



Spring Obturators: A Functional Solution for Palatal Defects

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(Received: 16 November 2024

Revised: 20 December 2024

Accepted: 04 January 2025)

KEYWORDS

Obturator, mucormycosis, bilateral, subtotal, maxillectomy

ABSTRACT:

Introduction: During the severe second wave of the COVID-19 pandemic, India faced a notable increase in cases of COVID-19-associated mucormycosis, a serious fungal infection caused by Mucorales species. This infection is highly angioinvasive and spreads rapidly. Many patients underwent bilateral subtotal maxillectomy due to the aggressive nature of the fungus. Reconstructing the resulting defect is challenging, and there is limited data on creating delayed surgical obturators for these cases.

Aim: This design aims to produce an appliance that is easy to fabricate, adjust, cost-effective, and comfortable for patients.

Materials and Methods: The surgical obturator will use a spring made of 22 gauge stainless steel wire. The thick gauge addresses postsurgical trismus and creates a seal between the acrylic plate and the dorsum of the tongue during swallowing, aiding in the patient's ability to take a soft diet initially.

Conclusion: The spring obturator represents a novel, patient-centric solution for addressing the functional and structural challenges associated with bilateral subtotal maxillectomy due to mucormycosis. Its simplicity and affordability make it a promising option for widespread clinical application.

Introduction:

The second wave of the COVID-19 pandemic in India, characterized by a surge in cases and increased severity, led to a significant rise in COVID-19-associated mucormycosis (CAM) cases. Mucormycosis, a rare but aggressive fungal infection caused by Mucorales species, predominantly affected individuals with compromised immune systems, including those recovering from COVID-19.⁽¹⁾

Several factors contributed to the widespread occurrence of CAM during this period. Uncontrolled diabetes mellitus, prevalent in the Indian population, emerged as a significant risk factor, exacerbated by the use of corticosteroids in COVID-19 treatment protocols. Additionally, environmental conditions and the causative agents played a role in the surge of CAM cases.⁽¹⁾

the rise in mucormycosis cases led to an increase in maxillary defects due to surgical interventions like maxillectomy, performed to manage the infection. These



defects resulted in challenges related to mastication, esthetics, and overall quality of life for patients.⁽²⁾

Rehabilitation of such defects posed significant challenges. The fabrication of obturators, essential for closing palatal defects, required careful consideration of the extent of the defect and the patient's overall health status.⁽²⁾

Case Report:

A 32 year-old male reported with the chief complaint of reduced mouth opening and inability to have food. He gave a past history of mucormycosis and had undergone complete maxillectomy for the same. Extraoral examination showed midfacial concavity and depressed left eyeball. The intraoral examination revealed insufficient hard and soft palate structures, accompanied by inflammation at the edges of the defect.(fig 1,2,3)

Due to inflammation of the remaining tissues and the inability to provide adequate hard and soft tissue support for a conventional surgical obturator, a design utilizing a spring-retained obturator connected to a mandibular plate was proposed.

The preliminary impression of the mandibular arch was made with irreversible hydrocolloid material.(fig. 5) The maxillary defect was packed with a wet gauge with a floss tied to it and the impression was made with irreversible hydrocolloid.(Fig.4) .Casts were poured of both the maxillary and mandibular impressions.(fig.6,7).Fabrication of maxillary plate using clear acrylic autopolymerising resin was done after blocking the defect with modelling wax.(fig 8) Tentative jaw relation was recorded and mounted on a mean value articulator followed by fabrication of Mandibular appliance using 0.7 mm Stainless steel wire.(fig 9,10).

To fabricate spring, 0.7 mm S.S wire was used to make one coil of 3 mm internal diameter on both left and right sides. All the coils were in a relaxed state. The spring was design in a 'V' shape for the ease of closing and opening of the jaw and as the wire used was 0.7mm this makes the appliance flexible and rigid at the same time. The lower end of spring was attached to the acrylic buttons. These buttons were fabricated in the lower molar region. The upper end was attached to the record base plate using auto polymerizing acrylic resin. Thus, the upper base plate was in a suspended position. Additional

retention was provided by using ball end clasps in the anterior teeth region.(fig. 11)



Fig.1:Extraoral photograph



Fig.2:Intraoral photograph of maxillary defect



Fig.3:Intraoral photograph of mandible



Fig.4:Impression of palatal defect

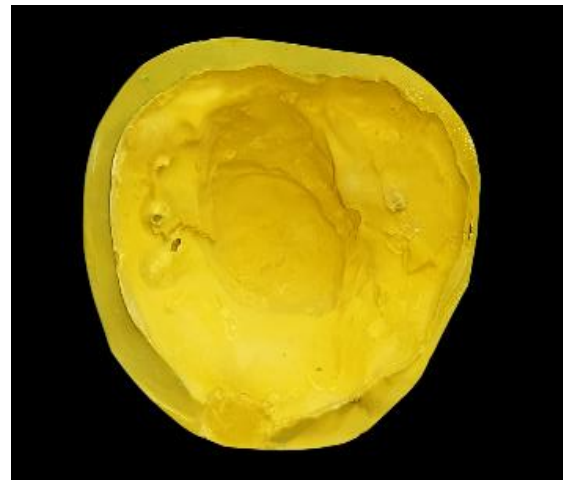


Fig.7:Maxillary Cast



Fig.5:Impression of mandibular teeth



Fig.8:Fabrication of acrylic plate



Fig.6:Mandibular cast

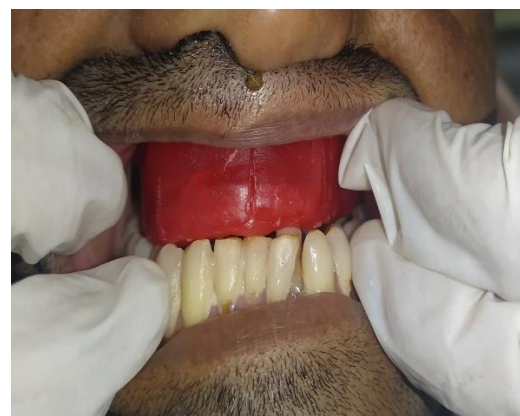


Fig.9:Recording of Jaw relation



Fig.10:Fabrication of appliance on the mounted cast



Fig.11:Frontal view of the appliance



Fig 12: Intraoral fit of the appliance

Discussion:

There is limited data on delayed surgical obturator fabrication of the patients who have undergone bilateral total maxillectomy^[3] as it is a relatively uncommon surgical process and creates defects that are difficult to rehabilitate prosthetically.^[4] Lack of retention, support, and stability are common problems encountered while constructing prostheses for such patients.^[5] Irrespective of the final treatment options available, the most immediate matter to be addressed is adequate nutrition in the postoperative phase.^[6] Typically, immediate surgical obturators that utilize wire retention pose significant challenges due to extensive surgical defects and ongoing wound contraction. Consequently, opting for a removable delayed surgical obturator proves to be a more effective solution in these scenarios. While external aids for retention may be considered, they often lack aesthetic appeal and tend to be less favored by younger patients. Therefore, it becomes crucial to explore various intraoral retention methods. One effective design is the spring-retained surgical obturator, which employs a spring mechanism. This innovative feature creates a secure seal between the acrylic plate and the tongue's dorsum, particularly during swallowing.

The basic requirement for spring retained surgical obturator is, stable mandibular arch with healthy dentition to retain prosthesis. The obturator develops a seal with the dorsum of the tongue thus allowing the patient to take a liquid diet orally. The spring used in this surgical obturator is easy to fabricate, is cleansable and causes less soft tissue irritation than previously described spring like Washington's spring etc⁽⁷⁾

While traditional spring-retained obturators have been employed in the management of total maxillectomy cases, the inherent design complexities of these devices present significant challenges. Expectations from this delayed surgical obturator were to obturate the defect, help the patient in deglutition of liquid, and semisolid diet postremoval of a nasogastric tube, improve speech, and counter trismus after surgery. Another expectation was to reduce psychological trauma to the patient⁽⁸⁾

We have innovated a streamlined Z-spring-retained customized obturator that stands out for its ease of fabrication and adjustment. This design strategically occupies the buccal corridor, ensuring it avoids



impingement on sensitive soft tissues, thereby significantly enhancing patient comfort.

Contrasting with previous spring-retained obturators, which employed a uniform spring design regardless of each patient's unique Vertical Dimension of Rest (VDR), our new approach personalizes the diagonal arm length for every individual based on their specific rest position. This allows the spring to maintain a passive state when the patient is at rest, mitigating any undue force on the mandibular teeth and arch, which is crucial for long-term oral health.

The design incorporates a singular coil within the appliance, supplemented by two ball-end clasps positioned in the anterior region. This configuration not only secures the device effectively but also provides an additional layer of retention, thereby ensuring improved stability and functionality for the patient.

The thickness of the wire makes it a suitable choice after maxillectomy, as it helps reduce trismus, a condition that limits jaw movement. Additionally, the wire's flexibility allows for some movement of the mandible. After three months of monitoring, the spring remained intact, did not harm the surrounding soft tissues, and effectively aided in keeping the mouth open, addressing the trismus that followed the surgery.

The patient felt quite comfortable using the obturator and experienced an increase in oral intake after it was inserted. This improvement contributed to an average weight gain of 4 kg over the three months. As the patient was able to consume mainly liquid and semi-solid foods, the softness of these foods made eating much easier. The obturator did not require any repairs during this period, which not only saved on costs but also reduced the time needed for procedures.

Furthermore, the appliance assisted the patient in maintaining good oral hygiene. Over time, it was noted that the yellowish color of the patient's tongue changed to a healthier pink. There was also a noticeable reduction in halitosis, which helped improve the patient's overall comfort and confidence.

Conclusion:

This straightforward design can be beneficial for creating a delayed surgical obturator in total maxillectomy

situations where adequate anatomical undercuts for retention are lacking. This approach is particularly advantageous for patients who wish to avoid using extraoral retention devices to keep the obturator secure.

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