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Case Report

A graftless approach with dental implants for maxillary rehabilitation in an operated case of post-covid mucormycosis: A case report

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Abstract

Rhinocerebral mucormycosis was the most common form, often requiring extensive surgical debridement resulting in complex maxillary defects. These defects pose significant challenges for rehabilitation, affecting mastication, speech, aesthetics, and overall quality of life.Conventional removable prostheses often fall short due to poor retention and stability in such cases. Zygomatic and pterygoid implants have emerged as viable alternatives, offering improved support and functional outcomes in patients with limited maxillary bone. However, literature detailing their use in post-mucormycosis cases remains scarce.

This report presents the case of a 48-year-old male who developed post-COVID mucormycosis, leading to a left total and right partial maxillectomy. Following soft tissue closure using regional flaps, the patient underwent implant-based rehabilitation using four zygomatic implants, one pterygoid implant, and one anterior tilted implant. Implant placement was guided by CBCT, virtual planning, and stereolithographic modeling. A screw-retained, titanium bar-supported prosthesis with a PMMA superstructure was delivered on the second postoperative day, restoring function and aesthetics.

The use of zygomatic and pterygoid implants in this case provided a stable, predictable foundation for prosthetic rehabilitation, eliminating the need for extensive bone grafting or patient-specific implants. With proper planning and execution, these implants offer an effective solution for complex post-maxillectomy defects, especially in cases following mucormycosis.

Keywords: Mucormycosis, COVID-19, Zygomatic implants, Pterygoid implants, Dental rehabilitation, Dental implants.

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1. Introduction

The maxillofacial skeleton can be affected by various defects resulting from trauma, craniofacial or congenital deformities, and ablative surgeries. Mucormycosis, a fast-spreading fungal infection that primarily affects elderly individuals with weakened immune systems, gained significant attention during the second wave of the COVID-19 pandemic.[1] Between April and July 2021, India recorded over 45,000 cases of Mucormycosis, with around 77.6% classified as the rhinocerebral type.[2] Interestingly, this surge in infections was not limited to older adults; even younger individuals, including those without pre-existing health conditions, were impacted.[3]

In cases with mucormycosis, surgical debridement often results in unique maxillary defects that differ from those caused by other conditions. When it comes to restoring both function and aesthetics in patients with maxillectomy defects, various treatment options are available. Historically, restoring such ablative defects with removable dental prostheses presents significant challenges, particularly in terms of achieving adequate retention and stability, providing satisfactory masticatory function and acceptable aesthetic outcomes.[4]

Zygomatic and Pterygoid implants have gained prominence as a reliable solution for complex orofacial defects, offering improved retention, support, and functionality for prosthetic rehabilitation.[5] Despite the limited research on their application in such cases, this report

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highlights their successful use in restoring maxillary structures affected by mucormycosis.

2. Case Report

A 48-year-old male presented to the department with difficulty in chewing due to multiple missing teeth. Patient was diagnosed with bronchopulmonary pneumonia in 2021 and tested positive for COVID-19. Patient had no known comorbidities. Patient was on ventilatory support and later developed post-COVID Mucormycosis affecting the left maxilla. Patient was operated for mucormycosis, where left total maxillectomy and right partial maxillectomy were performed, leaving a debilitating edentulous maxillary defect. A left temporalis myofascial flap and right bucco-myomucosal flap were taken to close the oroantral communication. A palatal defect continued to persist, which was further closed by an anteriorly based tongue flap. Following complete soft tissue closure, the patient desired dental rehabilitation for aesthetic and functional purposes (**Figure 1**).

2.1. Investigations

A bone scan and a Magnetic Resonance Imaging of the Paranasal Sinus (MRI PNS) were done to rule out any remnant of infectious aetiology. The patient was advised an OPG along with a CBCT to understand the spatial orientation (**Figure 2**). Further, a stereolithographic model was printed to aid in planning and for preoperative simulation purposes. After careful assessment of the CBCT as well as mock surgery on the model, the implant sizes were decided (**Figure 3**).

Figure 1: Preoperative clinical photos showing partially edentulous maxilla

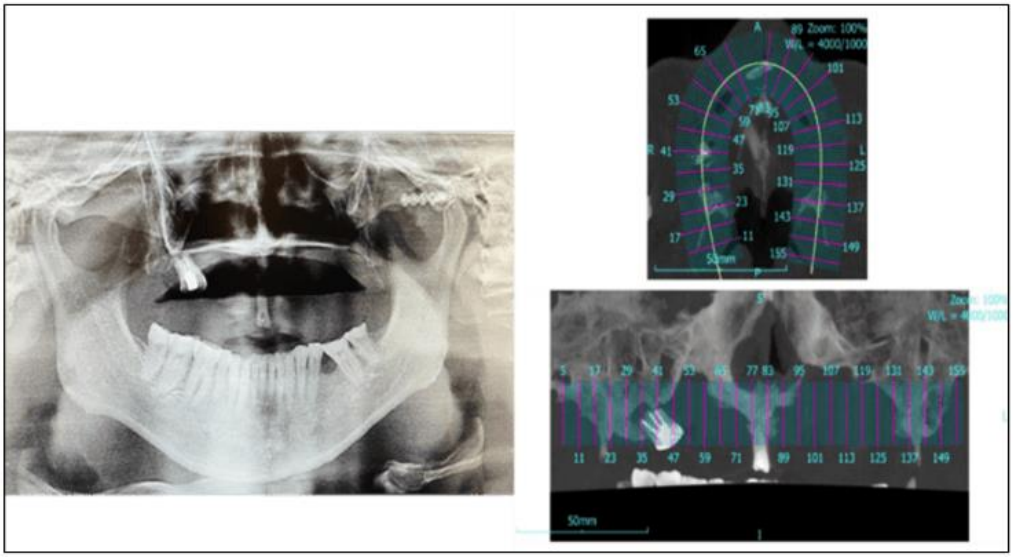

Figure 2: Preoperative radiographic findings (OPG and CBCT)

2.2. Procedure

Patient was taken under general anaesthesia and intubated via nasoendotracheal intubation. Extraction of right central incisor and first molar was done. A crestal incision was made, followed by elevation of a full-thickness mucoperiosteal flap to expose the zygoma bilaterally, extending to the insertion site of the masseter muscle tendon. Implant site preparation was carried out using zygomatic implant kit drills mounted on a contra-angled handpiece. Osteotomy site preparation revealed healthy bone, confirming optimal conditions for implantation. Subsequently, zygomatic implants were placed as follows: 4.2×45 mm at Zygomatic Right 1, 4.2×45 mm at Zygomatic Right 2, 4.2×40 mm at Zygomatic Left 1, and 4.2×40 mm at ZL2. The pterygoid hamulus was palpated, and an osteotomy site in the region of left third molar was drilled. A pterygoid implant of size 3.75x16mm was placed to engage the pterygoid plate. An osteotomy site was also prepared in the region of the right central incisor, and a tilted implant was placed to engage the vomer bone. Multi-unit abutments were strategically placed to align with the existing mandibular teeth, creating a supporting polygon and preventing offset loading due to cantilever effects (**Figure 4**). Healing caps were positioned, and the flaps were carefully approximated using 3-0 Vicryl sutures.

Following the patient's recovery from general anaesthesia, a post-operative orthopantomogram (OPG) was obtained, and digital impressions were captured using an intraoral scanner. The patient received intravenous antibiotics and analgesics for five days, along with intraoral flushing using betadine. On the second postoperative day, a milled titanium bar-supported prosthesis with a PMMA supra-structure was delivered to provide immediate rigid splinting of the implants (**Figure 5**). Regular follow-up appointments were scheduled to monitor implant stability (**Figure 6**).

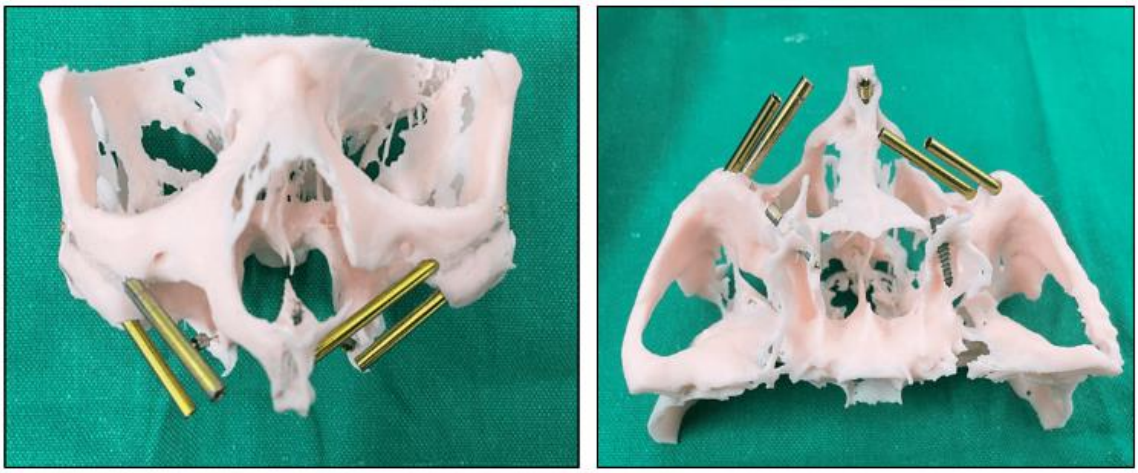

Figure 3: Stereolithographic model with pterygoid, zygomatic and vomer implant placed in mock-up surgery

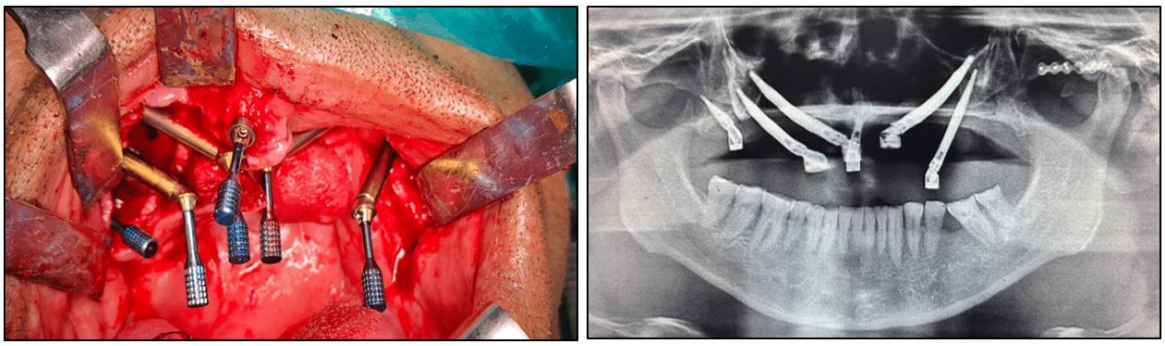

Figure 4: Placement of bilateral zygomatic, right pterygoid and vomer implants with tilted abutments

Figure 5: Screw retained, Bar-supported final Maxillary prosthesis

Figure 6: Extraoral and intra-oral photographs with final fixed prosthesis

3. Discussion

Maxillary defects with oronasal and oroantral communications can lead to masticatory dysfunction, hypernasal speech, fluid leakage, and aesthetic concerns, significantly disrupting the normal function of the stomatognathic system and diminishing the patient's quality of life [6]. Due to compromised adaptive capabilities, prosthetic rehabilitation poses a considerable challenge in such cases. This case report explores the potential of implant-based treatment for managing severe hard and soft tissue deficiencies, aiming for long-term prosthetic success and improved patient outcomes.

Various reconstructive options exist for addressing maxillofacial defects, with selection based on multiple factors, including defect dimensions, presence of the infra-orbital rim, degree of palatal involvement, condition of underlying skin, and patient-specific aesthetic considerations. In such cases, reconstruction of the palatal and orbital floor can be achieved through overdentures or a fixed framework incorporating attachments for removable components such as an obturator or palatal plate.[7]

When placing bicortical implants, specific principles must be followed. These implants, featuring smooth surfaces and relying on osseo-fixation, require secure anchorage in cortical bone. Implant placement utilizes available distant bone, while definitive abutments must be positioned carefully to establish a supporting polygon, which can be achieved by adjusting the implant head. In the maxilla, this polygon forms by abutting the implant in the canine region and the most distal implant in the tuberosity area.

The introduction of zygomatic implants has revolutionized rehabilitation for complex defects, offering a time-tested, durable solution that restores both function and aesthetics.[8] However, in cases of unilateral defects, placement can be challenging due to the presence of teeth on the opposite side, which may limit angulation. Additionally, preserving healthy anterior teeth becomes a concern, as cross-arch anchorage may necessitate their removal for optimal zygoma implant placement.

For unilateral defects, some literature suggests patient-specific implants as an alternative to zygomatic implants. However, in this particular case, the need for a patient-specific implant did not arise.

A systematic review identified two studies evaluating the clinical outcomes of zygomatic implants.[9] These studies encompassed 1,031 patients and a total of 2,131 zygomatic

implants, with follow-up periods ranging from six months to 12 years. Of these, 42 implants were reported as failures, yielding an overall survival rate of 98.1%. This data highlights the reliability and predictability of the zygomatic implant technique, demonstrating favorable clinical outcomes.

Meanwhile, the pterygoid implant technique offers distinct advantages, including reduced morbidity, lower treatment costs, and shorter healing durations.[10] From a prosthetic perspective, pterygoid implants enhance dental rehabilitation by eliminating long distal cantilevers, as they emerge in the second molar region. Additionally, studies by Curi and Penarrocha have reported high patient satisfaction with prosthetic rehabilitation involving pterygoid implants.[11] In cases where the pterygoids were intact, virtual surgical planning played a crucial role in achieving better prosthetic stability when combined with zygomatic implants.

4. Conclusion

Zygomatic and pterygoid implants provide highly effective solutions for patients with severe maxillary atrophy and defects, eliminating the need for bone grafts in cases where traditional dental implants are not viable. These techniques restore both function and aesthetics, significantly enhancing the quality of life for individuals unable to wear conventional prostheses. By bypassing the need for extensive bone grafting or sinus lifts, they offer a streamlined approach to rehabilitation.

5. Source of Funding

None.

6. Conflict of Interest

The authors declare that there were no competing interests during this study.

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