Print ISSN: 2321-6379
Online ISSN: 2321-595X

Case Report

A Novel Prosthetic Approach of a Complex Bilateral Maxillectomy Defect – A Case Report with 1.5-Year Follow-Up

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Abstract

As a post-COVID complication, many immune-compromised patients were diagnosed with invasive fungal sinusitis due to mucormycosis and underwent surgical debridement, resulting in mid-facial defects. These defects lead to speaking, deglutition, mastication difficulty, and esthetics. Bilateral unconnected maxillary defects are uncommon; however, prosthetic rehabilitation of such defects, achieving retention, stability, and esthetics is challenging. This case report explains how to achieve retention and stability of the prosthesis by engaging the favorable undercuts of the defects and the mid-palatal hard tissue with the help of a customized acrylic Cu-sil connector, fabricating a complete denture above the Cu-sil connector, and obtaining adequate retention and stability of the prostheses. This innovative approach improved the patient's phonation, mastication, deglutition, esthetics, and quality of life with 18 months of follow-up.

Key words: Bilateral maxillectomy rehabilitation, Fungal sinusitis rehabilitation, Maxillary obturator, Maxillectomy defect, Mucormycosis rehabilitation

INTRODUCTION

In the year 2021, India witnessed the highest number of mucormycosis cases as a post-COVID complication. B.1.617.2, a variant of Delta of SARS-CoV-2, was found to be the cause of the increased number of COVID-19 cases and its associated mucormycosis infection.[1] After the COVID-19 diagnosis, 2–3 weeks is the median time for developing mucormycosis.[2] It is an opportunistic fungal infection that directly invades the blood vessels and causes thrombosis and necrosis of the tissue, leading to high morbidity and mortality rates even after aggressive medical and surgical management, particularly in diabetic patients with or without other underlying conditions.[3] The leading cause of the increased number of deaths is due to cerebral involvement of Rhino orbital cerebral mucormycosis.[4] Invasion of the organism causes thrombosis and tissue necrosis.[5] Rhino-orbital cerebral mucormycosis is a surgical emergency. Extensive surgical debridement and necrotic tissue resection are required to reduce the fungal load.[6] Surgical removal of the maxillary bone, nasal cartilage, and orbital exenteration cause profound facial deformity and mid-facial defects.[7] Acquired maxillectomy defects result in oro-nasal communication, causing difficulty in deglutition, phonation, leakage of mucous from the nasal cavity, regurgitation of foods and fluids, and an esthetically compromising facial appearance. Surgical management using grafts and flaps is not always possible because of the size of the defects, the patient's underlying health conditions, and age; for those defects, prosthetic management or a combination of both surgical and prosthetic management can be used.[8] However, prosthetic management of midfacial

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www.ijss-sn.com

Month of Submission : 11-2024
Month of Peer Review : 12-2024
Month of Acceptance : 01-2025
Month of Publishing : 01-2025

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defects has many advantages compared to surgical management, such as cost-effectiveness, maintenance of oral hygiene, and acceptable esthetic results.[9] Due to the constant downward gravitational pull, retaining a maxillary obturator prosthesis is challenging. Bilateral unconnected maxillary defects are uncommon; however, prosthetic rehabilitation of such defects, achieving retention, stability, and esthetics is challenging. This case report explains the fabrication of a definitive obturator for a complex bilateral maxillary defect.

CASE REPORT

A 63-year-old male was referred from a service for rehabilitation. During an extraoral examination, he was presented with a ryles tube in his nasal cavity. On intraoral examination, he presented two significant unconnected post-surgical defects due to maxillectomy with oronasal communication on both the left and right sides. The defect margins were unhealed with a super-added bacterial infection. Advised antibiotics and analgesics and reviewed them after 2 weeks. The defect margins healed and were found healthy. The primary impression for the interim obturator was made with an impression compound (DPI, Pinnacle), and a pick-up dual impression was made with an irreversible hydrocolloid (Algitex DPI India). A single-piece heat cure (DPI India) interim obturator was delivered. Still, enough retention could not be achieved because of the two fibro-cartilaginous rounded tissues in the mid-palatal region [Figure 1].

After 4 months, the patient was called to fabricate a definitive obturator. On examination, two significant unconnected post-surgical defects on the maxillary bone could not come under any of the classifications of aramany, so it is classified as aramany's Class I maxillectomy defect on both the right and left sides. Brown classification is type 2,[10] right side defect size 5.4 cm anteroposteriorly, 3.5 cm posteriorly, anteriorly 3.1 cm, left side defect 3.9 cm anteroposteriorly, 3.2 cm posteriorly. The patient had a completely dentulous mandibular arch and a completely edentulous maxillary arch with two fibro-cartilaginous rounded scar tissues in the mid-palatal region, connected anteriorly. On palpation, the mid-palatal fibro cartilaginous tissues were mobile; however, the mid-palatal bone was firm. There is one favorable bony undercut on the left side defect and no favorable undercuts on the right side. The patient has been diabetic under medication for the past 20 years, so rehabilitation with an implant-supported prosthesis was not recommended.[11] Meticulous treatment planning was done, and the hollow bulb definitive obturator was fabricated in four pieces. Two hollow bulbs engaged the bilateral defects; magnets were placed on the medial wall of both the right and left bulbs. The third piece is the customized winged Cu-sil connector; magnets were placed on both the wings of the winged Cu-sil connector; thus, the Cu-sil connector clamps the bulbs together with the help of magnetic attraction of the opposite poles. Above, a complete denture was fabricated and attached to the Cu-sil connector. Thus, the four-piece obturator rehabilitated the mid-facial defect and helped the patient dramatically in deglutition and phonation.

Treatment Procedure

Fabrication of two hollow, open bulbs

The primary impression of the right and left defects was recorded with an impression compound, and the pick-up dual impression was recorded with an irreversible hydrocolloid. The primary cast was made with dental

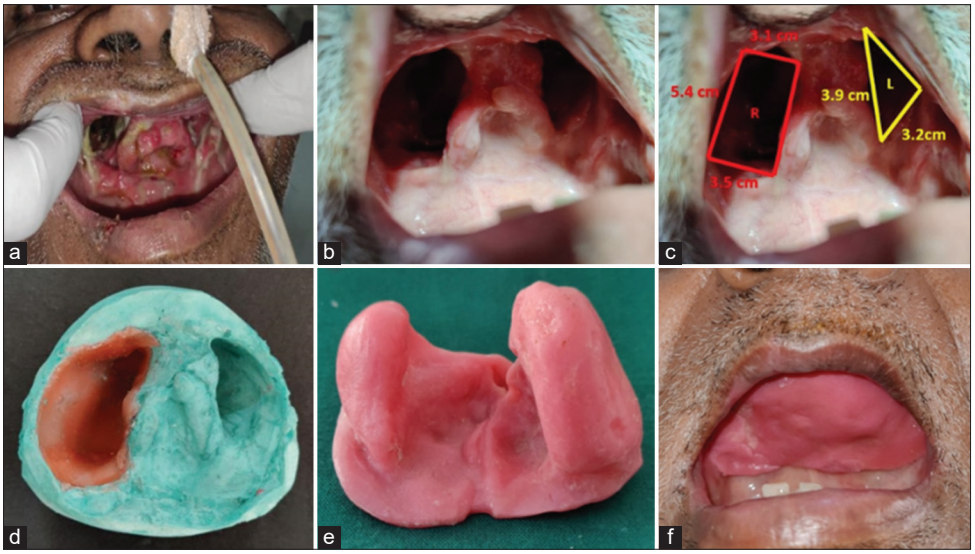

Figure 1: (a-c) Pre-operative, (d-f) Fabrication and insertion of interim obturator

stone. The special tray for both defects was fabricated with self-cure acrylic resin. Border molding of the defects to ensure the peripheral seal was recorded with a green stick impression compound (DPI, India), followed by a final wash impression with light body polyvinyl siloxane material (Neopure Elastomeric Impression material) [Figure 2]. Wax patterns were done, followed by processing with heat cure Poly Methyl Metha Acrylate resin, and a bulb trial was done.

Fabrication of Cu-sil connector

Two open hollow bulbs were engaged in the bilateral defects, and an impression was recorded with an irreversible hydrocolloid. The cast was made with dental stone, and a wax pattern for the winged Cu-sil connector was made on the model, followed by processing it with heat-cure acrylic resin [Figure 3]. On the medial wall of both right and left hollow bulbs, 6 mm × 2 mm diameter cobalt samarium magnets (Hema Surgical, India) were attached. Magnets were placed on both the wings of the winged Cu-sil connector; thus, the Cu-sil connector clamps the bulbs with the help of magnetic attraction of the opposite poles[12] [Figure 4].

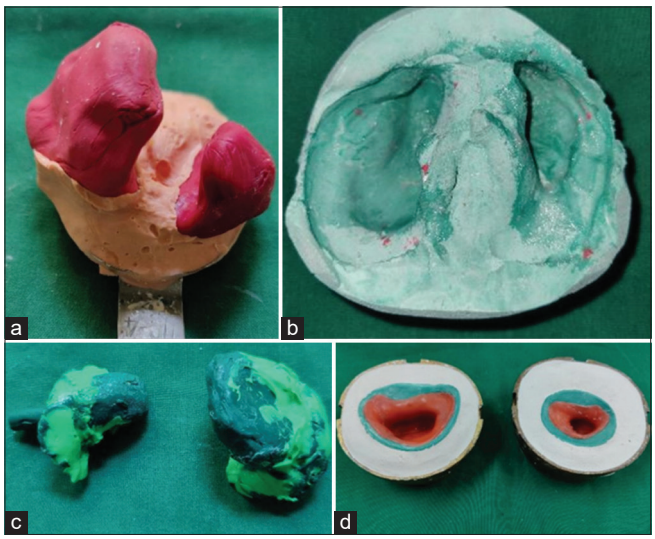

Figure 2: (a-d) Primary and secondary impressions of defects

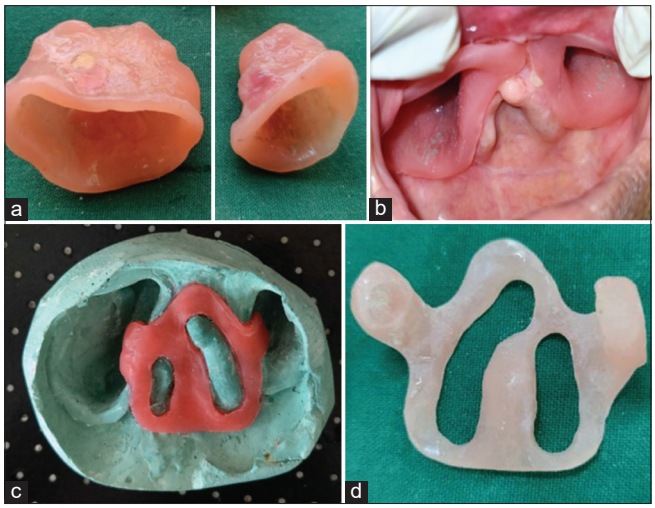

Figure 3: (a and b) Bulb trial, (c and d) fabrication of customized Cu-sil connector

Fabrication of a complete denture

Two hollow bulbs were engaged in the bilateral defects above the customized winged acrylic Cu-sil connector with magnets attached to the right and left side bulbs. Stability and retention of the winged Cu-sil connector were checked, an impression was made with irreversible hydrocolloid, and the dental stone master cast was made above a record base fabricated, jaw relation was done, wax try-in was done to check the vertical dimension, occlusion, phonation, and esthetics followed by processing done with heat cure acrylic resin [Figure 5]. A complete denture is attached to the winged Cu-sil connector with mechanical retention. The complete denture and customized Cu-sil connector are attached and made into one piece, and then the Cu-sil connector and complete denture are attached to the hollow bulbs with the help of magnets. Occlusion was checked, and selective grinding was performed [Figure 6].

Follow-Up

Post-insertion instructions, including cleaning and disinfecting of the obturator, were given and recalled after 2 days, 1 week, 1 month, 3 months, and every 3 months. Post-insertion problems mainly involved removing and inserting the obturator during the first 2 weeks due to its complex four-piece design. They developed prosthesis-induced erythematous ulcerative lesions on the borders of the defects. After repeated instructions, the patient started to use the prosthesis at ease.

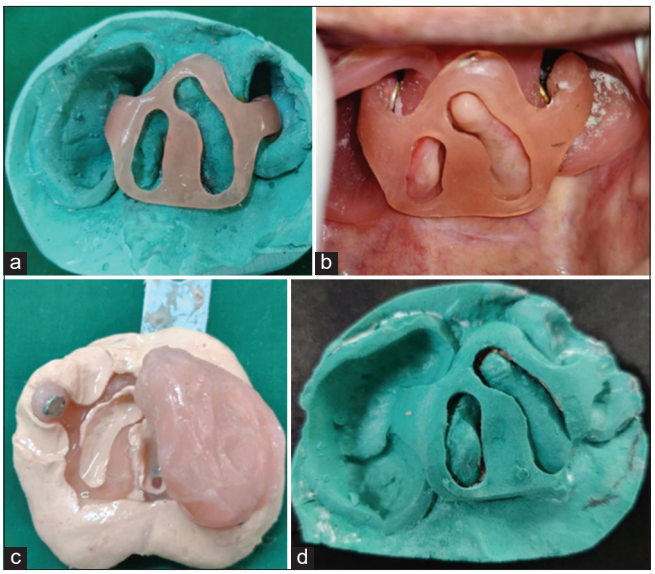

Figure 4: (a-d) Bulbs and Cu-sil connector are attached using magnets & pick up impression

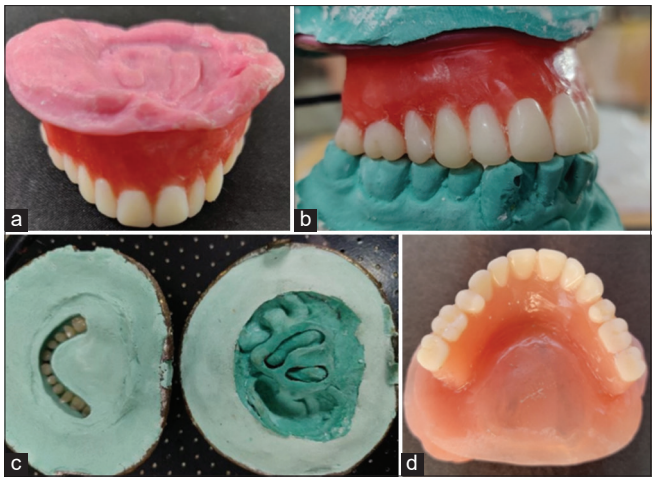

Figure 5: (a-d) Fabrication of complete denture

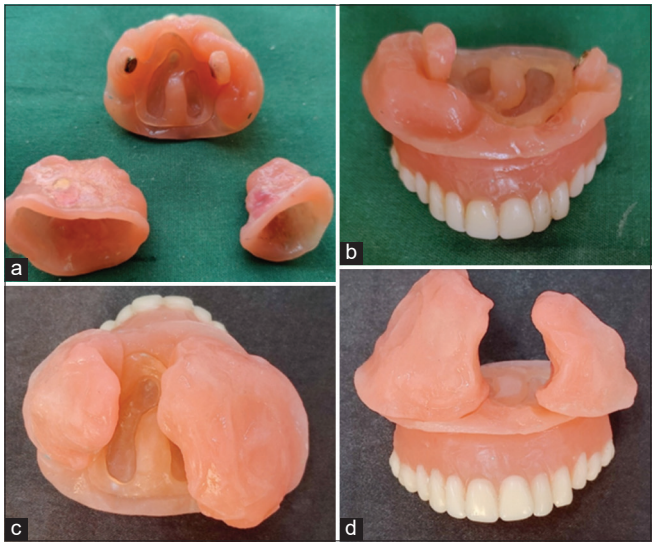

Figure 6: (a-d) Four-piece complete obturator prosthesis

The Visual Analog Scale assessed the retention, stability, comfort, and satisfaction with the treatment during the follow-up visits.[13] The patient's satisfaction with the obturator prosthesis improved from a score of 5–9 [Figure 7].

DISCUSSION

As a post-COVID complication, many people with diabetes and immune-compromised patients underwent subtotal, total maxillectomy, and exenteration of orbital contents.[14] Those who underwent surgical resection not only undergo mental trauma because of facial disfigurement but also difficulty in mastication, deglutition, phonation, and quality of life. Clinical changes include changes in occlusion, jaw deviation, and changes in occlusal cant and vertical dimensions are presented.

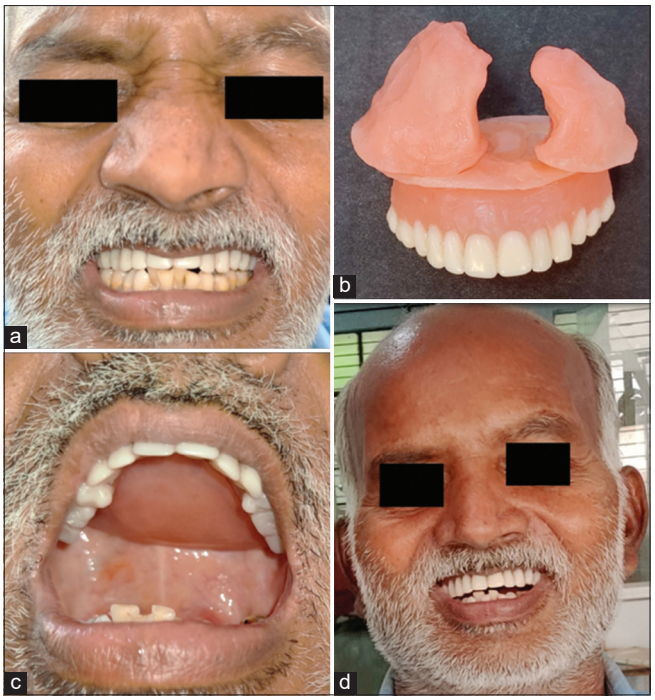

Figure 7: (a-d) Post-operation

Rehabilitation of midfacial defects is always a challenge, and the role of a prosthodontist is incredible. After surgical resection, a definitive obturator should be planned after 12–24 weeks, and it allows complete healing of the defect borders.[15] Meticulous treatment planning and designing are essential, and they mainly depend on the defect size and classification of the defect. A hollow bulb design is often recommended to reduce the bulb weight by one-fourth compared to the conventional bulb design.[16] The success of the definitive obturator mainly depends on many factors, including defect size, extent, classification of the defect, obturator design, attachment used, occlusal schemes, and maintenance.

The definitive obturator is planned in four pieces for the following reasons: To overcome the disadvantages of an interim obturator, for the bilateral defect classification, the size of the defect, and to relieve mid-palatal cartilaginous tissues. Mid-palatal hard tissue and favorable undercuts of the defects are used for retention. A novel customized Cu-sil connector ensured the retention and stability of the bulbs by clamping the mid-palatal tissues with the help of magnets, and it also relieved the two rounded fibro-cartilaginous scar tissues of the mid-palatal area. Magnets are predominantly used as a retentive aid in the maxilla-facial prosthesis for the following reasons. Newer neodymium and coated magnets are corrosion-resistant and show less tarnish and corrosion for saliva and intra-oral fluids.[17] They are stable even after many number attachment cycles, ease

of incorporation of magnets in the prosthesis, and the most patient-friendly attachment.

This innovative approach to definitive obturator dramatically improved the patient's phonation, mastication, deglutition, aesthetics, and quality of life. Some incredible advantages of the four-piece obturator design are good retention, bulbs/complete dentures that can be fabricated or repaired separately, Easy cleaning, and lightweight compared with a conventional obturator design. The disadvantages of the design are the complex prosthesis design and the fact that patient education is required.

CONCLUSION

Proper planning is essential to achieving retention, stability, support, and esthetics in rehabilitating maxillofacial defects. This novel method reduces the bulk of the prosthesis and offers enough retention and stability even after 18 months of follow-up. Thus, this novel four-piece obturator can be a gold-standard protocol for rehabilitating bilateral maxillectomy defects.

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How to cite this article: Bhatt S, Simre SS, Gupta E, Kaur R, Rodda R, Sowki N. A Novel Prosthetic Approach of a Complex Bilateral Maxillectomy Defect – A Case Report with 1.5-Year Follow-Up. Int J Sci Stud 2025;12(10):6-10.

Source of Support: Nil, **Conflicts of Interest:** None declared.