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**RESEARCH ARTICLE**

**REHABILITATION OF SURGICALLY RESECTED MAXILLA USING ZYGOMATIC IMPLANTS AND HYBRID PROSTHESIS**

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**ABSTRACT**

Zygomatic implants have been used since the late 1980s to restore atrophic maxillae with great success. It has proved to be a conservative alternative to extensive autogenous bone grafting, distraction osteogenesis and LeFort 1 osteotomy. A 23-year-old female patient reported with a severe maxillary defect extending from the second premolar region up to the central incisor on the opposite side. Two zygomatic implants (Branemark System ZygomaTiUnite Implants; Nobel Biocare AB) were placed in the right zygomatic bone and a root form dental implant (Ankylos, Dentsply Implants, Germany) was placed following extraction of the left maxillary lateral incisor. After 6 months of undisturbed healing a hybrid screw retained bar along with individual cement retained crowns was fabricated. Although the treatment planning was complex the final prosthetic outcome was successful.

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**INTRODUCTION**

Various factors are responsible for the atrophy observed in the maxilla including ablative cancer surgery, trauma and genetic disorders. The main aim of rehabilitation is not only to restore esthetics but also function and speech. Over the last few decades, various techniques have been developed to increase the bone volume which include onlay bone grafting, maxillary sinus augmentation procedures and LeFort1 osteotomy with interpositional bone grafts <sup>1</sup>.

These procedures have higher risk of complications, extensive and multiple surgeries, higher morbidity of the graft and longer treatment duration. To overcome these limitations an alternative method of using zygomatic implants to rehabilitate such patients is a preferred treatment modality. The zygomatic implant was first created and used by Professor P.I. Branemark in the late 1980s. A combination of both zygomatic implants and conventional implants can also be used to restore the edentulous span <sup>2,3,4</sup>. Great care should be taken while performing the procedure as the drill path is close to anatomical landmarks like the maxillary sinus and the orbit <sup>5,6</sup>. This case discusses about the surgical and prosthetic management using zygomatic implants.

**MATERIALS AND METHOD**

A 23-year-old female patient reported with missing teeth from the central incisor on the left side to the premolar tooth on the right side of the maxillary arch. On further investigation it was noted that a tumor resection had been carried out in that region one year ago. Oral and radiographic examination revealed that the entire premaxilla region had been excised up to the nasal floor anteriorly and extending up to the medial wall of the maxillary sinus. The patient had no systemic conditions. The patient had been wearing a removable prosthesis temporarily but desired a fixed dental prosthesis.

**Treatment Planning**

Patients diagnostic models were made and mounted to check for inter arch space. A cone beam computed tomography (CBCT) scan was performed. The zygomatic bone of the right side was assessed to decide the position and length of the implants to be used (Fig 1). Two zygomatic implants were planned to be placed in the right zygomatic bone and it was decided to extract the left maxillary lateral incisor and immediately place a conventional root form implant in that region.

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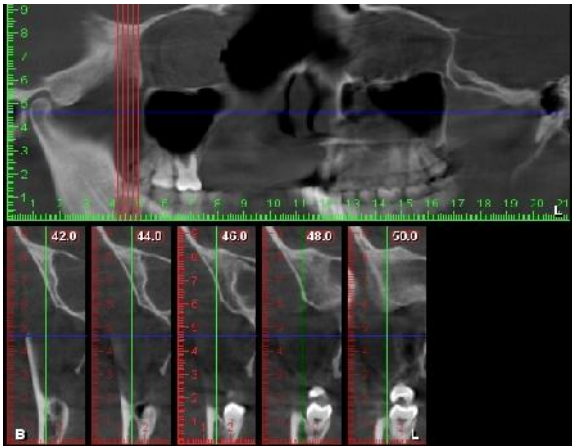


Fig 1

### **Surgical Procedure**

Under nasotracheal intubation general anesthesia was administered, and 2% lignocaine with adrenaline was infiltrated into the right and left buccal vestibule. A crestal incision was made and a mucoperiosteal flap was raised along the lateral wall of the maxillary sinus up to the zygomatic buttress (Fig 2).



Fig 2

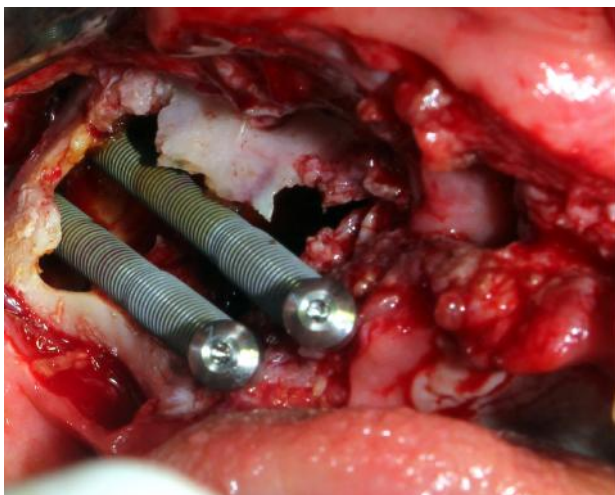


Fig 3

A peizotome was used to create a small window in the lateral wall of the maxillary sinus to better visualize the osteotomy preparation. A sterilized pencil was used to mark the path of the osteotomy along the lateral wall of the maxillary sinus up to the zygomatic buttress. A 2.9mm round bur was used to prepare initial punch cuts within the zygomatic buttress. The final osteotomy position was decided. Sequential osteotomy

was done with 2.9 mm cylindrical bur and 3.5 mm pilot drill for both the anterior and posterior zygomatic implant site. Paralleling pins were placed to verify the parallelism between the two implants. The posterior implant 40 mm (Branemark System ZygomaTiUnite Implants; Nobel Biocare AB) was placed emerging near the second and first premolar region. The anterior implant 42.5 mm (Branemark System ZygomaTiUnite Implants; Nobel Biocare AB) was placed emerging near the first premolar and canine region (Fig 3). The maxillary right lateral incisor was atraumatically extracted and sequential osteotomy was carried out. Following this a 3.5 x 14 mm Ankylos (Dentsply Implants, Germany) was placed along with an healing abutment. The flaps were approximated and sutured using resorbable 3-0 vicryl (Fig 4).



Fig 4

### **Restorative Procedure**

During the osseointegration phase a long span resin bonded, metal reinforced, temporary was given. After six months of undisturbed healing second stage surgery was performed and healing abutment were placed. Fourteen days of soft tissue healing was allowed following which open tray impression post were placed and an open tray impression was made using polyvinyl siloxane (Aquasil Ultra Monophase, Dentsply, Germany) (Fig 5).



Fig 5

Angulated multi-unit abutments (Branemark System Zygoma Multiunit abutments RP; Nobel Biocare AB) were connected to the analogues representing the zygomatic implants and a straight Ankylos balanced based abutment (Dentsply Implants, Germany) was screwed onto the analogue. Facebow transfer and maxillomandibular relation records were made with a record base with an occlusal wax rim, and the definitive maxillary cast was mounted opposing the diagnostic mandibular cast in a semi-adjustable articulator. The maxillary bar was designed digitally following a set up done on the

articulator. The bar was milled using Co-Cr alloy and CAD/CAM technology (Fig 6).



Fig 6

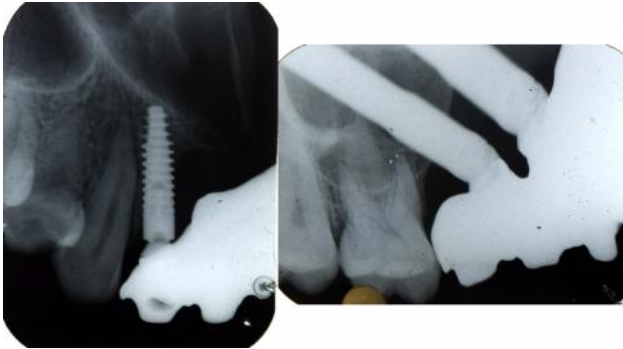


Fig 7

The passive fit of the milled bar was checked clinically and radiographically (Fig 7). Compatible veneering gingival composite was then applied on the milled bar and an opaquer was applied on the copings to mask the metal (Fig 8). Following this individualized Polymethylmethacrylate (PMMA) CAD/CAM crowns were fabricated. The metal bar was screw retained to the implant abutments and the individual PMMA crowns were cemented onto the framework (Fig 9,10,11). Patient was given instructions regarding oral hygiene measures and was followed-up at regular intervals of 15 days, 1 month, 3 months, and 6 months. the patient's satisfaction with the esthetic result was excellent.



Fig 8



Fig 9



Fig10



Fig 11

## DISCUSSION

Zygomatic implants in atrophic maxilla provide successful results <sup>7,8,9</sup> and a 97% to 100% implant survival rate. When zygomatic implants are connected to anterior conventional implants the restoration should be connected to the implants using a rigid bar. Rigid cross-arch stabilization is the key to the success of this system. The main advantages of using zygomatic implants include the elimination of sinus grafting procedures and the morbidity associated with harvesting autogenous bone. The major drawbacks on the other hand is the need for deep sedation and general anesthesia for placement, close proximity of vital structures like the orbit and the lack of stability if one of the zygomatic implant fails. The extraction of the maxillary left lateral incisor was carried out due to the lack of bone in the premaxilla region up to the nasal floor. CAD/CAM technology used to mill the bar framework reduces the laboratory time and complexity. If an individual PMMA crown fails due to chipping, it can be easily removed and a new crown can be fabricated without replacing the entire prosthesis. If there is a failure of the veneered gingival composite, it can be repaired intraorally <sup>10</sup>. One of the major drawbacks of a screw retained fixed implant supported prosthesis with cemented single crowns is retrievability. PMMA crowns were decided for this patient in comparison to porcelain fused to metal or zirconia crowns, so that lesser occlusal forces are transmitted to the implant fixture. The soft tissue surrounding the zygomatic implants is generally inflamed and requires regular maintenance as there is almost no keratinized tissue surrounding it.

## CONCLUSION

One of the most conservative and reliable treatment options in the posterior maxilla after tumor resection is zygomatic implants. In this particular case the treatment modality aided the patient to get a fixed implant prosthesis in the shortest duration of time, without any extensive surgical procedures. High level of surgical skill and knowledge is required for the placement of zygomatic implants. The combined use of zygomatic implants along with conventional implants can be considered as a viable treatment option. However, studies with more follow-up time and controlled clinical trials should be carried out in order to verify the long-term effectiveness of this technique.

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