# Zygomatic implant-supported prosthetic rehabilitation of a patient with Brown *et al*. Class II c maxillary defect: A clinical report

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**Abstract**

The genesis of acquired maxillary defects poses a significant challenge when it comes to rehabilitating a patient prosthetically. These defects lead to functional and esthetic impairment, affecting the quality of life of an individual. This clinical report describes a satisfactory zygomatic implant-supported overdenture rehabilitation of a patient who underwent subtotal bilateral maxillectomy after an industrial accident. The result shows zygomatic implant-supported overdenture as a viable, predictable, and economical treatment option for a patient with an extensive maxillary defect.

**Keywords:** Attachments, maxillary defect, overdenture, zygomatic implant

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**Submitted:** 21-Jun-2021, **Revised:** 28-Sep-2021, **Accepted:** 27-Nov-2021, **Published:** 27-Jan-2022

## INTRODUCTION

After pathological ablation, chemical debridement, trauma, or failed reconstructions, a maxillary defect presents a significant challenge in reconstruction and prosthetic rehabilitation. Maxillectomy performed to excise the necrosed maxillary tissue leads to mastication, swallowing, speech, and esthetics problems.[1] The reconstructive or rehabilitation-based Brown and Shaw classification of maxillary defects divides the defect into vertical and horizontal components. The vertical component (I-IV) denotes the extent of unilateral defect, whereas the horizontal component (a-d) qualifies the extent of palate and alveolus involvement.[2] Several surgical reconstruction options, such as crestal onlay grafts, modifications of osteotomies with grafting, inlay grafting, and microsurgical revascularized flap, have been employed to reconstruct the maxillary defects. However, the surgical procedures are considered invasive; the results can be unpredictable and incomplete in rehabilitation.[1,3] In scenarios where reconstruction is not possible, prosthetic rehabilitation is the only way out.

In recent years, reconstruction with a combination of soft-tissue flaps and alloplastic implants, distraction osteogenesis, tissue engineering,[4] and rehabilitation with conventional obturators, two-piece obturators,[5] or implant-supported obturators[6] have been employed for the significant maxillary defects.

The prosthetic rehabilitation with zygomatic implants, introduced by Branemark System in 1988, presents

| Access this article online | |
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| Quick Response Code: | Website: www.j-ips.org |
| | DOI: 10.4103/jips.jips_313_21 |



**How to cite this article:** Gandhi N, Gandhi S, Talwar H, Dhawan K. Zygomatic implant-supported prosthetic rehabilitation of a patient with Brown *et al*. Class II c maxillary defect: A clinical report. J Indian Prosthodont Soc 2022;22:92-6.

a more straightforward approach in such complex situations. Zygomatic implants have been indicated in patients with atrophy of the maxilla, maxillary resection, complications after grafting procedures, congenital or acquired maxillary defects, and infeasibility to place conventional endosteal implants.[1,7,8] The length of available zygomatic implants varies from 30 to 52.5 mm and is either straight or angulated with an external hex connection. Zygomatic implant passes through the three or four layers of cortical bone providing stability and sufficient length for implant placement.[9] This clinical report demonstrates a satisfactory rehabilitation of a patient with Brown *et al*. Class II c maxillary defect with a zygomatic implant-supported overdenture.

## CASE REPORT

A 32-year-old male patient was referred from the department of oral and maxillofacial surgery for the rehabilitation of a large maxillary defect after maxillectomy. The patient gave a history of an industrial accident that had led to the deposits of molten plastic in the oral cavity. The biopsy report confirmed avascular necrosis and osteomyelitis of the maxilla, for which, the patient underwent debridement of the necrosed maxillary tissue. The maxillary resection left a large bilateral maxillary defect and communication between the sinuses, nasal, and oral cavity.

Extraoral examination revealed severe loss of upper lip support, poor facial esthetics, nasal twang, and speech impairment. Intraoral examination showed bilateral loss of palate, maxillary alveolus, maxillary teeth, oro-antral, and oro-nasal communication [Figure 1].

The entity of the defect, the uncertain outcome of surgical reconstruction, and the economic constraints of the patient were taken into consideration. After a thorough clinical examination and cone-beam computed tomography (CBCT) evaluation, prosthetic rehabilitation with zygomatic implant-supported overdenture was proposed. The Blue-Sky Bio Software (Blue Sky Software, United States) was used to plan the implant's tentative angulation, diameter, and length. A free-hand surgical procedure was planned because of lack of supporting structure to stabilize a surgical template [Figure 2]. A vestibular incision was given to expose the body of zygoma and osteotomies were prepared on both zygomas. A bilateral Quad-zygoma-implant configuration was modified to the placement of zygomatic implants 45 degrees (32.5 mm × 4 mm) (Branemark System Zygoma, Noble BioCare, Switzerland), 2 on the right and 1 on the left side due to the lack of insufficient malar bone and torque achieved on the left side.

Multiunit abutments (Nobel Zygoma, Noble BioCare, Switzerland) were connected to the implants after 3 months. An open tray definitive impression with polyvinylsiloxane impression material (GC-Flexceed®, GC, India) was made and poured in Type IV gypsum (Kalabhai Kalstone, Kalabhai Karson, India) [Figure 3 left and right]. A circular anteroposterior bar was planned to splint all the implants together for the distribution of load cross-arch stabilization of the prosthesis along with burn out Preci-clix plastic 2.25 mm male PA attachments (CEKA Preci-Line, Belgium) to aid in the retention. To verify the design, a mock-up pattern resin framework with attachments was tried intraorally [Figure 4a]. The verified assembly was cast into a rigid metallic framework and checked intraorally as well as radiographically [Figure 4b left and right]. The wax occlusal rims were fabricated on the record bases for the interocclusal record, teeth arrangement, and trial were done to verify function [Figure 5], esthetic, and phonetics. The standard

**Figure 1:** Intraoral examination

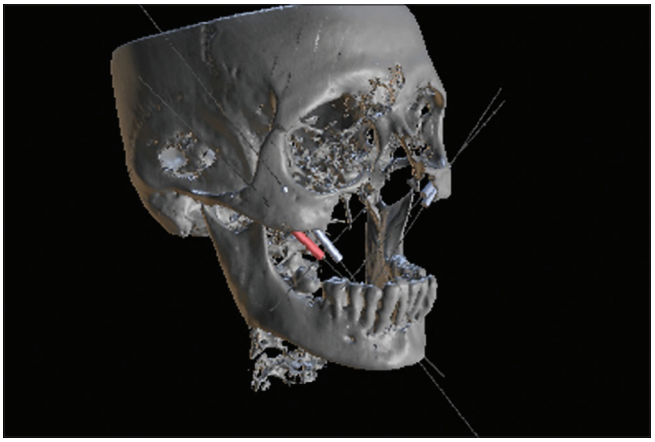

**Figure 2:** Treatment planning with Blue Sky Bio Software

protocol for maxillary complete denture fabrication was followed and acrylized with embedded CEKA Preci-clix female attachments, (CEKA Preci-Line, Belgium) on the denture intaglio surface [Figure 6a]. The finished and polished maxillary overdenture was inserted [Figure 6b]. The prostheses demonstrated optimal retention and stability during speech and mastication. The patient's response was satisfactory concerning speech, swallowing, mastication, and esthetics [Figures 7 and 8]. Postinsertion instructions were given, emphasizing insertion, removal, and hygiene of the prosthesis.

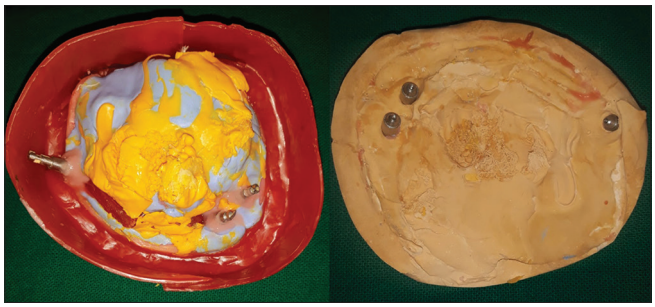

**Figure 3:** Definitive impression and master cast

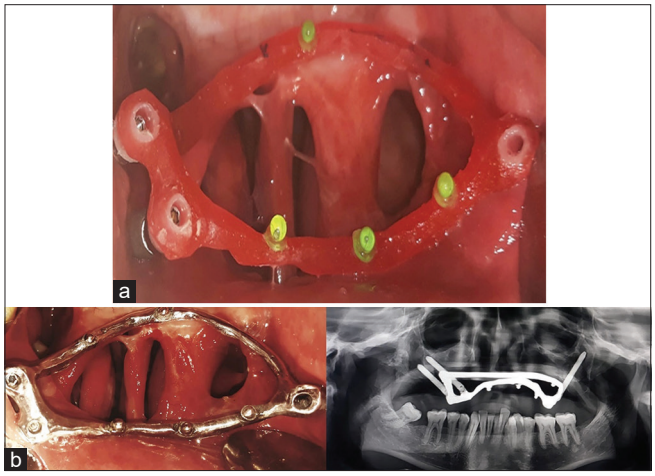


**Figure 4:** (a) Mock-up framework with PRESICLIX male attachments (b) Cast metallic framework with attachments (intraoral and radiograph)

**Figure 5:** Intraoral trial of prosthesis after teeth arrangement

## DISCUSSION

The acquired maxillary defect, unlike congenital defects, leads to abrupt physiological and cosmetic changes. The quantity of tissue resected leads to functional, emotional, and social impacts on the patient. Various reconstruction and prosthetic rehabilitation options are available with their own set of merits and demerits.

Surgical reconstruction is often associated with postoperative morbidity, multiple revision surgeries, and unpredictable outcomes[1,9] and still warrants the removable prosthesis to restore the dentition and function.

The rehabilitation of Brown and Shaw[2] maxillary defects with the vertical component (II-IV) and the horizontal component (b-d) limits the feasibility of the conventional approach with obturator prosthesis, mainly due to the lack of supporting structures. The limitations of surgical reconstruction and impracticality of rehabilitation with conventional obturator designs, the plan to rehabilitate the patient with Brown *et al.* Class II c was paved with zygomatic implant-supported overdenture.

Zygomatic implants, introduced by Branemark, are indicated in patients with the atrophic maxilla, congenital defects, who have undergone maxillary resection, and bone grafting procedures are not feasible. The two main design configurations[7] for the use of zygomatic implants are (1) two zygomatic implants, one on each side bilaterally with two or more endosteal implants in the anterior maxilla and (2) "Quad approach" advocates two zygomatic implants on each side bilaterally in the posterior maxilla.[3] The clinical scenario in discussion presented a lack of anterior axillary bone, and therefore, the "Quad approach" configuration was planned. The CBCT evaluated showed insufficient zygomatic bone on the left side for the placement of two implants. Hence, the approach was modified by placing a single zygomatic implant on the left and two zygomatic implants on the right side.

The implants were splinted together to distribute the load and prevent overload of a single zygomatic implant on the left side.[1] The vast extension of the palatal defect limits the use of a single cross arch bar, and therefore, an anterior circular bar was milled to achieve the stability of the planned prosthesis.

The attachment systems available aid in the retention of the prosthesis. CEKA Preci Clix[10] is a stud type attachment system with a small head male attachment (2.25 mm Φ). Unlike Hader bar and clips, this attachment system requires

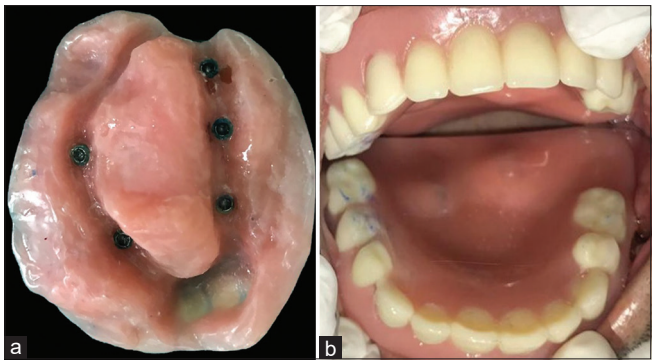

**Figure 6:** (a) Intaglio surface of overdenture with embedded female attachments (b) palatal view

**Figure 7:** Frontal view (after prosthesis insertion)

**Figure 8:** Profile view (before and after prosthesis insertion)

only 4 mm of the vertical space. The small head size and limited vertical space requirements allowed the sufficient bulk for the planned overdenture prosthesis and limited the risk of fracture of acrylic material. In addition, the female attachment allows better retention (yellow 2.5 lbs) and engages all around the male, thus increasing the area of retention. The sectional cuts provided in the female attachment allow greater flexibility and compensated for nonparallel male attachments on zygomatic implants. However, the female attachments are subjected to wear and may require replacement in future. The casting of the entire assembly with male attachments ensured rigidity, enhanced retention and was economical to the patient.

Opting for a zygomatic implant-supported overdenture with customized framework design makes hygiene maintenance and access much easier for the patient. Therefore, this approach represents a promising and adaptable treatment option to rehabilitate the large maxillary defects.[1,3]

## SUMMARY

The presented treatment demonstrates an interdisciplinary approach for a maxillectomy patient. Zygomatic implants constitute a practicable and predictable approach for supporting a removable prosthesis in patients with the resected maxilla. This option is proven to be a better alternative to osseo-cutaneous flap surgery with endosseous implant-supported obturator in terms of retention, support, function, and esthetics. Thus, zygomatic implant-supported overdenture renders an efficient and economical approach in patients with large or subtotal maxillectomy defects.

### Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his consent for his images and other clinical information to be reported in the journal. The patient understands that his name and initials will not be published and due efforts will be made to conceal identity, but anonymity cannot be guaranteed.

### Financial support and sponsorship

Nil.

### Conflicts of interest

There are no conflicts of interest.

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