Case Report

Digitally fabricated precision attachment with cast partial framework retained obturator in a partial maxillectomy patient following mucormycosis: A case report

ABSTRACT

Oral mucormycosis mainly involves the maxilla, although it can also affect other areas of the oral cavity. Mucormycosis infection involving the maxilla spreads rapidly leading to the palatal perforation and necrosis of the bone, which eventually leads to intraoral communication between the oral and nasal cavities leading to difficulty in speech, deglutition, and mastication. Although surgical reconstruction is the best treatment modality, reconstruction of large defects still remains questionable, so prosthodontic rehabilitation of such patients restores normal functioning, enhances aesthetics, and boosts the confidence of the patient. This case presentation describes the amalgam of both conventional and digital techniques to bring out an economical and effective possible treatment modality for the rehabilitation of such patients. This case report entails the usage of a digitally fabricated precision attachment retained definitive prosthesis as a simple and effective approach to restore the acquired maxillary defect following mucormycosis.

Keywords: DMLS, interim, mucormycosis, partial maxillectomy, precision attachment

INTRODUCTION

COVID-19-associated mucormycosis has become an area of extreme consideration as it has a negative impact on the quality of life of the patient.[1] Oral mucormycosis commonly affects the maxilla, especially in diabetic and immunocompromised patients. Removal of the necrotic segment following mucormycosis results in a palatal defect creating an oro-antral communication. The defects can be reconstructed surgically using pedicled flaps or free micro-vascularized flaps. Surgical repair sometimes is questionable in patients with large defects; such defects are then eventually rehabilitated using the prosthesis.[2] The goal of the prosthodontic rehabilitation of such patients is the creation of separate oral and nasal cavities to allow adequate deglutition and articulation, and mastication along with restoring the mid-facial contour, and aesthetics. This case report presents the combination of both digital and conventional means for rehabilitation of a patient with partial maxillectomy using digitally fabricated precision attachment retained cast partial obturator.

Access this article online	
Website: www.njms.in	Quick Response Code
DOI: 10.4103/njms.njms_130_22	

CASE REPORT

A 40-years-old female patient reported to the Department of Prosthodontics with the chief complaint of missing teeth in the upper arch following the surgery for mucormycosis. She also had complaints of discharge from the nose while drinking fluids, and difficulty in speech, chewing, and

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Received: 24 July 2022, **Revised:** 02 December 2022, **Accepted:** 04 March 2023, **Published:** 24 July 2024

How to cite this article: Chahal S, Dahiya D, Nagar P, Mittal S. Digitally fabricated precision attachment with cast partial framework retained obturator in a partial maxillectomy patient following mucormycosis: A case report. Natl J Maxillofac Surg 2024;15:332-6.

deglutition post-surgery. Medical history revealed a history of sinonasal mucormycosis for which partial maxillectomy was carried out. Extraoral examination revealed contracture of the cheek with drooping of the commissure of the lips on the right side of the face. Intra-oral examination revealed Aramany's Class I maxillary defect which extended along the midline of the maxilla mesiodistally from the midpalatine raphe to the buccal mucosa on the right side; the teeth were maintained on one side of the arch. The radiograph revealed bone loss post-surgery mesial to the left central incisor making it periodontally vulnerable. The margins of the defect were not healed properly [Figure 1a] and the oral hygiene was fair. The mouth opening was restricted due to postoperative pain and scar formation. An interim obturator was planned for the patient. Diagnostic impression [Figure 1b] was made using the irreversible hydrocolloid material (DPI Algitex, India) and the cast was obtained [Figure 1c]. An interim obturator made of clear self-cure acrylic resin was fabricated [Figure 1d] and delivered to the patient. Instructions regarding oral and prosthesis hygiene were given to the patient. The patient was kept on regular follow-up until the defect site was healed properly [Figure 2a], following which a definitive treatment was planned.

Various treatment options including flap reconstruction, implant-supported prosthesis, conventional clasp retained obturator, magnet retained obturator, and precision attachment retained obturator were given to the patient. The patient was not willing to any invasive treatment and was highly aesthetics concerned, so she opted for an attachment retained obturator. Informed consent was obtained and treatment was carried out.

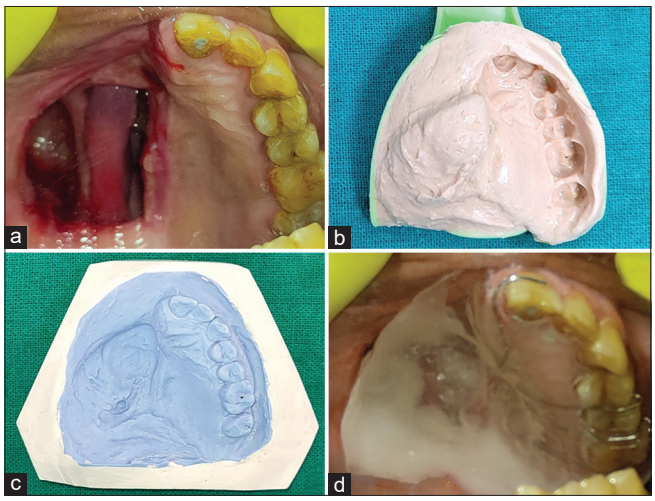

Figure 1: a) Intraoral maxillary view showing partial maxillectomy of the right side, b) Diagnostic impression of the maxillary arch, c) Diagnostic maxillary cast obtained from the impression, d) Insertion of the interim obturator made of clear acrylic resin

The intraoral periapical radiograph revealed a periodontally compromised left central incisor with a bony defect present mesial to the tooth [Figure 2b]. Primary impressions and casts [Figure 2c] were obtained following the healing of the defect. Surveying was done on the maxillary cast and the necessary modifications were made in the mouth. Tooth preparation [Figure 2d] for the metal ceramic crown with equigingival finish line was done on the left central, lateral incisor, and canine (#21, 22, and 23). The gingival retraction was carried out and the final impression was made using the single-step putty wash impression technique. The impression was scanned [Figure 2e] and virtual designing of the crowns with precision attachment was done [Figure 2f]. Following the design, 3-dimensional printing of the metal crowns along with the male portion of the precisagix attachment was done using the direct metal laser sintering (DMLS) technique. Try-in of the metal crowns along with the male part of the attachment was done [Figure 3a]. The male portion was seated passively on the ridge with no impingement on the mucosa. The tripod design was selected for the denture base metal framework with rest seats [Figure 3b] prepared on the left first premolar, first molar, and second molar (#24, 26, and 27). The final impression of the rest seats along with the metal crowns was made using the single-step putty wash impression technique [Figure 3c]. The impression was then scanned [Figure 3d], following which designing [Figure 3e] and 3D printing of the cast partial denture framework with embrasure clasps on the first and second molar (#26, 27) and indirect retainer on the first premolar (#24) was done. The third component of the tripod design was retained over the precisagix attachment. The jaw relation was recorded using the occlusal rims made on the temporary denture base [Figure 3f]. Try-in of the teeth arrangement along with the metal framework for cast partial denture [Figure 4a] was done using the anatomic teeth [Figure 4b]. Following the try-in, conventional acrylization of the prosthesis was done [Figure 4c]. Glazing was done over the metal crowns fabricated using direct metal laser sintering and the porcelain fused metal crowns with attached male portion were cemented to the teeth using resin-modified glass ionomer cement [Figure 4d]. A finished and polished cast partial prosthesis [Figure 4e] along with the female component attached to it was inserted into the mouth [Figure 4f]. Oral hygiene and denture hygiene maintenance instructions were given to the patient. The patient was kept on a regular follow-up to adjust the necessary modifications. The patient was satisfied with the treatment [Figures 5 and 6].

DISCUSSION

Acquired maxillary defects may lead to an oro-antral communication, causing intertransportation of microorganisms

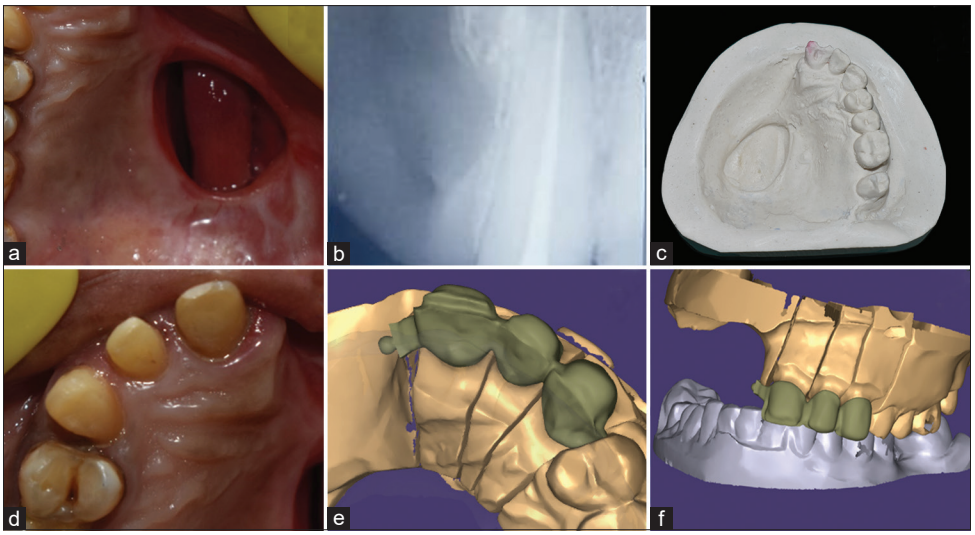

Figure 2: a) Intraoral view of the maxillary arch showing the healed margins of the defect, b) Radiograph revealing bony defect mesial to the left central incisor, c) Primary cast obtained from the impression, d) Tooth preparation with equigingival finish line on 21, 22, and 23, e) Designing of the crowns along with the precisagix attachment, f) Designing along with the mandibular scan to check for the proper occlusion

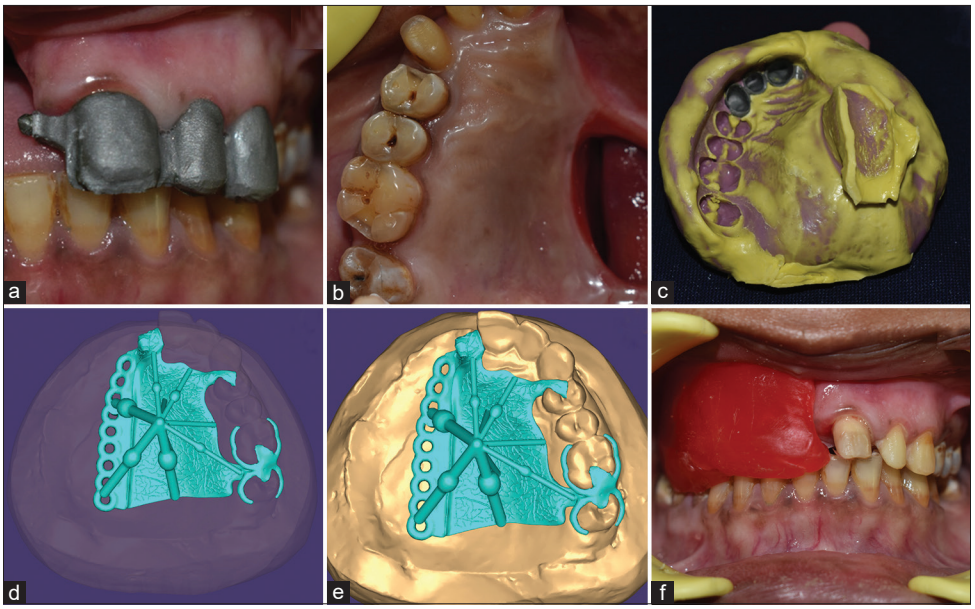

Figure 3: a) Try-in of the 3D printed metal crowns along with the precisagix attachment, b) Rest seats prepared on the teeth 24, 26, and 27 for the metal framework, c) Final impression of the rest seats along with the metal crowns, d) Digital designing of the metal framework, e) Digital adaptation of framework on the maxillary cast, f) Recording of jaw relation

between the oral and nasal cavities, which may further lead to sinus infection.[3] The obturator acts as an artificial palate, seals the defect, and prevents the regurgitation of the fluids.[4,5] It improves deglutition, mastication, and speech tremendously. Prosthetic rehabilitation of such defects through zygomatic implants is a better treatment modality but certain medical conditions, bone quality, financial constraints, and patient desires limit the acceptability of implants.

The conventional removable obturator framework design is also used to rehabilitate partial hemimaxillectomy patients. Retention is frequently increased by increasing the supra bulge area or through the creation of a favorable undercut.[6] Clasps have a low retention capacity, and repeated insertion/removal cycles cause plastic deformation leading to loss of retention, discomfort, and nasal regurgitation.[7] So, a precision attachment-supported prosthesis was chosen as a better treatment option for the present clinical case.

The position of the abutment teeth and their periodontal health are crucial elements that contribute to the absorption of stresses caused by the functional movement of the obturator. Extra-coronal attachments provide added enhanced reinforcement in periodontally compromised teeth and large

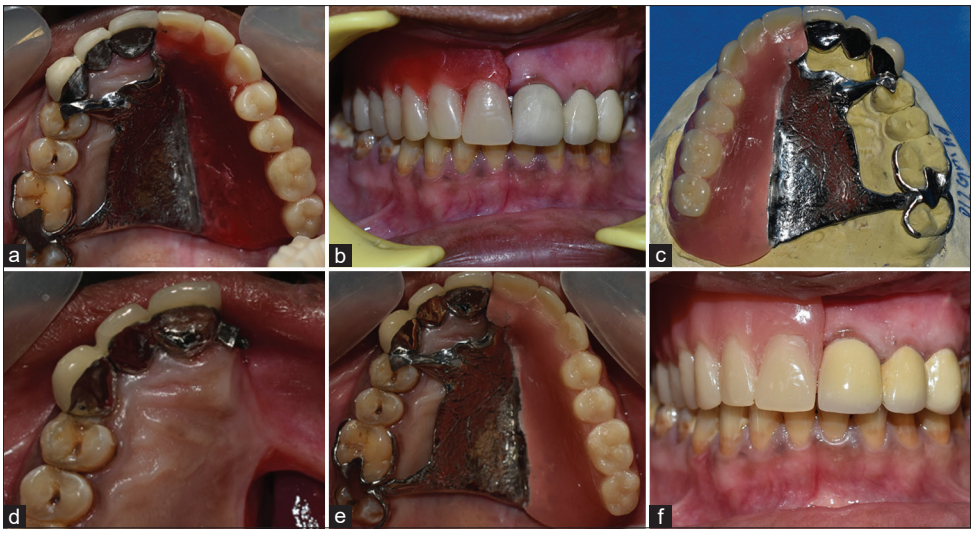

Figure 4: a) Try-in of the 3D printed cast partial denture framework with embrasure clasps on 26, 27 and indirect retainer on 24, b) Try-in of the teeth arrangement along with the metal framework, c) Acrylization of the prosthesis along with the precisagix attachment and PFM crowns adapted on the final cast, d) Cementation of the PFM crowns along with a male portion of the precisagix attachment, e) Intraoral maxillary view showing the adaptation of the metal framework, f) Insertion of the final finished and polished prosthesis along with the precisagix attachment

Figure 5: a) Pre-rehabilitative frontal view, b) Post-rehabilitative frontal view with the final prosthesis

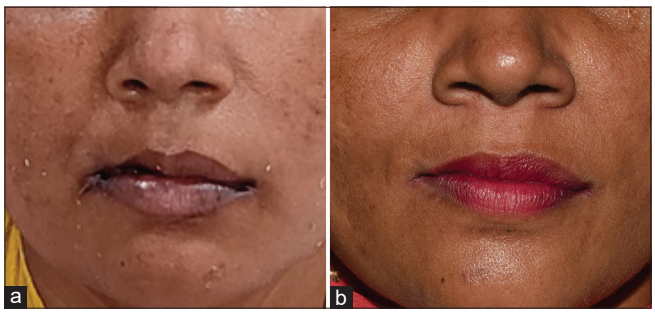

Figure 6: a) Pre-rehabilitative frontal view, b) Post-rehabilitative frontal view

defects and the resilient attachments allow stress distribution while accommodating the movement of the obturator.[8] The present case report focuses on both the digital and conventional aspects of the fabrication of the definitive obturator. Digital fabrication of the precisagix attachment and the cast partial framework was done using 3D printing through a direct metal laser sintering technique. Although the use of the lingual wall of the remaining teeth as a guide plane for the attachment would have been a less invasive choice, the full coverage crowns involving three maxillary anterior were chosen to provide a splinting effect and preventing excessive torque and detrimental stresses, thereby maintaining the periodontal health of the maxillary anterior teeth. The use of 3D printing in dentistry can help dentists to offer patients more personalized and affordable care while also streamlining the labor-intensive process of fabricating dental appliances.[9]

CONCLUSION

Digital fabrication of the prosthesis provides simplified designing and printing with high accuracy. The laboratory-intensive procedures are eliminated, thus providing ease in the fabrication of the prosthesis while maintaining the best accurate details. The precision attachment retained obturator prosthesis is designed in a way that not only extends the life of the abutment but also results in a highly retentive, aesthetically pleasing prosthodontic rehabilitation for maxillary deformity. This case report highlights the fabrication of the precision attachment retained obturator using an effective and feasible hybrid of both digital and conventional techniques.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given her consent for her images and other clinical information to be reported in the journal. The patient understands that her name and initials will not be published and due efforts will be made to conceal identity, but anonymity cannot be guaranteed.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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