Prosthetic rehabilitation of a maxillary defect caused by post covid mucormycosis using a two-part obturator- A case report.

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Abstract
Mucormycosis is a hostile and life-threatening fungal infection caused by Mucormycetes that primarily affects when body defence mechanisms become weaker. Diabetes is a major risk factor followed by cancer immunotherapy, organ transplantation, and steroid therapy. Mucormycosis presents in various clinical forms such as pulmonary, gastrointestinal, cutaneous and rhinocerebral. The most common symptoms of rhinocerebral mucormycosis include headache, sinus congestion, unilateral facial swelling, black lesions on the nasal turbinate that can rapidly extend to the midfacial and orbital region and can lead to palatal and maxillary deformities, fistula, blindness, and other analogous damage. Surgical excision and debridement of the necrotised areas might affect the quality of life of the patient and will result in facial deformity, speech impairment and improper mastication. The prosthetic rehabilitation of such extensive maxillary defects poses a challenge. Lack of bone support, tissue loss resulting in additional weight and volume of the obturator, uncertainty over retention of the prosthesis and difficulty in insertion and removal due to increased vertical height of the prosthesis are factors to be considered. This article presents an innovative technique for fabrication of a two-part obturator for the prosthetic rehabilitation of maxillary defect to make a retentive obturator that can be inserted and removed with ease.

Key words: Maxillectomy, Maxillary defect, Mucormycosis, Necrosis, Obturator, Prosthetic Rehabilitation

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Introduction

Mucormycosis is a life-threatening fungal infection that requires immediate attention due its rapidly advancing and devastating nature. Mucormycosis is caused by Mucormycetes, that primarily affects, when body defence mechanisms become weaker, specifically in individuals with diabetes mellitus, malignancy, organ transplantation renal failure and steroid therapy. Mucormycosis can present as pulmonary mucormycosis, cutaneous and soft tissue mucormycosis and rhino-orbital-cerebral mucormycosis. The primary method of transmission appears to be through inhalation of sporangiospores leading to pulmonary infection.[1] Direct invasion through the blood vessels can spread the infection to orbital and cerebral tissues which cause Rhino-orbital-cerebral infection. As the fungus spreads, arteries become thrombotic, which results in necrosis of both hard and soft tissue.[2] The symptoms vary depending on the type and system that is affected, the primary symptom of Rhino-orbital-cerebral mucormycosis represent palpebral or palatal fistula that progresses into necrosis, proptosis, and unilateral facial edema.[1,3,4]

Surgical excision and debridement of the necrosed areas cause significant deformities on the affected site. The defect could be small spreading from the oral cavity into the maxillary sinus, or it could be a part of palate, alveolar bone, and nasal cavity.[2] The quality of life of the patient is significantly impaired

by the maxillary resection, which results in facial deformity, speech impairment and improper mastication.

The prosthetic rehabilitation is initiated following complete recovery from infection. The tissue stability is evaluated, and the prosthetic design is chosen based on the functional requirement. The prosthetic rehabilitation of these patients is a challenge as the deformity due to the surgical procedure can be massive with loss of adjacent structures. Obturator is an excellent prosthetic choice that significantly improves the quality of life for patients. The factors to be considered are the extensive loss of tissue vertically, lack of alveolar bone support, obtaining required retention of the prosthesis and difficulty in insertion and removal due to increased vertical height of the prosthesis. This article describes a technique to fabricate a two-part obturator for the prosthetic rehabilitation of maxillary defect due to post Covid-19 muccormycosis.

Case report:

A 47 year old male reported to the Department of Prosthodontics, for prosthetic rehabilitation of a maxillary defect secondary to mucormycotic necrosis. Surgical history revealed that the patient underwent maxillectomy for post covid-19 necrosis of maxilla as a result of mucormycosis. On intraoral examination the defect was class IV (Aramany's classification)[5] without any oroantral communication with few remaining teeth 15,16,17. (Figure1a,1b) The treatment plan was to provide a treatment denture for initial period of three months followed by definitive prosthesis with maxillary two-piece obturator to enhance the retention of the prosthesis. As there was substantial vertical tissue loss, difficulty in insertion and removal of the prosthesis would be encountered resulting in discomfort to patient and hence, a modified technique was used for obturator fabrication. This article describes a technique to fabricate a two-part obturator for the prosthetic rehabilitation of maxillary defect due to post Covid-19 mucormycosis.

Procedure:

A primary impression was made with irreversible hydrocolloid impression material (Chromatex Alginate,DPI, India) using a stock tray. After obtaining the primary cast a custom tray was fabricated with autopolymerising acrylic resin (DPI RR Cold Cure, India). Border moulding was completed using greenstick compound (DPI, Uttarakhand, India) and secondary impression was made with light body polyvinyl siloxane impression material (Aquasil,Dentsply Sirona,Germany) (Figure 2). The master cast was obtained with type III gypsum product and undercut around the defect was blocked out with wax. Three overdenture ball attachments (collar height 3mm) with stainless steel caps (Adin dental implant system) (Figure 3) were waxed up in 23,25,27 region (Figure 4) following which the ball attachment was removed, and retentive grooves were made in the proximal, buccal, and lingual surfaces (PBL groove) in 23,25,27 region (grooves aid reorientation of the second part of obturator). Heat polymerizing acrylic resin (DPI Heat cure denture base material, India) was used to prepare a permanent denture base (Figure 5). The permanent denture base was tried intraorally and bite registration was done. Maxillary and mandibular casts were mounted on Articulator. The ball attachments with stainless steel caps were inserted into the denture base using auto polymerizing acrylic resin (Figure 6) and occlusal rim was fabricated. This was followed by teeth arrangement and try-in done (Figure 7).

Two similar denture flasks were chosen. The cope and the drag parts of the two flasks were interchangeable. Reverse flasking was done

in this situation as the vertical height of the obturator was more. To proceed with the flasking at this stage two cope were used with one drag (Figure 8). Trial denture was flasked and dewaxed; the upper part of the flask was holding the teeth (Cope 1) and the lower member (Drag) was holding the permanent denture base with attachments (Figure 9). After wax removal all the attachments were blocked out with polyvinylsiloxane (putty consistency) and obturator with teeth was processed utilising heat polymerising acrylic resin using the drag. Upon completion of processing, the obturator was not removed from the master cast. The occlusal side of the obturator was indexed with another polyvinylsiloxane (putty consistency). This obturator and putty index were attached to the drag. Now, a second cope was used for this second pour (Cope 2) (Figure 10). The second cope and drag were well fitting. Once the investing plaster was allowed to set, the processed denture teeth were separated to expose the attachments (Figure 11). Separated posterior teeth were carefully placed in the second putty index. Exposed attachments were covered with tinfoil (Figure12a, 12b) and the stainless steel cap was picked up in separated posterior teeth of the prosthesis using autopolymerising acrylic resin within same drag and cope 2 (Figure 13a,13b). Denture adjustments were made to fit the prosthesis intraorally. The prosthesis was inserted (Figure 14a,14b) along with reinforcement of aftercare instructions, and the patient was recalled every three months for a year. The patient was happy and pleased with the prosthesis.

Discussion:

Patients after maxillectomy often experience psychological breakdown in addition to the anatomical constraints of having their maxilla and associated structures removed. It may impair a patient's ability to chew, speak, swallow, esthetics, and feel less confident. Primary goal in prosthetic rehabilitation of maxillary defect is to restore function and aesthetics with a prosthesis. The main strategy of treatment is careful planning, designing and in the execution of technique of fabrication of the prosthesis. Here, a modified technique for fabrication of a two-part obturator for prosthetic rehabilitation of maxillary defect due to post Covid-19 mucor using attachments has been described. Here the ball attachments and the stainless steel housing with silicone, enabled retention of the retention of the second part of the obturator apart from ensuring ease of insertion and removal. The permanent denture base was retained utilising wrought wire clasp retention.

There are different techniques in fabrication of obturators described by various authors. Dholam KP describe fabrication of obturator that consisted of upper plate with a bulb and silicon cap held in place by studs and magnets.[6] Sukumaran P, Fenlon MR introduced a keyhole to the original obturator design to serve as an active point where the removable partial denture can be securely inserted.[7] Manish M described fabrication method for a two-piece closed, hollow bulb obturator held in place by magnets.[8] However, in all these techniques retention of the denture was primarily from the surgical undercut. In the present case, undercuts are not present in the defect. The defect is extensive with loss of tissue and little alveolar bone support underneath. Hence a two-part obturator utilising clasp and attachments was planned. Authors are not aware of any reported literature on prosthetic management of such a case. The obturator provided in this instance resulted in a stable, retentive, and supported prosthesis fulfilling esthetic, functional requirements of the patient utilizing the available soft and hard tissues.

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FIGURES

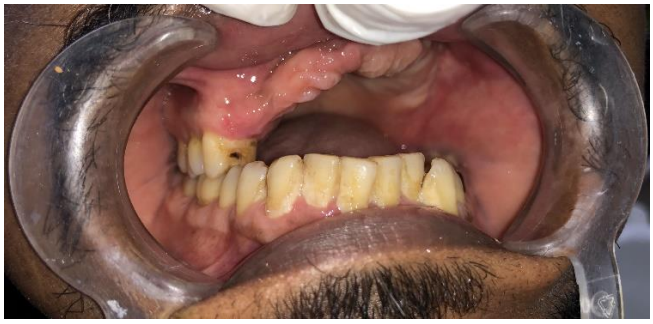
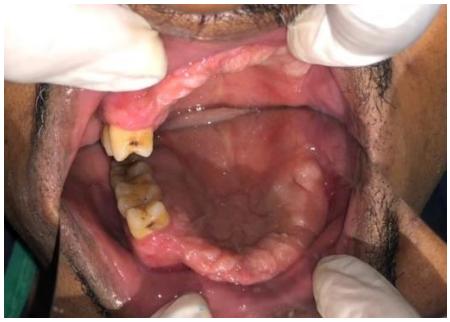


Figure 1a



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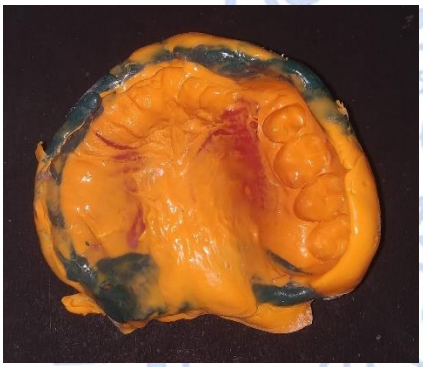

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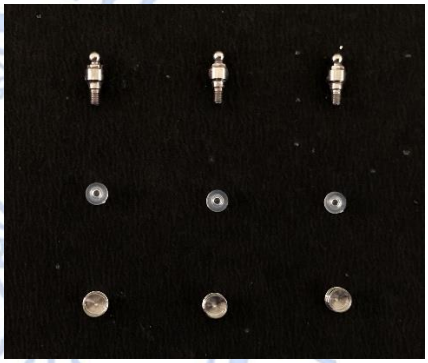

Figure 3

Figure 4

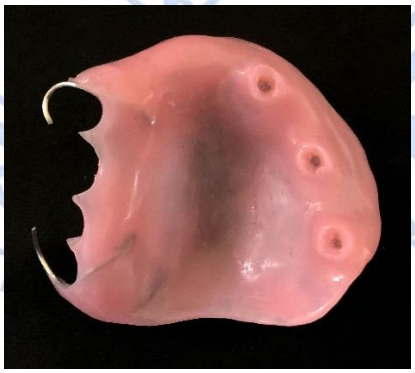

Figure 5

Figure 6

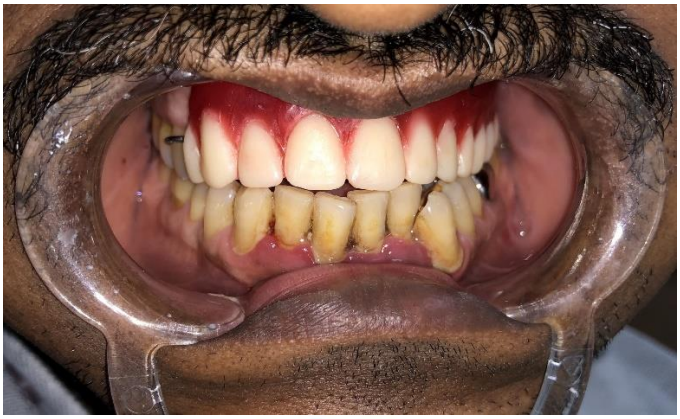

Figure 7

Figure 8

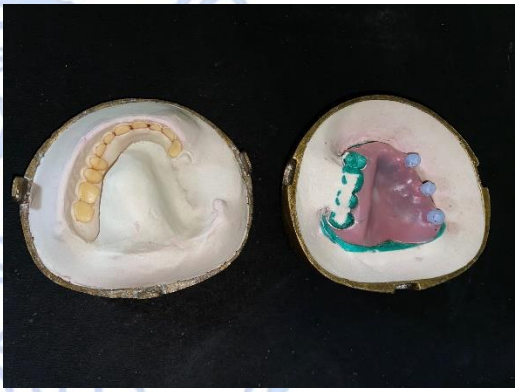

Figure 9

Figure 10

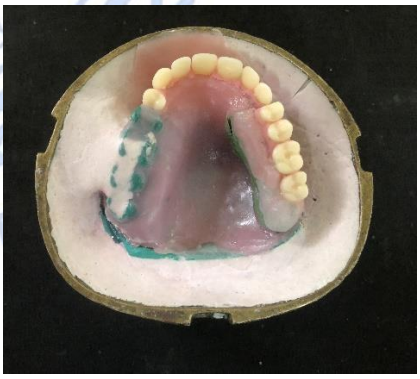

Figure 11

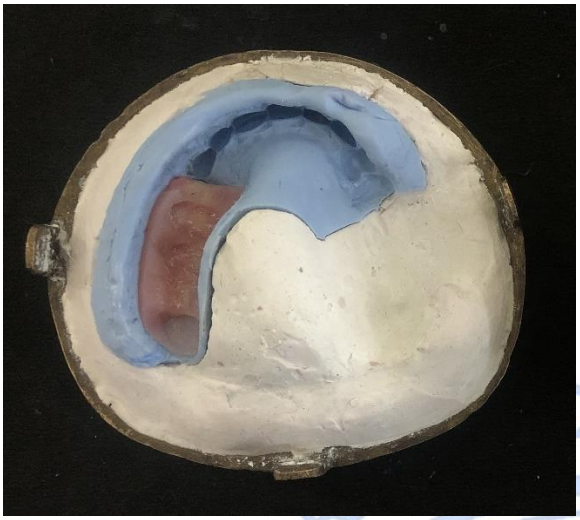

Figure 12a

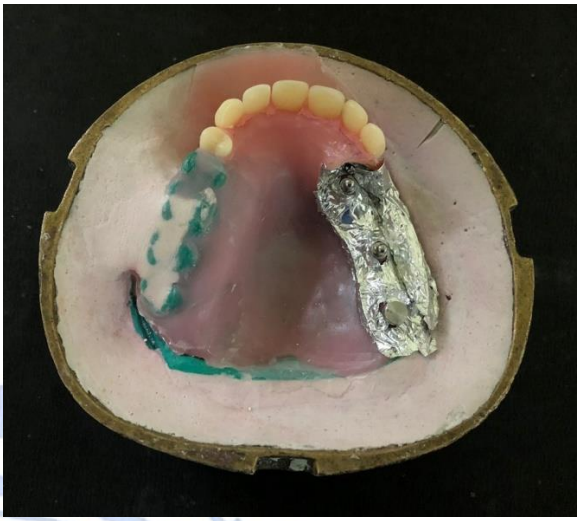

Figure 12b

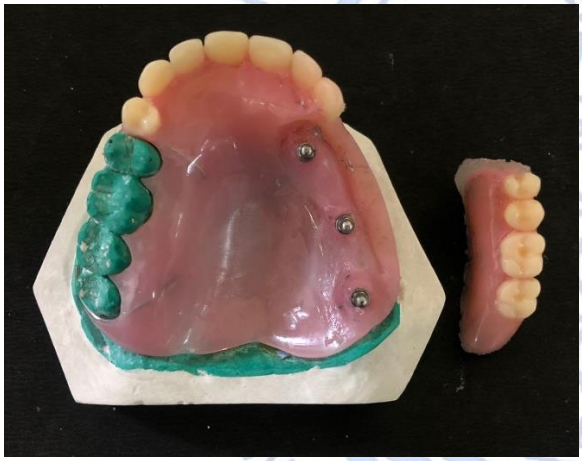

Figure 13a

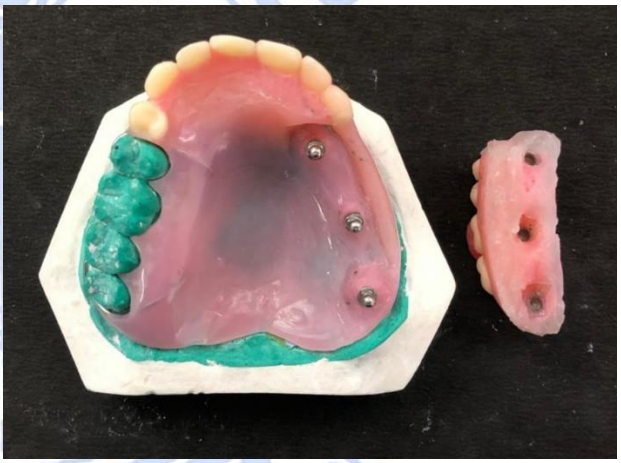

Figure 13b

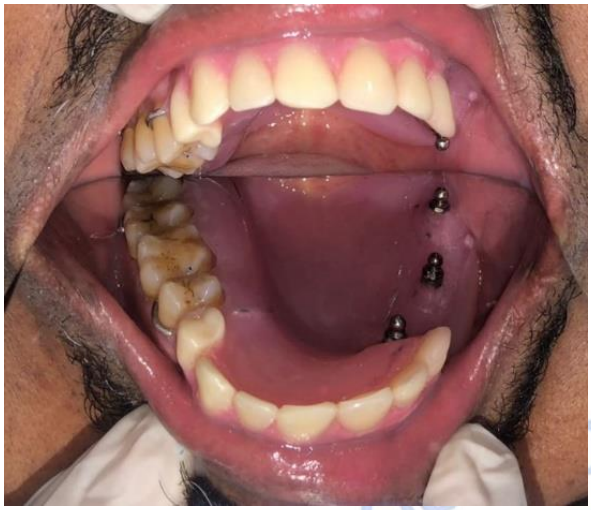

Figure 14a

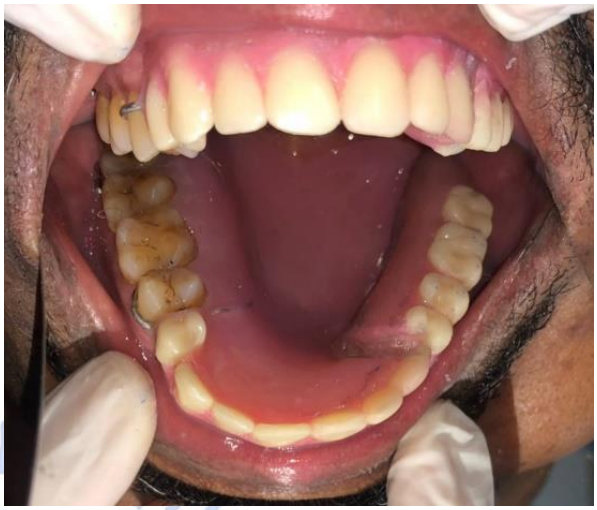

Figure 14b