



PROSTHETIC REHABILITATION IN MAXILLOFACIAL DEFECTS : A STEP TOWARD AESTHETIC AND FUNCTIONAL RESTORATION: A CASE REPORT

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ABSTRACT Maxillary defects following surgical management of rhino-cerebral mucormycosis can result in oro-nasal communication, impaired speech, difficulty in mastication and swallowing, nasal regurgitation, and facial disfigurement. Prosthetic obturation remains an important conservative rehabilitation option, particularly when residual dentition can provide adequate support and retention. **Case Report:** A 36-year-old male with a healed unilateral maxillary defect following surgery for rhino-cerebral mucormycosis presented with poor retention and instability of an existing obturator, associated with hypernasality, nasal regurgitation, and difficulty in mastication and swallowing. Clinical examination revealed an Aramany Class I defect with adequate residual dentition on the unaffected side, while the maxillary left central incisor showed Grade I mobility and significant mesial bone loss. A definitive heat-cured acrylic hollow-bulb obturator was fabricated. Retention was obtained from the canine, first premolar, and first molar, while the compromised central incisor was excluded as a principal abutment. The hollow bulb was created using the lost-salt technique to reduce prosthesis weight. The definitive prosthesis demonstrated satisfactory retention, stability, support, and comfort, with immediate improvement in speech and reduction in hypernasality and nasal regurgitation. **Conclusion:** A carefully designed hollow-bulb obturator fabricated using the lost-salt technique can provide a simple, economical, and effective means of rehabilitating unilateral maxillary defects following mucormycosis, particularly when biomechanical planning and appropriate abutment selection are emphasized.

KEYWORDS : Mucormycosis; Maxillectomy; Obturator; Hollow Bulb; Lost-Salt Technique; Aramany Class I.**INTRODUCTION**

Mucormycosis is a rapidly progressive, angioinvasive fungal infection caused by fungi of the order Mucorales, predominantly affecting individuals with impaired immunity or altered metabolic status. Diabetes mellitus, corticosteroid therapy, hematological malignancies, organ transplantation, and other immunocompromised states are well-recognized predisposing factors (Wadhwa et al., 2024; Srivastava et al., 2025). Rhino-orbital-cerebral mucormycosis (ROCM) is the most frequently encountered clinical form and may progressively involve the paranasal sinuses, palate, maxilla, orbit, and intracranial structures (Wadhwa et al., 2024).

Management of advanced ROCM often necessitates aggressive surgical debridement or partial/total maxillectomy. Although essential for disease control, the resulting maxillary defects may produce oro-nasal communication, hypernasal speech, nasal regurgitation, impaired mastication and swallowing, facial disfigurement, and substantial deterioration in quality of life (Ravi et al., 2022; Lalrawngbawli et al., 2022).

Prosthetic obturation provides a practical means of restoring separation between the oral and nasal cavities and improving speech and masticatory function following maxillectomy. Indeed, obturators remain the predominant prosthetic rehabilitation modality reported for ROCM-associated intraoral defects (Wadhwa et al., 2024). However, extensive tissue loss, reduced supporting structures, prosthesis weight, and compromised residual dentition can adversely affect retention and stability (Boruah & Nandini, 2022). Hollow-bulb designs address some of these limitations by reducing prosthesis weight, while techniques such as the lost-salt method provide a simple and economical approach for creating the hollow component (Lalrawngbawli et al., 2022).

The present case describes the definitive prosthetic rehabilitation of an Aramany Class I maxillary defect following rhino-cerebral mucormycosis using a heat-polymerized acrylic hollow-bulb obturator fabricated by the lost-salt technique, with particular consideration given to retention and biomechanical design in the presence of compromised residual dentition.

Case Report

A 36-year-old male patient reported to the Department of Prosthodontics with the chief complaint of poor retention and instability of his existing obturator prosthesis. He experienced difficulty in mastication, swallowing, and speech, together with frequent nasal regurgitation during food intake. The patient was also dissatisfied with his facial appearance and reported that these functional limitations adversely affected his confidence and social interactions.

His medical history revealed previous treatment for rhino-cerebral mucormycosis involving the right maxillary region, for which unilateral maxillectomy had been performed, followed by placement of an immediate surgical obturator. There was no history of radiotherapy or chemotherapy. At presentation, the surgical site was satisfactorily healed, the patient was systemically stable, and there was no clinical evidence of recurrence.

Extraoral examination revealed mild right-sided facial asymmetry secondary to loss of the underlying supporting structures. Intraoral examination demonstrated a well-healed unilateral maxillary defect corresponding to an Aramany Class I defect, with intact and functionally adequate dentition on the contralateral side (Figure 1). The maxillary left central incisor exhibited Grade I mobility. Speech evaluation revealed hypernasality with nasal air escape, while the existing obturator demonstrated inadequate retention and stability.



Figure 1. Clinical presentation of the maxillary defect. (A) Intraoral occlusal view demonstrating the healed right-sided unilateral maxillary defect corresponding to Aramany Class I; (B) frontal

intraoral view showing the residual dentition and maxillary defect.

Cone-beam computed tomography (CBCT) demonstrated adequate alveolar bone support around most of the remaining teeth; however, significant mesial bone loss was evident in relation to the maxillary left central incisor (Figure 2). This finding was considered during prosthesis design because excessive loading of the periodontally compromised tooth was undesirable.

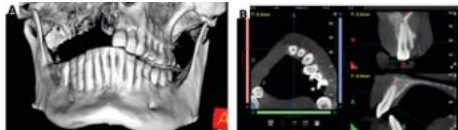


Figure 2. Radiographic evaluation of the residual maxilla. (A) Three-dimensional CBCT reconstruction demonstrating the extent of the right maxillary defect; (B) multiplanar CBCT views demonstrating significant mesial alveolar bone loss associated with the maxillary left central incisor.

Following discussion of surgical reconstruction and prosthetic rehabilitation, the patient elected a conservative, non-surgical approach. A definitive heat-polymerized acrylic hollow-bulb obturator retained by clasp assemblies on the remaining left maxillary dentition was planned. The principal objectives were to re-establish oral–nasal separation, improve mastication, swallowing and speech, eliminate nasal regurgitation, restore facial support, and preserve the remaining dentition.

A preliminary impression was obtained using elastomeric putty impression material (Photosil Soft), with care taken to avoid trauma to the tissues lining the surgical defect (Figure 3A). The impression was poured in Type III dental stone (BN Stone) to obtain the diagnostic cast (Figure 3B). A custom acrylic resin tray was subsequently fabricated with appropriate relief over sensitive areas. Border moulding was performed using low-fusing impression compound (IMPRESX) to accurately record the boundaries of the defect and clinically useful undercuts (Figure 3C).



Figure 3. Impression procedures for fabrication of the definitive obturator. (A) Preliminary elastomeric putty impression; (B) primary cast; (C) custom impression tray; (D) border moulding of the maxillary defect with low-fusing impression compound; (E) definitive impression made with light-body addition silicone; (F) master cast obtained from the definitive impression.

The definitive impression was made using light-body addition silicone (Photosil Light Body) following application of tray adhesive. The impression recorded the surgical defect, residual palate, remaining dentition, and supporting tissues (Figure 3D). It was subsequently beaded and boxed and poured in Type IV dental stone (Ultralith) to obtain the master cast. Maxillomandibular relations were recorded using a wax occlusion rim, and the casts were mounted on a semi-adjustable articulator (Hanau).

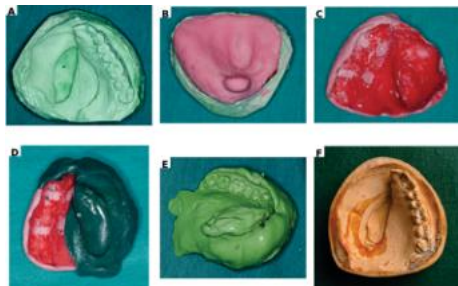


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Artificial teeth (Biocare) were arranged according to the functional and esthetic requirements of the patient. During the trial insertion (Figure 4), occlusion, phonetics, facial support, lip contour, smile line, and overall appearance were evaluated, and the necessary modifications were completed before processing.



Figure 4. Maxillomandibular relation and trial evaluation. (A, B) Recording of the maxillomandibular relationship using a wax occlusion rim; (C, D) intraoral trial insertion for assessment of occlusion, phonetics, tooth position, and esthetics.

Retention was obtained using clasp assemblies engaging the maxillary canine, first premolar, and first molar on the unaffected side. Although the maxillary left central incisor was situated close to the defect, its mobility and compromised periodontal support contraindicated its use as a principal abutment.

The hollow-bulb component was fabricated using the lost-salt technique. Salt crystals were incorporated into the bulb region during packing (Figure 5A). Following processing, the salt was removed through an access opening, producing a hollow cavity and thereby reducing the overall weight of the prosthesis while maintaining its structural integrity (Figure 5B). The access opening was subsequently sealed with autopolymerizing acrylic resin, and the prosthesis was finished and polished (Figure 5C).



Figure 5. Laboratory fabrication of the hollow-bulb obturator. (A) Waxed prosthesis with retentive clasp assemblies; (B, C) flasking and dewaxing; (D–F) packing procedure using the lost-salt technique to create the hollow-bulb component.

The completed definitive hollow-bulb obturator was inserted and evaluated for retention, stability, support, occlusion, speech, and patient comfort (Figure 6). The patient was instructed regarding insertion and removal of the prosthesis, oral hygiene, and prosthesis maintenance. Immediate improvement in speech quality with reduction in hypernasality was observed. Effective separation of the oral and nasal cavities eliminated nasal regurgitation during swallowing, while the patient also reported improved masticatory efficiency, comfort, and facial appearance. No complications were observed during the post-insertion period, and periodic follow-up was scheduled to monitor prosthesis performance and the health of the remaining dentition.



Figure 6. Definitive prosthesis and treatment outcome. (A–C) Completed heat-polymerized acrylic hollow-bulb obturator showing the clasp assemblies and hollow-bulb component; (D, E) frontal intraoral views before and after definitive rehabilitation; (F, G) occlusal intraoral views before and after insertion of the definitive obturator.

DISCUSSION

Rehabilitation of acquired maxillary defects following surgical treatment of rhino-cerebral mucormycosis is challenging because the resection may simultaneously compromise oral–nasal separation, dentoalveolar support, speech resonance, mastication, swallowing, facial contour, and psychological well-being. Prosthodontic rehabilitation therefore plays an important role not merely in replacing missing structures, but also in restoring basic oral functions and facilitating social reintegration. Pruthi (2023) emphasized that patients undergoing aggressive resection for mucormycosis may experience substantial functional and psychological consequences and that obturator and facial prostheses form an important component of comprehensive rehabilitation.

The choice between surgical reconstruction, implant-assisted rehabilitation, and a conventional removable obturator depends on the extent of the defect, residual bone and dentition, systemic condition, patient preference, and feasibility of additional surgery. Despite developments in reconstructive and implant-based approaches, conventional obturators remain highly relevant. In the systematic review by Wadhwa et al. (2024), 84% of reported patients with ROCM-associated intraoral defects were successfully rehabilitated using removable obturators without implants. The authors also highlighted an important advantage in this particular patient population: a removable obturator permits periodic inspection of the surgical site, which is valuable where continued surveillance for recurrence is required.

The present patient had a well-healed unilateral Aramany Class I defect with useful residual dentition on the contralateral side. This anatomical situation favored conventional prosthetic rehabilitation because remaining teeth and available defect undercuts could contribute to retention and stability. Comparable mucormycosis-related Class I defects have previously been rehabilitated successfully with hollow-bulb obturators. Mukhopadhyay et al. (2022), for example, described a unilateral Aramany Class I defect following maxillectomy for rhino-orbital mucormycosis that produced nasal regurgitation and speech impairment and was managed using a lightweight closed hollow-bulb prosthesis. The present case therefore supports the continued applicability of conventional obturator therapy in appropriately selected unilateral defects.

A particularly important consideration in this patient was abutment selection. Although the maxillary left central incisor was anatomically close to the defect and could theoretically have contributed to prosthesis retention, it exhibited Grade I mobility and significant mesial alveolar bone loss on CBCT. It was therefore deliberately excluded as a principal retentive abutment. Instead, clasp assemblies engaged the canine, first premolar, and first molar on the unaffected side. This distinction is clinically important because the design of an obturator should not be dictated simply by proximity of a tooth to the defect. Periodontal support, anticipated direction of functional forces, and preservation of the remaining dentition should guide abutment selection. In a prosthesis already exposed to destabilizing rotational and gravitational forces, inappropriate loading of a compromised tooth

may accelerate periodontal deterioration and further diminish prosthetic support.

The weight of the prosthesis represents another major biomechanical consideration. Extension of a solid acrylic bulb into a maxillary defect can substantially increase prosthesis mass, potentially increasing gravitational displacement and transmitting additional stresses to the remaining teeth and tissues. Hollowing the obturator bulb provides a logical method of reducing these unfavorable forces. Wadhwa et al. (2024) noted that hollow-bulb designs are commonly employed because they decrease prosthesis weight and may also improve speech resonance. Similar advantages were reported by Lalrawngbawli et al. (2022), who specifically selected a hollow bulb because the additional weight of a solid obturator could compromise retention. Their patient subsequently reported improved mastication and phonetics. More recently, Srivastava et al. (2025) likewise emphasized that a lightweight closed hollow-bulb design can improve stability, comfort, speech, and swallowing after extensive maxillary resection.

Several techniques have been described for creating a hollow obturator, including two-part processing, sugar or salt spacers, plaster matrices, thermoformed shells, polyurethane foam, and other sacrificial materials. Lalrawngbawli et al. (2022) summarized many of these approaches and noted that salt, sugar, alum, two-flask methods, thermoforming techniques, and various matrix materials have all been used to generate the hollow cavity. In the present case, the lost-salt technique was selected because of its simplicity, low cost, ready availability of the material, and ease of removal following polymerization. Salt crystals were incorporated during packing and subsequently flushed out through a small access opening, which was then sealed with autopolymerizing acrylic resin. Lalrawngbawli et al. (2022) employed a comparable method specifically to reduce obturator weight without compromising retention. The technique therefore offers a practical option where sophisticated laboratory equipment or specialized materials are unavailable.

The extent and configuration of the surgical defect nevertheless determine whether a one-piece conventional obturator is appropriate. Greater vertical tissue loss, severe undercuts, restricted mouth opening, or unfavorable paths of insertion may necessitate sectional or two-piece designs. Boruah and Nandini (2022), for instance, reported that substantial vertical tissue loss following mucormycosis-related maxillectomy made conventional insertion and removal difficult, prompting fabrication of a two-part obturator. Similarly, implant-supported prostheses may be considered in patients with inadequate retention. Wadhwa et al. (2024) identified the use of zygomatic, pterygoid, bicortical, and conventional endosseous implants in selected extensive defects; however, the majority of even the more substantial defects in their review were still rehabilitated using removable obturators. Thus, increasingly complex or invasive rehabilitation should not automatically be regarded as superior when a stable and functional conventional prosthesis can be achieved.

Functional improvement after obturator placement largely depends on effective re-establishment of the partition between the oral and nasal cavities. In the present patient, the previous prosthesis was associated with hypernasality, nasal air escape, poor retention, and functional difficulty. The definitive obturator demonstrated satisfactory retention and stability, with immediate improvement in speech quality and reduction in hypernasality. This is consistent with the fundamental objective of obturator therapy: sealing the defect to improve resonance, swallowing, and oral function. Lalrawngbawli et al. (2022) similarly described improved phonetics and mastication following hollow-bulb obturation, while Srivastava et al. (2025) reported restoration of speech and swallowing with a lightweight closed hollow-bulb design.

The present case also demonstrates that successful maxillofacial rehabilitation depends as much on individualized biomechanical planning as on the fabrication technique itself. The clinical success cannot be attributed solely to the lost-salt method; rather, it resulted from accurate recording of the defect and usable undercuts, appropriate extension of the prosthesis, reduction of prosthetic weight, and selective use of periodontally favorable abutment teeth. Such individualized planning is particularly relevant in mucormycosis patients because surgical resections are often dictated by disease extent rather than ideal prosthodontic boundaries.

Nevertheless, the outcome of a single case should be interpreted

cautiously. Much of the literature on prosthetic rehabilitation following mucormycosis consists of individual case reports and small case series with heterogeneous defect classifications, prosthesis designs, outcome measures, and follow-up durations. Pruthi (2023) specifically identified inadequate reporting of follow-up, patient survival, quality of life, and objective functional performance as important limitations in the available evidence. Long-term follow-up of the present patient is therefore essential to evaluate maintenance of retention, periodontal health of the remaining abutments, tissue changes within the defect, prosthesis integrity, and sustained improvement in function. Future reports would also benefit from validated patient-reported outcome measures and objective assessment of speech and masticatory performance.

Declaration of Patient Consent

Written informed consent was obtained from the patient for publication of the clinical information and associated clinical images. Every effort has been made to preserve patient anonymity.

Conflict of Interest

The authors declare no conflict of interest

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