

# Revolutionizing Maxillary Rehabilitation: Zygomatic Implants Addressing Severe Alveolar Atrophy

Received 05/09/2024  
Review began 05/22/2024  
Review ended 05/24/2024  
Published 05/31/2024

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Arushi Beri <sup>1,2</sup>, Sweta G. Pisulkar <sup>3</sup>, Bhushan Mundada <sup>4</sup>, Akansha Bansod <sup>1</sup>, Shruti Deshmukh <sup>1</sup>, Pooja Bhardwaj <sup>5</sup>

1. Prosthodontics, Sharad Pawar Dental College and Hospital, Wardha, IND 2. Prosthodontics, Acharya Vinoba Bhave Rural Hospital, Wardha, IND 3. Prosthodontics and Crown & Bridge, Sharad Pawar Dental College and Hospital, Wardha, IND 4. Oral and Maxillofacial Surgery, Sharad Pawar Dental College and Hospital, Wardha, IND 5. Periodontics, Rishiraj College of Dental Science, Bhopal, IND

**Corresponding author:** Arushi Beri, arushi.beri25@gmail.com

## Abstract

This case report describes the care given to a 58-year-old male patient with severe upper jaw atrophy. The treatment strategy involved utilizing zygomatic implants in conjunction with endosteal implants to rehabilitate both the maxilla and mandible. Temporary prostheses were used during the healing phase, followed by the fabrication and placement of final prostheses. The utilization of zygomatic implants offers advantages such as immediate stabilization and function without the need for extensive bone grafting. This approach not only reduces treatment time and costs but also enhances patient outcomes. Furthermore, guided surgical techniques are increasingly employed to ensure precise implant placement, optimizing prosthetic support.

**Categories:** Dentistry, Oral Medicine, Osteopathic Medicine

**Keywords:** endosteal implants, maxillary atrophy, fp 1 prosthesis, immediate temporisation, zygomatic implants

## Introduction

In typical dental implant treatments, managing severely resorbed partially or fully edentulous maxillae that are worsened by osseous resorption and maxillary sinus expansion poses significant complications. These challenges often result in prolonged treatment duration, increased morbidity, and higher costs for patients. However, the zygomatic process can now be used for quick implant stabilization and fixation with immediate function since other therapeutic options have emerged. As a result, longer-term grafting is not necessary, and the implant can be positioned in denser, more stable bone [1-4].

Zygomatic implants have emerged as a valuable solution over the past two decades for addressing severely resorbed maxillae. Initially introduced by Brånemark in 1988 and subsequently made available for clinical use, early protocols encountered complications primarily due to implant positioning. However, advancements in implant design and surgical techniques have effectively mitigated these issues [5].

In situations where numerous grafting surgeries are not practical or feasible and maxillary bone volume is insufficient, particularly in certain areas like the paranasal or lateral pyriform border, zygomatic implants offer a promising solution for immediate stabilization and functional restoration. These implants, varying in length from 30 mm to 60 mm and diameter from 3.5 mm to 4.5 mm, are designed to engage the zygoma at an angle, requiring angled corrections at their platforms to accommodate the trajectory through the maxillary sinus [6].

Classification schemes such as the Aparicio classification are necessary due to anatomical differences and help classify zygomatic implants according to where they are in relation to the sinus's lateral wall. A portion of the implants pass through the sinus, especially along the outside of the lateral wall, without being covered by bone. Their length guarantees stability in the zygoma's dense bone [7-11].

Incorporating zygomatic implants into severely resorbed maxillae can be integrated into conventional "All-on-4" procedures or expanded to quad zygoma procedures in cases where the paranasal region cannot accommodate anterior implant fixtures. Furthermore, zygomatic implants serve as a viable alternative for partially edentulous maxillae with insufficient bone volume, eliminating the need for osseous grafting and thereby reducing treatment time and complexity [12-16].

## Case Presentation

The article describes a case that records the recovery process for a 58-year-old male patient suffering from significant maxillary atrophy. The patient presented to the department with the complaint of having trouble

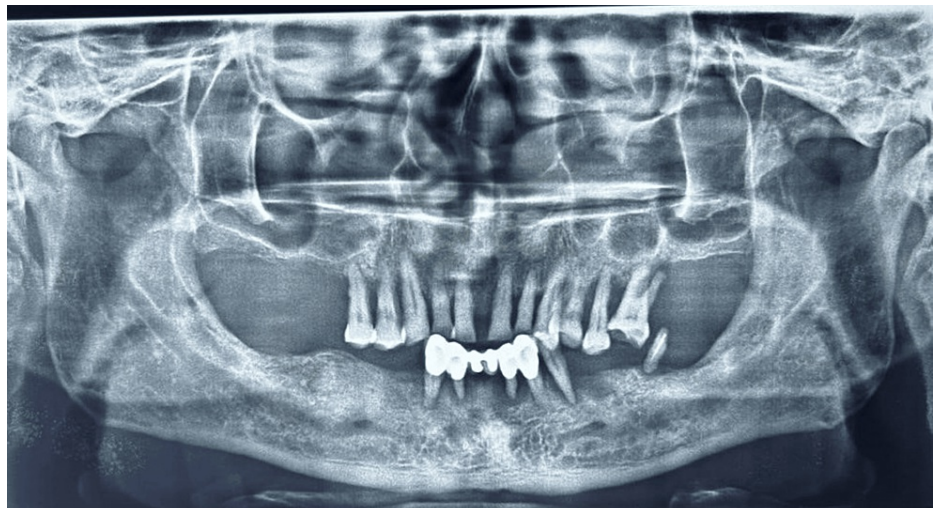
### How to cite this article

Beri A, Pisulkar S G, Mundada B, et al. (May 31, 2024) Revolutionizing Maxillary Rehabilitation: Zygomatic Implants Addressing Severe Alveolar Atrophy. Cureus 16(5): e61430. DOI 10.7759/cureus.61430

speaking and mastication for eight years due to numerous missing, carious, and movable teeth in his mandibular and maxillary arches. The aesthetic appearance of a dental restoration was significantly compromised, resulting in a reduction in the patient's confidence level. Upon intraoral examination, it was noted that teeth 15 through 26 in the maxillary arch exhibited grade 2 mobility, while teeth 33 through 43 in the mandibular arch displayed a fixed prosthesis with grade 3 mobility, with teeth 34 and 37 root pieces also showing mobility (Figure 1). Radiographic evaluation revealed crown root ratio throughout the dentition and severe atrophy in the maxillary posterior region (Figure 2).



**FIGURE 1: Pre-operative intraoral examination**

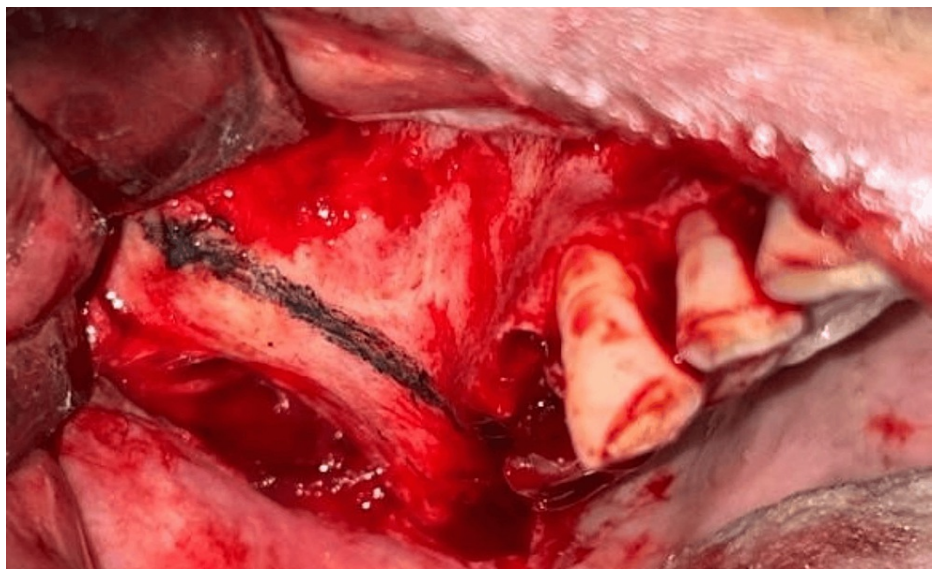


**FIGURE 2: Pre-operative radiographic evaluation**

Various diagnostic procedures, including blood tests (BT, CT RBS, HbA1C, hb%), and blood pressure evaluation, were conducted during the pre-surgical phase. Following consultation with a physician, the patient was scheduled for implant placement under local anesthesia. During the surgical phase, meticulous aseptic precautions were observed. Extraoral markings were made to guide the zygomatic bone approach (Figure 3), while intraoral markings were used for flap reflection, allowing for a direct approach to the zygomatic bone and for osteotomy preparation (Figure 4). Sequential drilling was performed to create osteotomy sites for implant placement. This included the placement of zygomatic implants sized 4.2 x 60 mm in the 15 regions and 4.2 x 62 mm in the 25 regions, as well as two endosteal implants sized 4.5 x 13 mm in the maxillary anterior region and similarly sized endosteal implants in the mandibular anterior and posterior regions. Hemostasis was achieved, sutures were applied, and post-operative medications were administered. The patient was monitored at intervals of 3, 6, 8, and 12 hours post-surgery, and radiographs were taken in order to ensure the proper position of implants as shown in Figures 5-6. Delayed loading was done.

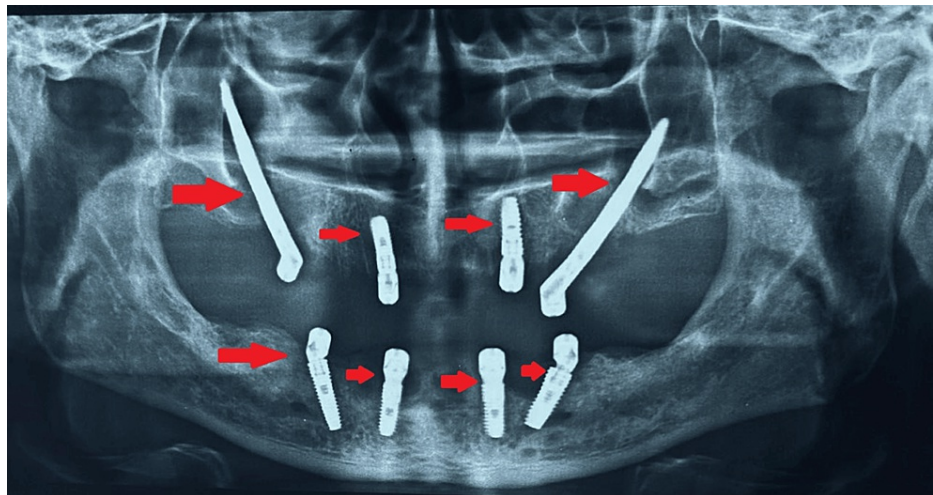


**FIGURE 3: Extraoral markings for placement of zygomatic implants**



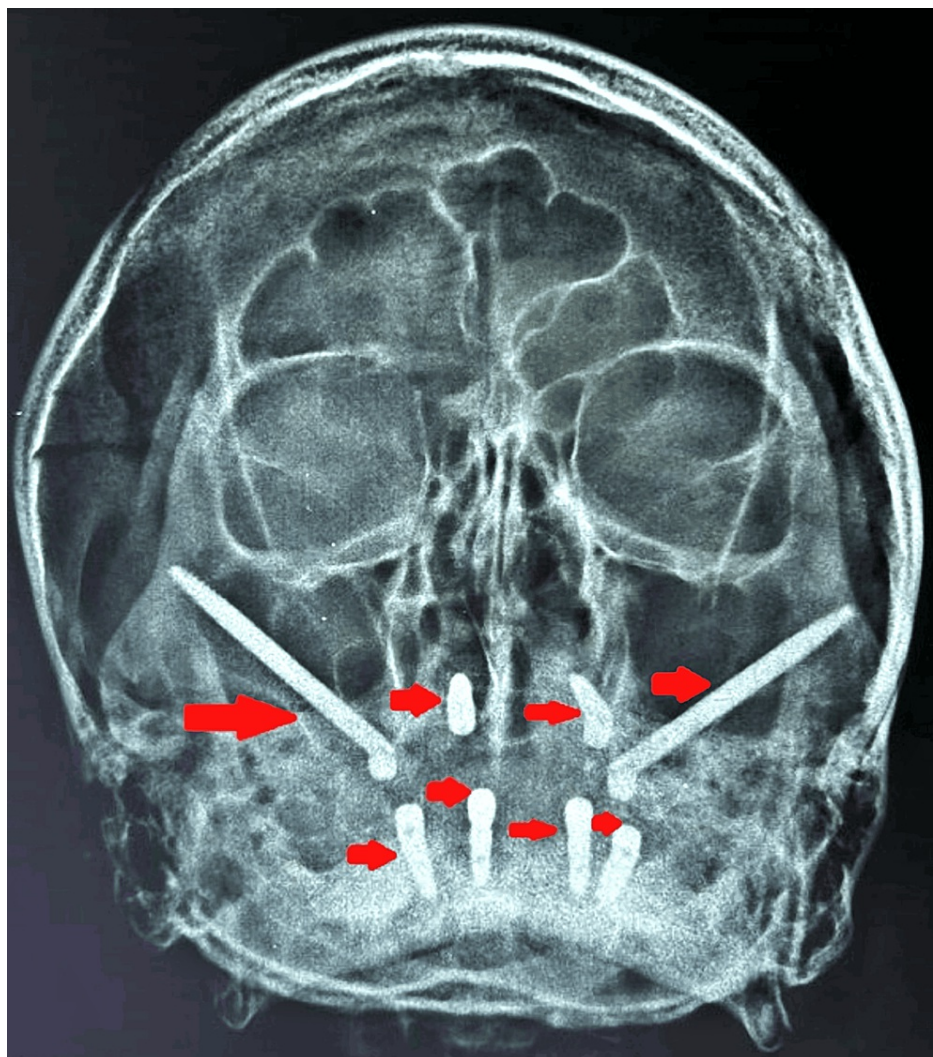
**FIGURE 4: Intraoral marking for osteotomy preparation**





**FIGURE 5: Post-implant placement radiograph**

Arrows are indicative of implant position.



**FIGURE 6: Waters view projection showing implant position**

Arrows are indicative of implant position

The completely healed mucosa is shown in Figure 7. Three months after implant placement, the patient underwent a recall visit for open tray impression making. This involved joining impression copings with pattern resin and utilizing light body putty impression material as shown in Figure 8. A fabrication jig was then created, followed by a jig trial and jaw relation assessment, and then a facebow record was made and transferred to a Hanau wide-view articulator (Whip Mix Corp., Louisville, KY) again to accommodate post-surgical changes in the vertical dimension as shown in Figure 9. Wax try-in was performed to assess occlusal interferences, followed by the designing of a metal framework digitally using exocad (exocad GmbH, Darmstadt, Germany) as shown in Figure 10, and fabrication of a metal framework using direct metal laser sintering (DMLS) technology (Figure 11). The metal framework was layered with porcelain of appropriate shade, and a bisque trial was conducted before the final finishing and polishing of the prosthesis. Final prosthesis insertion was performed (Figure 12), with subsequent follow-up visits scheduled after one week, three months, and six months. A comparison of the pre- and post-operative images is shown in Figure 13.

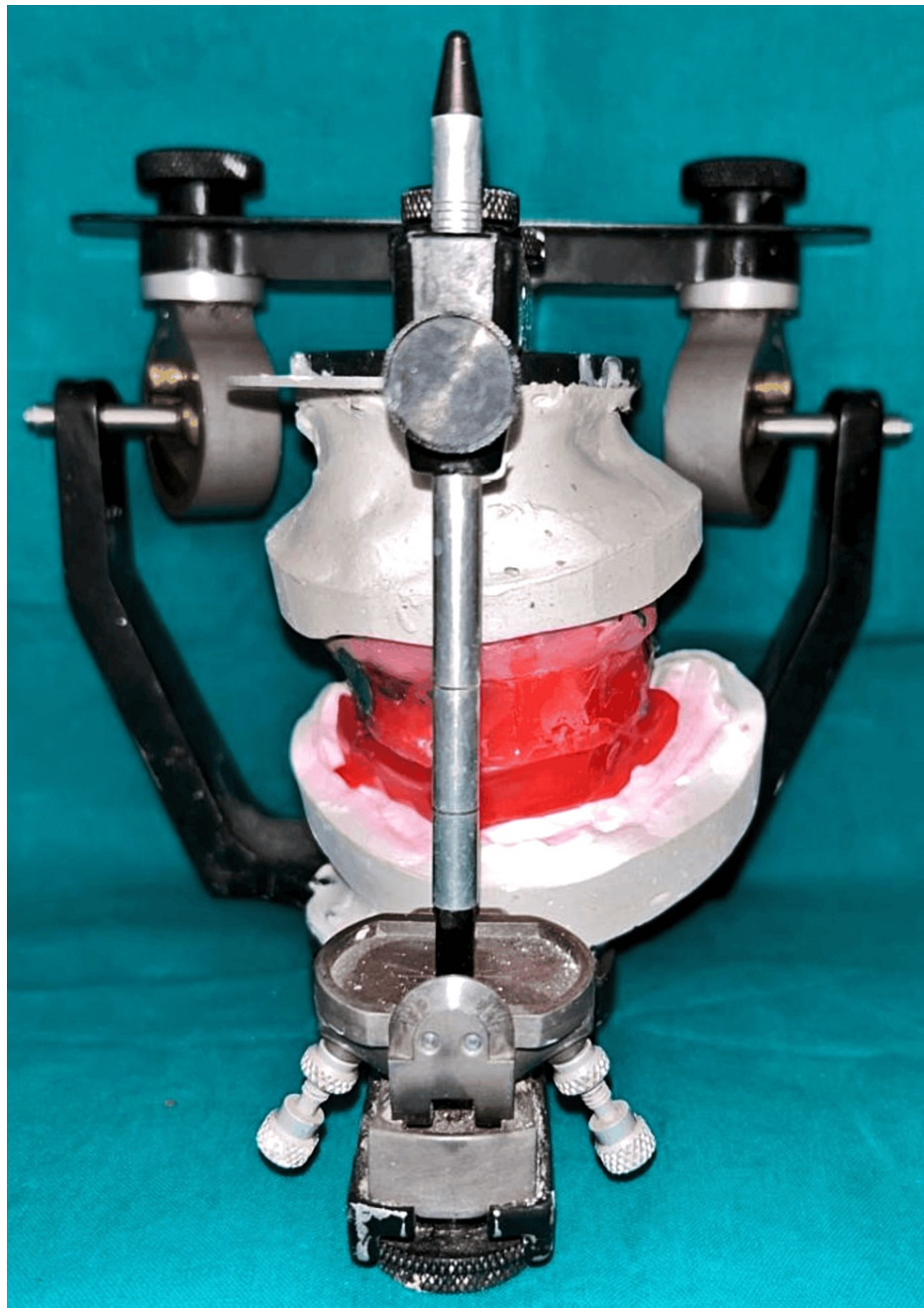


**FIGURE 7: Completely healed mucosa with healing caps seen in the maxillary and mandibular arches respectively**

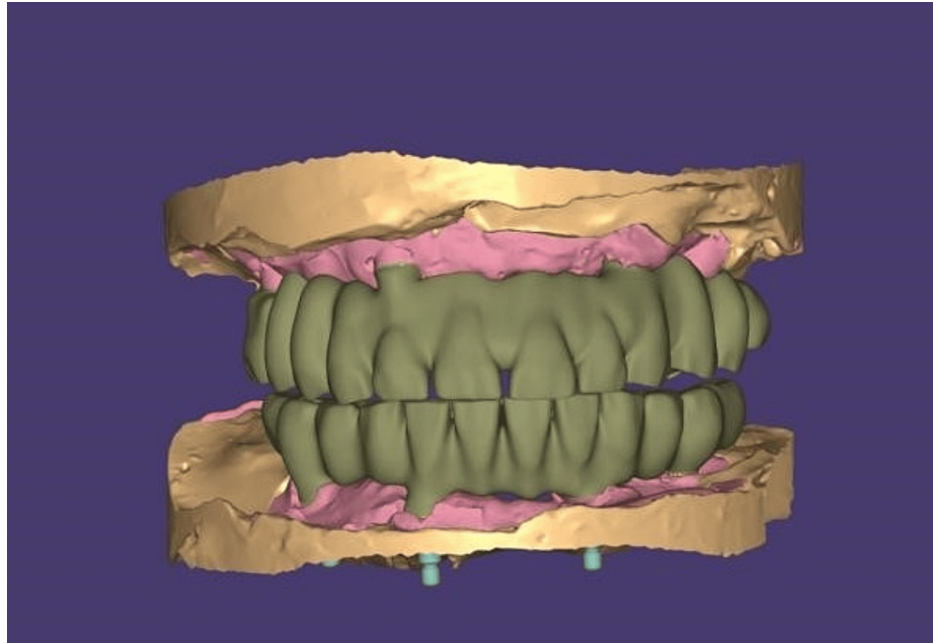


**FIGURE 8: Open-tray impressions of the maxillary and mandibular arches made with putty and light body**





**FIGURE 9: Facebow transfer on Hanau wide-vue articulator**



**FIGURE 10: Designing of metal framework digitally using exocad software**



**FIGURE 11: Metal framework try-in**



**FIGURE 12: Final prosthesis post cementation**



**FIGURE 13: Comparison of pre- (L) and post-operative (R) photographs**

## Discussion

In the posterior maxilla, bone loss, increased expansion of the maxillary sinus, and decreased bone quality frequently make conventional implant placement difficult; it also needs significant osseous grafting. To increase bone volume for supporting conventional implants, a number of bone augmentation procedures have been described, including onlay grafting and sinus augmentation using lateral and crestal methods. However, these approaches may extend treatment duration and escalate associated costs. To address these challenges, alternative strategies to grafting procedures in the atrophic maxilla have been explored [17,18].

Zygomatic implants offer a potential treatment for individuals with severely resorbed totally or partially edentulous maxillary arches. They have been used in clinical therapy for the past 20 years. However, there are hazards associated with using zygomatic implants, and their insertion requires surgical competence. In the literature, sinusitis is the most often documented complication, with an incidence as high as 26.6%. Severe sinusitis difficulties are not usually linked to zygomatic implant placement, yet sinus issues may be predicted given that part of the implant passes into the maxillary sinus. Postoperative hemorrhage, vestibular cortical fenestration, oroantral fistula formation, and transient sensory nerve impairment are



other possible problems [19–22].

Individuals who have prominent buccal concavities on the lateral aspect of the maxillary sinus may be more susceptible to problems, particularly if they undergo non-guided surgery. This technique is clinically challenging due to the anatomical complexity of the structures and the complexities of the zygoma [23–25]. On the other hand, new developments in technology, like virtual implant planning, cone beam computed tomography (CBCT), and computer-aided design/computer-aided manufacture (CAD/CAM) surgical guide fabrication, have the potential to lower problems and increase placement accuracy.

Numerous studies have indicated good success rates with zygomatic implants, despite some problems. Positive long-term results have been obtained, with cumulative success rates between 97% and 100%. Following a 36-month follow-up, a systematic evaluation of research published between 2000 and 2012 found a 97.86% survival rate. The American College of Prosthodontists recognizes the adaptability of zygomatic implants in a range of therapeutic contexts, emphasizing their contribution to improving patients' quality of life and offering effective and dependable treatment alternatives [25–31].

## Conclusions

In conclusion, zygomatic implants emerge as a promising alternative in the management of severely atrophic fully or partially edentulous maxillae, offering a valuable option alongside traditional osseous grafting for implant placement. Their comparable success rates and survival outcomes to conventional implants hint at the potential to streamline treatment protocols, thereby reducing both the time and financial burdens associated with complex grafting procedures. With advancing technologies like cone beam computed tomography (CBCT), virtual planning, and surgical guides, the utilization of zygomatic implants is poised to grow, promising a future marked by fewer complications and enhanced patient care. This research underscores the importance of integrating innovative solutions in dental practice to improve patient outcomes and optimize clinical workflows.

## Additional Information

### Author Contributions

All authors have reviewed the final version to be published and agreed to be accountable for all aspects of the work.

**Concept and design:** Arushi Beri, Sweta G. Pisulkar, Akansha Bansod, Shruti Deshmukh, Pooja Bhardwaj, Bhushan Mundada

**Acquisition, analysis, or interpretation of data:** Arushi Beri, Sweta G. Pisulkar, Akansha Bansod, Shruti Deshmukh, Pooja Bhardwaj, Bhushan Mundada

**Drafting of the manuscript:** Arushi Beri, Sweta G. Pisulkar, Akansha Bansod, Shruti Deshmukh, Pooja Bhardwaj, Bhushan Mundada

**Critical review of the manuscript for important intellectual content:** Arushi Beri, Sweta G. Pisulkar, Akansha Bansod, Shruti Deshmukh, Pooja Bhardwaj, Bhushan Mundada

**Supervision:** Arushi Beri, Sweta G. Pisulkar, Akansha Bansod, Shruti Deshmukh

### Disclosures

**Human subjects:** Consent was obtained or waived by all participants in this study. **Conflicts of interest:** In compliance with the ICMJE uniform disclosure form, all authors declare the following: **Payment/services info:** All authors have declared that no financial support was received from any organization for the submitted work. **Financial relationships:** All authors have declared that they have no financial relationships at present or within the previous three years with any organizations that might have an interest in the submitted work. **Other relationships:** All authors have declared that there are no other relationships or activities that could appear to have influenced the submitted work.

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