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Application of Polyvinyl chloride sheet as delayed surgical obturator in maxillectomy defects secondary to mucormycosis- A case series

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ABSTRACT

It was a great challenge for the prosthodontist to rehabilitate and sustain the prosthesis in patients with bilateral maxillectomy defects due to mucormycosis seen with Covid-19 during second wave in India. In such extensive defects there was difficulty in retaining the obturator due to the absence of soft tissue or anatomical undercut, condition of existing dentition, retained inferior turbinates and limitation in taking retention from defect side during healing phase. In such extensive maxillectomy defects, retention, stability and support can be enhanced by maximum preservation of hard and soft tissues, skin grafting and removal of inferior turbinates to provide a larger surface area for stress distribution. But here, in this case series, maxillectomy defects with retained inferior turbinates presented a problem in retaining the obturator prosthesis due to limitation in taking retention from the defect side. The conventional method of fabrication of obturator using autopolymerizing acrylic failed in terms of weight of the prosthesis and in gaining retention from the defect side during healing phase. Therefore, thermoplastic vacuum pressed Polyvinyl chloride sheet (PVC) was used for fabrication of delayed surgical obturator due to many merits conferred by it. Its light weight, non porous nature, easy adaptability, patient comfort, efficient undercut engagement, hygienic nature makes it a good treatment option. The main concern was to close oro-nasal communication to eliminate the need of nasogastric tube and to prevent nasal regurgitation. In all cases, patients were comfortable with the obturator prosthesis in terms of adaptation and function.

1. Introduction

Mucormycosis infection was emerged as a matter of concern during second wave of COVID-19 in India. Diabetes mellitus (DM) and other comorbidities were risk factors for both severe COVID-19 and mucormycosis. The use of corticosteroids to treat severe/critical COVID-19 was also a well-known risk factor for mucormycosis infection.¹ Affected patients acquired various maxillectomy defects in post surgical debridement of necrotic tissue, out of which rehabilitation of bilateral maxillectomy patients posed significant challenge. The most common prosthodontic treatment problem associated with maxillectomy patients was difficulty in achieving retention, stability, and support. The size of the defect, the number of remaining teeth, the amount and nature of the remaining soft and hard tissues, and the patient's ability to adapt to the prosthesis are few factors that affect the prognosis of the treatment.^{2,3} The size and location of the defect and retained inferior turbinates usually influences the amount of impairment and difficulty experienced in prosthetic rehabilitation. Obturator prosthesis is commonly used as an effective means for rehabilitating maxillectomy cases. In cases of large

maxillary defect, movement of the obturator prosthesis is inevitable, especially when the maxilla is completely edentulous.⁴ There are many methods for retaining the obturator prosthesis including spring-retained intraoral method, for this adequate mouth opening should be present along with mandibular teeth and second extra-oral retentive aid.^{5,6} But both the methods are difficult for the patient in ease of wear and maintenance of the prosthesis. Therefore, in this case series, thermoplastic vacuum pressed Polyvinyl chloride sheet (PVC) of 2 mm thickness was tried for the fabrication of obturator prosthesis that was easy to fabricate and easy to adapt.

2. Case series

2.1. Case 1

Patient was diagnosed as Rhino-orbital mucormycosis with type II DM (diabetes mellitus) in ENT department. Patient had undergone surgical debridement along with anti-fungal medication. Bilateral inferior maxillectomy by midfacial degloving approach was done on June

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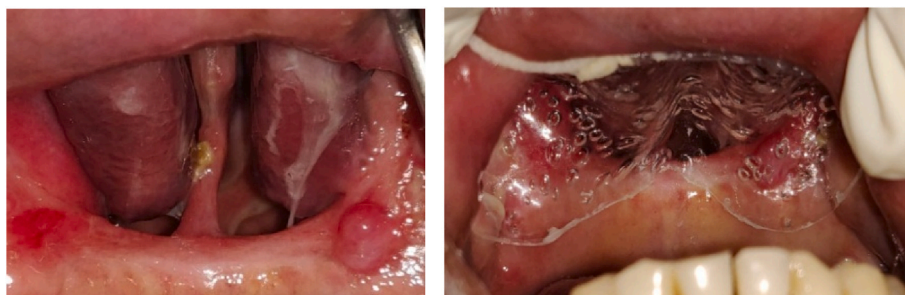


Fig. 1. (a) Bilateral maxillectomy case with retained inferior turbinates (b) obturator fabricated using thermoplastic vacuum pressed PVC sheet delivered.



Fig. 2. (a) Bilateral maxillectomy case with retained inferior turbinates on left side (b) obturator delivered.

2021. Patient was referred to Prosthodontic department for the fabrication of obturator prosthesis. In this case inferior turbinates were retained that posed a problem in retaining the obturator from defect side due to reduced retentive space for prosthetic obturation, its repeated engorgement and distortion of palatal contours as seen in Fig. 1(a). Obturator fabricated using autopolymerizing acrylic was tried out but posed difficulty in retention due to the weight of the prosthesis and influence of gravity. Second problem encountered was recurrent inflammation of inferior turbinates which got augmented by the acrylic prosthesis. Therefore, the thermoplastic vacuum pressed PVC sheet was used for the obturator fabrication. Firstly impression was made in irreversible hydrocolloid and cast was poured in type II gypsum. Due to the presence of inferior turbinates, relief wax placed over it in the cast and thermoplastic sheet was adapted by vacuum press. In this case, Pouch-effect was taken via anatomical undercuts. Dental floss was attached for easy retrievability of the prosthesis. Fig. 1(b)

2.2. Case 2

A 55 year old male patient reported to ENT department diagnosed with right Sino-nasal mucormycosis. History revealed Covid-19 treatment with steroids administration. Patient was also under medication for diabetes since 10 years. Patient had undergone bilateral inferior maxillectomy under GA in surgical debridement in August 2021. Along

this the patient was under anti-fungal medication. In this case also, inferior turbinates were retained on the left side. The obturator was fabricated using the thermoplastic vacuum pressed PVC sheet. Retention was taken by extending obturator into the defect side. Along this there was firm tissue present surrounding the defect area which was utilized for gaining the retention of the obturator. So during fabrication of the obturator, it was extended few millimetres beyond the defect along with utilization of the pouch effect. Fig. 2 (a and b).

2.3. Case 3

A 48 year old female patient reported to the ENT department with pain and mobility of alveolar segment in upper front region, gingival swelling in 16–26 tooth region with multiple draining sinuses. Patient was diagnosed with rhino-orbital mucormycosis with hypertension and type II DM. Inferior maxillectomy done in June 2021 for surgical debridement of the necrotic tissues. Patient presented with class IV Aramany defect in Prosthodontic department. Inferior turbinates were retained on right side. There was advantage as one tooth 17 was preserved. In this case retention was achieved from the defect side along with aid of the pouch effect and by encirclement of the retained tooth. For achieving additional retention PVC sheet adapted around the tooth was relined using autopolymerizing acrylic. Fig. 3 (a and b).



Fig. 3. (a) Aramany class IV defect with retained inferior turbinates on right side and retained tooth 17 (b) obturator relined using autopolymerizing acrylic.

3. Discussion

The prosthodontic rehabilitation poses extreme difficulty in bilateral maxillectomy cases. The volume, location and configuration of the defect, retained inferior turbinates, amount with nature of the remaining soft and hard tissues, reduced mouth opening and weight of the prosthesis are the major factors influencing the retention and stability of the prosthesis.⁷ Defects resulting from surgical debridement or disease extension from mucormycosis differ significantly from the defects that result from tumor resection as marginal tissues are very fragile, ischemic preclude grafting procedure and in the absence of skin grafting, the tissues were unhealed and not load-bearing, therefore undercuts cannot be utilized.⁸ Inferior nasal turbinates were left intact in all cases which created trouble in extension of the impression and prosthesis bulb. Autopolymerizing acrylic was used for the fabrication of hollow obturator but was not successful as retention cannot be taken from the defect side during healing period with its weight also aiding in dislodgement of the prosthesis. Another problem encountered was recurrent inflammation of the inferior turbinates due to irritation from acrylic prosthesis and its porous nature despite relieving the turbinates. Therefore, in this case series, PVC sheet was used for the fabrication of obturator as it is very light since weight of the prosthesis is a prime concern and also to counteract the effect of gravity. Its other advantages are its non-porous characteristic nature which hinders absorption of the mucous secretions, its uniform thickness, transparent nature which aid in easy visualization of the defect. Most importantly it is easy to fabricate, easy to clean-no odour, hygienic with no leaching.⁹ It is easy to adapt with optimum undercut engagement. In contrast to acrylic it undergoes no polymerization shrinkage hence, results in better adaptation. Its non monomer constitution renders it a vital prosthetic aid in patients experiencing allergy to monomer. Since model is not damaged during PVC delayed surgical obturator fabrication, therefore casts can be preserved for record maintenance and refabrication purposes. PVC sheet can easily be relined using autopolymerizing acrylic resin which aids in adjustability of the prosthesis. PVC sheet possess ease of use and no esthetic issues as encountered in intraoral and extraoral retentive techniques.^{5,6} In all cases, patients were comfortable with the obturator prosthesis in terms of adaptation and function. It gets well adapted to the tissues around the defect and patient were capable of taking liquid and semisolid diet as while swallowing action it gets stuck into the tissues even if there is slight retention. Some of the possible limitations associated with this treatment modality is that palatal contour is not fully restored so phonetics was not improved so much. In addition there is a need for vacuum press machine for adapting PVC sheet which might pose requirement for initial investment. Thus, might not be readily available in all healthcare setups. In this case series, pouch effect was used for retention of the obturator. This terminology was used here as the presence of soft tissue undercuts on the periphery of the defect and adaptation of PVC into the defect creates a pouch like concavity or sac.¹⁰ This can be effectively engaged by the PVC sheet owing to its light weight and good adaptation.

It enhances the retention of the prosthesis especially in cases where tissues are flexible, non load bearing and non retentive. This Pouch effect was utilized in all cases that are presented in this case series.

4. Conclusion

The fabrication of delayed surgical obturator using polyvinyl chloride sheet is a novel treatment option in maxillectomy cases especially during healing period. Patient's comfort, prosthesis ease of use and maintenance with good retention and adaptability are some of the factors leading to its successful treatment outcome. Pouch effect can also be utilized with PVC sheet in specific cases which further augments prosthesis acceptability and success.

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Declaration of competing interest

There is no conflict of interest of any of the authors about its publication.

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There is nothing to declare.

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