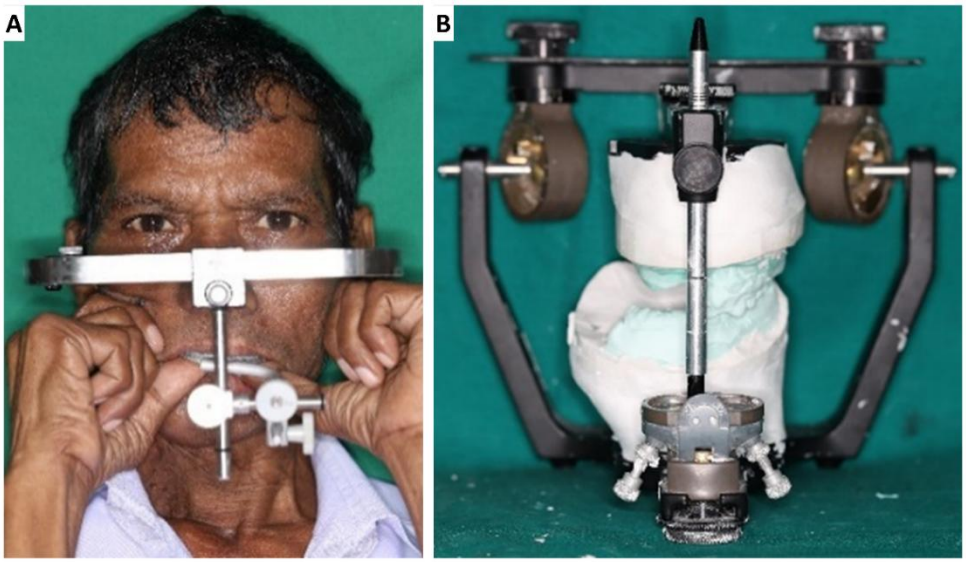

Figure 3: A) Recording the jaw relation records in centric relation using a facebow; B) Transferring jaw relation to an articulator

Second phase: fabrication of the Obturator: The bulb component was processed using heat-polymerizing acrylic resin (DPI Heat Cure, Dental Products of India, Mumbai, India) following the manufacturer's instructions. After deflasking, the bulb was carefully removed. A-330-G Gold platinum primer (Factor 2 Inc., USA) was then applied on the inner surface of the bulb. Room temperature vulcanised Cosmesil M511 silicone (Technovent, UK) was then mixed and attached on the inner side of the bulb. The silicone was then packed inside the cast for 24 hours. The bulb component with silicone relining was then tried intraorally to ensure proper adaptation.

The final impression was recorded with the bulb prosthesis in situ using alginate, and the final cast was poured. A base plate was fabricated on the palatal area of the cast, and a wax rim was created parallel to the existing plane of the maxillary teeth. Teeth were arranged following the Twin-Table Occlusal Concept to guide the mandibular teeth in place. Finally,try-in was done to verify occlusion (Figure 4).

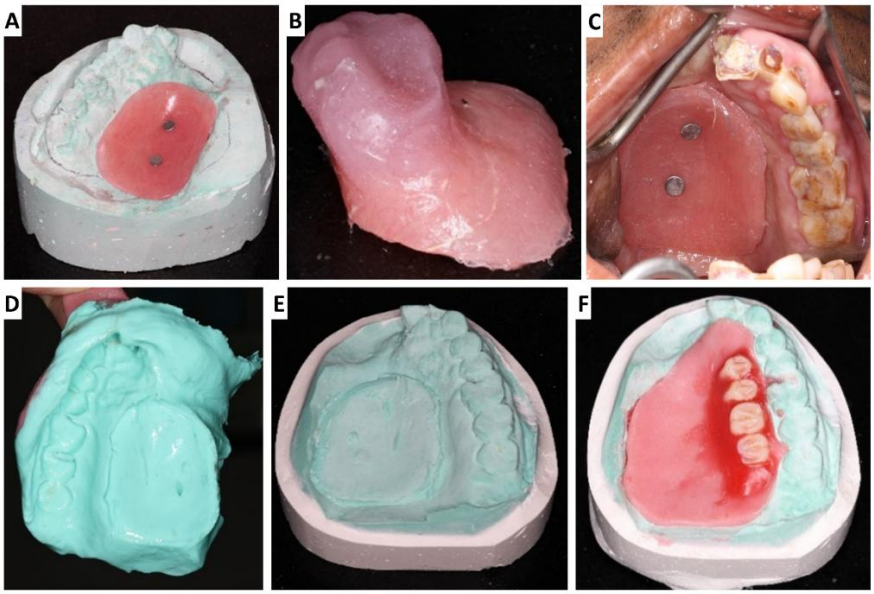

Figure 4: A) Heat polymerized bulb Prosthesis; B) Room temperature vulcanizedSilicone Bulb; C) Intraoral view; D) Final impression with the bulb prosthesis in situ; E) Final cast; F) Teeth arrangement

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A suitable pair of magnets (Dyna EFM alloy) with a magnetic force of 300 g, a height of 1.7 mm, and a diameter of 4.5 mm was selected to join the two components of the obturator. The magnet housings of same dimensions were prepared in both components. Auto-polymerizing resin was used to fix the magnets in the bulb component and the magnet keepers in the palatal plate component.The palatal plate and bulb components were finished and polished. Separate and simultaneous try-ins of both components were performed to ensure proper adaptation and fit within the oral cavity.

Following the wax try-in, clasps made of 19-gauge wire were added to enhance retention and stability on the intact teeth. The final prosthesis was processed in heat-polymerizing acrylic resin(Figure 5). After trimming and polishing, the prosthesis was inserted into the patient's mouth. Necessary occlusal adjustments were made to optimize fit, function, and comfort.The patient was provided with detailed instructions on the placement, removal, and hygiene maintenance of the prosthesis. Emphasis was placed on proper cleaning and regular follow-up visits.

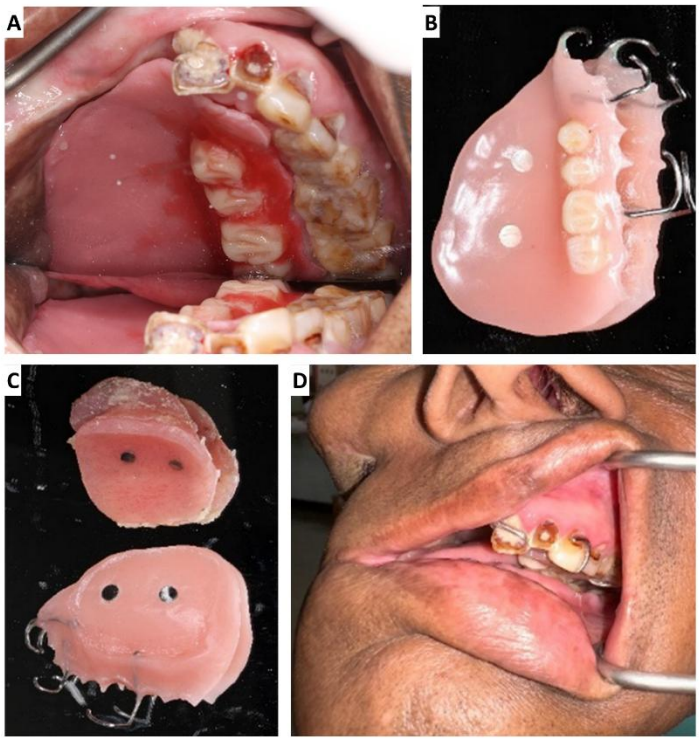

Figure 5: A) Wax try-in; B) Palatal plate with magnet housings and clasps; C) Magnet-retained two-piece obturator; D) Occlusal adjustments were done

Follow-up and Outcomes

The patient was evaluated at three-months, six-months, and one-year intervals. During all the follow-ups, the patient reported no issues with speaking, mastication, or aesthetics. As reported by the patient, the obturator significantly improved his quality of life, allowing him to resume normal daily activities without any discomfort.

2. Discussion

The use of obturator prostheses in patients with maxillofacial defects has been widely studied since Ambroise Pare in 16th century [2]. Obturators are used for rehabilitation with the aim of improving speech and eliminating regurgitation. The long-term effect of this prosthesis is that it helps the patient to settle into normal function and,in turn, helps to provide overall well-being of the patient. A study by C Chen et al. (2018) demonstrated that obturators play a crucial role in improving speech, swallowing, and aesthetics in post-maxillectomy cases [3].

However, the fabrication of obturators is not an easy task, owing to the varied complexities of each case. The procedure involves consideration of soft tissue undercuts, scar bands, retention sites, and relieving sites [4]. Post-operative changes, such as

reduced mouth opening,areother key factors to be considered in the fabrication process. Designs thus have to be moulded to better suit each patient. Pawar et al. (2019) emphasized the importance of customizing obturator designs based on the extent of the defect and patient-specific factors [5].

One such design type that is highlighted in this case, is the fabrication of a magnet-retained two-piece obturator. Two-piece obturators contain one piece, which is the bulb, which is used to close the defect, and another piece, which is the occlusal table, which harnesses the teeth for mastication. The two components are retained with the help of coin-shaped rare earth magnets [6]. The magnets provide 300 g of magnetic retentive force, which is constant with use and does not decrease with time [7]. This technique was demonstrated by Federick in 1976 in which coin-shaped magnets were augmented between the two components of the obturator [8].

In the above case, a two-piece magnet retainer was fabricated to better suit the patient and his maxillary defect secondary to surgical excision of SCC. Dyna EFM alloy magnet was used to retain both the pieces of the obturator in the above case. They are high-energy, rare-earth magnets that generate a strong yet controlled attractive force, ensuring optimal retention of prosthetic components. The use of these magnets increases the retention and stability of the two-piece denture. It helps for better stress distribution along the denture and also aids in the comfort of the denture wearer. However, careful material selectionand regular maintenance are necessary to optimize the performance and longevity of these magnets.

Twin-table occlusion in the prosthesis beneficial to achieve occlusion in hemimandibulectomy by compensating for jaw deviation. It incorporates a dual occlusal scheme, providing a stable occlusal platform that guides the mandible into a more favorable position, reducing strain on the contralateral side and enhancing masticatory efficiency. This approach helps in redistributing occlusal forces, minimizing unwanted tilting or dislodgment of the prosthesis while improving speech, deglutition, and overall prosthetic adaptation.

3. Conclusion

This case report highlights the successful rehabilitation of a maxillary and mandibular defect using a Dyna magnet retained two-piece obturator with twin table occlusion. The use of the magnet-retained prosthesis ensured ease of insertion and removal of the denture, which is crucial for a patient with a restricted mouth opening. It also helps to maintain retention and stability of the prosthesis. In the follow-ups, it was noted that the patient expressed satisfaction towards the prosthesis as it significantly enhanced the patient's ability to speak, eat, and perform daily functions, thereby improving their overall quality of life.

Informed Consent

Written informed consent was obtained from the patient for the publication of this case report.

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