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Prosthodontic Rehabilitation of an Aramany Class I Maxillary Defect Secondary to Mucormycosis Using a Hollow-Bulb Heat-Cured Acrylic Removable Partial Denture Obturator: A Case Report

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ABSTRACT

Background: Acquired maxillary defects following maxillectomy create an oronasal communication that compromises speech, deglutition, mastication and appearance. Aramany's classification of partially edentulous maxillectomy defects provides the basis for obturator design, and a hollow-bulb construction is commonly employed to reduce prosthesis weight and improve retention.

Case: A 58-year-old male with a history of mucormycosis-related maxillectomy performed approximately six years earlier, and a background of diabetes mellitus (8 years) and hypertension (2 years, on medication), presented with a fractured and non-serviceable maxillary obturator that had been in use for about four years. Examination revealed a right-sided Aramany Class I maxillary defect, with the second quadrant fully dentate and generalized attrition of the remaining teeth. A new definitive hollow-bulb heat-cured acrylic resin removable partial denture obturator, retained with a ball-end clasp and two 21-gauge wrought-wire clasps on the remaining natural abutments, was fabricated following primary impression, functional (secondary) impression, jaw relation recording, wax try-in, two-piece flasking to hollow the bulb, dewaxing, acrylization (heat-curing), finishing and insertion. At the two-month follow-up, the clinical findings were satisfactory.

Conclusion: A lightweight, clasp-retained hollow-bulb acrylic removable partial denture obturator, designed according to Aramany's Class I principles, restored oronasal separation and esthetics in a medically compromised patient, reaffirming its value as a predictable long-term rehabilitative option when surgical reconstruction is not feasible or desired.

Keywords: *Obturator; Maxillectomy; Mucormycosis; Aramany classification; Hollow bulb; Acrylic removable partial denture*

I. INTRODUCTION

Acquired maxillary defects most commonly result from surgical resection for neoplastic disease, but may also follow trauma, congenital malformation, or invasive fungal infection such as mucormycosis. Mucormycosis is an aggressive, angio-invasive fungal infection that predominantly affects immunocompromised and uncontrolled diabetic individuals; its rhino-orbito-cerebral form frequently necessitates radical surgical debridement or partial/total maxillectomy to control the disease. A marked global rise in mucormycosis, particularly in India, was reported in association with the COVID-19 pandemic among patients treated with corticosteroids and supplemental oxygen, making post-mucormycosis maxillary defects an increasingly encountered clinical entity in prosthodontic practice.

The resulting oronasal communication leads to hypernasal speech, nasal regurgitation of food and fluids, impaired mastication, and marked esthetic and psychosocial disability. While surgical reconstruction with vascularised free flaps is an option, prosthetic obturation remains a widely preferred alternative, particularly in medically compromised or elderly patients, as it is less invasive, more economical, quicker to deliver, and allows direct visualisation of the surgical site for surveillance of disease recurrence.

Aramany's classification of partially edentulous maxillectomy defects (Classes I–VI) provides a systematic framework for obturator design, guiding clasp placement, major connector selection, and the distribution of support, retention, and bracing so as to resist the dislodging forces

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directed toward the defect side (1,2,3). Hollowing the bulb portion that occupies the defect is a well-established modification that reduces prosthesis weight, thereby lessening the leverage exerted on the remaining abutment teeth and improving retention, comfort, and functional efficiency (4,5). This report describes the prosthodontic rehabilitation of an Aramany Class I maxillary defect secondary to mucormycosis, using a hollow-bulb, clasp-retained heat-cured acrylic removable partial denture obturator, in a patient whose earlier obturator had failed after approximately four years of service.

II. CASE REPORT

A 58-year-old male reported to the Department of Prosthodontics with the chief complaint of a broken and ill-fitting upper denture for the past 15 days. His medical history revealed mucormycosis approximately six years earlier that had been managed by surgical resection, resulting in a maxillary defect; he had been a known diabetic for eight years and hypertensive for two years, both under medication. His dental history revealed that a maxillary obturator prosthesis had been fabricated about four years previously, which had now fractured and become non-functional.

Intraoral examination revealed a partially edentulous maxillary arch with a right-sided defect resulting from the prior resection, the second quadrant (maxillary left) being fully dentate, and generalized attrition of the remaining teeth. Based on the extent of the defect and the pattern of the remaining dentition, the defect was classified as an Aramany Class I maxillary defect. The patient's blood glucose and blood pressure were confirmed to be under medical control before proceeding with prosthetic treatment.

Treatment Plan: Considering the patient's medical status, the extent of the defect, and his preference against further surgical intervention, prosthetic rehabilitation with a new definitive hollow-bulb heat-cured acrylic resin removable partial denture obturator, retained by a ball-end clasp and two 21-gauge wrought-wire clasps on the remaining natural abutment teeth, was planned.

Treatment Procedure: A primary impression of the maxillary arch was recorded in irreversible hydrocolloid (alginate) using a stock tray (Figure 1), and the resulting primary cast was used to fabricate a special (custom) tray confined to the defect margins. Guide planes were prepared on the abutment teeth, and a functional (secondary) impression was then made with the special tray using Avue Gum putty and Avue Gum medium-body addition silicone (Dental Avenue, India) in a putty–wash technique to accurately record the defect margins and undercuts while minimising tissue displacement (Figure 2); this impression was poured in dental stone to obtain the master cast (Figure 3).

The removable partial denture was designed on the master cast following Aramany Class I principles, with three clasps on the abutment teeth of the non-defect side (a ball-end clasp in the middle and 21-gauge wrought-wire clasps on the other two) and an acrylic resin denture base extending across the defect to support the bulb. Maxillomandibular jaw relation was recorded using a wax occlusal rim adapted over the defect area (Figure 4), following which a trial denture with the artificial teeth arranged on the intact side of the arch was evaluated intraorally for esthetics, phonetics, and vertical dimension (Figure 5).

The bulb portion of the prosthesis, which extended into the defect, was hollowed using a two-piece flasking technique: the bulb was fabricated in two separable parts — a base and a lid — that were processed independently (Figure 6A, 6B) and subsequently joined and sealed with a thin layer of heat-cured acrylic resin, closing the hollow chamber and thereby substantially reducing the overall weight of the prosthesis. The prosthesis was processed in DPI heat-cure acrylic resin (Dental Products of India), then finished and polished (Figures 7 and 8) and inserted (Figure 9). Retention, stability, and occlusion were verified and adjusted at the time of insertion, and the patient was instructed in the insertion, removal, and hygiene maintenance of the prosthesis, along with the need for periodic recall.

The patient reported satisfaction with the retention, stability, comfort and esthetics achieved with the new prosthesis, and was placed on a periodic recall schedule for continued follow-up evaluation. At the two-month follow-up, the prosthesis and supporting tissues were examined and the findings were satisfactory, with no complications and no intervention required.

III. DISCUSSION

Mucormycosis has emerged as an important and increasingly common cause of acquired maxillary defects, particularly following the surge in rhino-orbito-cerebral mucormycosis reported in association with the COVID-19 pandemic, especially among patients with uncontrolled diabetes who had received corticosteroid therapy (6,7,8). Radical surgical debridement of the necrotic maxilla, while essential to control the infection, leaves a defect that communicates the oral and nasal/sinus cavities, with functional and psychosocial consequences similar to those seen after oncologic maxillectomy.

Aramany's classification (1,2) remains central to obturator design planning. In Class I

defects, the resection is performed close to the midline with dentition retained along the entire non-resected side; because all remaining abutments lie on one side of the arch, the denture base and clasp design must be planned to resist rotational and dislodging forces directed toward the defect during function, favouring a quadrilateral or tripodal clasp arrangement over a purely linear one to improve leverage distribution (3). Prosthetic obturation, as employed in this case, offers several advantages over free-flap surgical reconstruction in a medically compromised patient: it is less invasive, more economical, quicker to deliver, and importantly allows direct visual and digital surveillance of the resection bed for early detection of disease recurrence.

Reducing the weight of the bulb portion of the obturator, as first described using lightweight core materials and subsequently refined with two-piece hollow designs (4,5), lessens the functional load transmitted to the remaining natural abutments, thereby improving retention, support, and patient comfort — an especially relevant consideration in Aramany Class I defects, where support is derived entirely from one side of the arch. A heat-cured acrylic resin denture base was used in this case because it is economical, easy to fabricate, and readily adjusted, relined or repaired, although it is less rigid than a cast metal framework and therefore depends on the hollow-bulb design to limit the load on the abutments. Prosthetic rehabilitation with an obturator has also been shown to meaningfully improve the quality of life of maxillectomy patients by restoring speech, deglutition, and appearance (9). Several recent reports have similarly described definitive hollow-bulb obturator rehabilitation following post-mucormycosis maxillectomy, underscoring the relevance of this approach in current prosthodontic practice (7,8).

The patient's previous obturator had remained functional for approximately four years before fracturing, which is consistent with the reported need for periodic review, relining, and eventual remake of obturator prostheses as the denture-bearing tissues bordering the defect undergo resorption and change over time. This reinforces the importance of a structured recall protocol, particularly in medically compromised patients, to detect early signs of prosthesis fatigue, tissue changes, or recurrence of disease at the resection margins.

IV. CONCLUSION

Rehabilitation of an Aramany Class I maxillary defect secondary to mucormycosis with a hollow-bulb, clasp-retained acrylic removable partial denture obturator successfully restored oronasal separation and esthetics in a medically compromised patient. Adherence to Aramany's classification-based design principles, combined with a lightweight hollow-bulb construction, provided a predictable and functional outcome, reaffirming prosthetic obturation as a reliable long-term rehabilitative option, together with the need for periodic follow-up to maintain long-term prosthesis performance.

INFORMED CONSENT

Written informed consent was obtained from the patient for the publication of this case report and the accompanying clinical images. A copy of the signed consent form is available for review by the Editor-in-Chief of this journal upon request.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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None.

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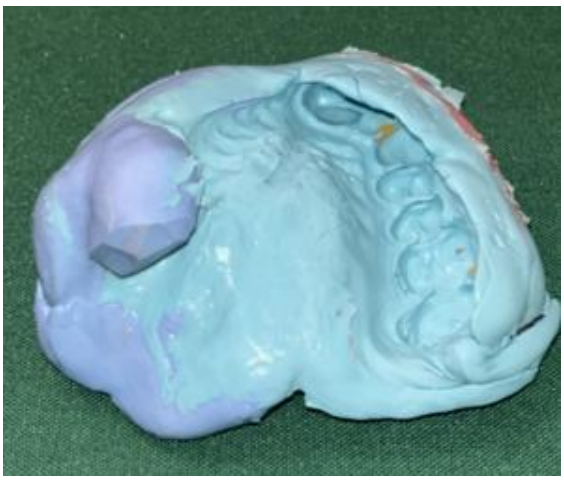
FIGURE LEGENDS

Figure 1: Primary impression of the maxillary arch.
Figure 2: Functional (secondary) impression recorded with a special tray using the putty-wash technique.
Figure 3: Master cast showing the Aramany Class I maxillary defect and remaining abutment teeth.
Figure 4: Jaw relation recorded with a wax occlusal rim adapted over the defect.
Figure 5: Trial denture with artificial teeth arranged on the master cast.
Figure 6A: Base portion of the two-piece hollow bulb, processed within the flask.
Figure 6B: Lid portion of the two-piece hollow bulb, processed separately prior to sealing.
Figure 7: Final obturator prosthesis — tissue (intaglio) surface.
Figure 8: Final obturator prosthesis — lateral view showing the clasp assembly.
Figure 9: Intraoral view at final insertion of the obturator prosthesis.

FIGURES

Figure 1: Primary impression of the maxillary arch.



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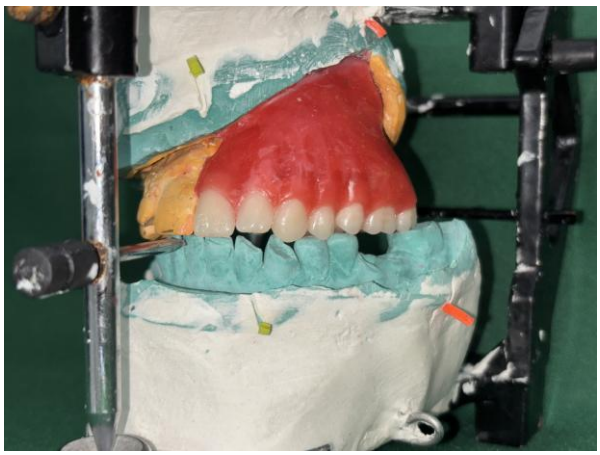

Figure 5: Trial denture with artificial teeth arranged on the master cast.

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Figure 9: Intraoral view at final insertion of the obturator prosthesis.