

Minimally invasive solution

Angled abutment in three-unit fixed prostheses

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Ceramic implants, particularly those made of zirconia, are increasingly recognised as a viable alternative to conventional metal implants due to their excellent mechanical properties, biocompatibility, and aesthetic advantages.

This case report presents the rehabilitation of an edentulous posterior maxillary area using two two-piece zirconia implants supported by a three-unit fixed prosthesis, with a 17° angled abutment on the distal implant to avoid sinus grafting. The patient underwent atraumatic extractions and implant placement, followed by immediate provisional restoration. After four months, a definitive prosthesis was fabricated, and at the 24-month follow-up, clinical and radiographic evaluations showed healthy peri-implant tissues, stable bone levels, and no signs of peri-implant bone loss. This case demonstrates the successful use of zirconia implants and

angled abutments in posterior maxillary rehabilitation, highlighting the potential for less invasive treatment options with careful planning and execution.

Introduction

Ceramic implants have become increasingly recognised as a strong alternative to conventional metal implants, particularly in the areas of dental and orthopaedic surgery. Among these materials, zirconia (ZrO_2), and more specifically yttria-stabilised tetragonal polycrystalline zirconia (Y-TZP), is widely used due to its excellent mechanical reliability, high degree of biocompat-

ibility, and favourable integration with bone tissue.¹ Its natural white appearance also improves aesthetic results, making it especially advantageous for use in visible areas such as the anterior region of the mouth.²

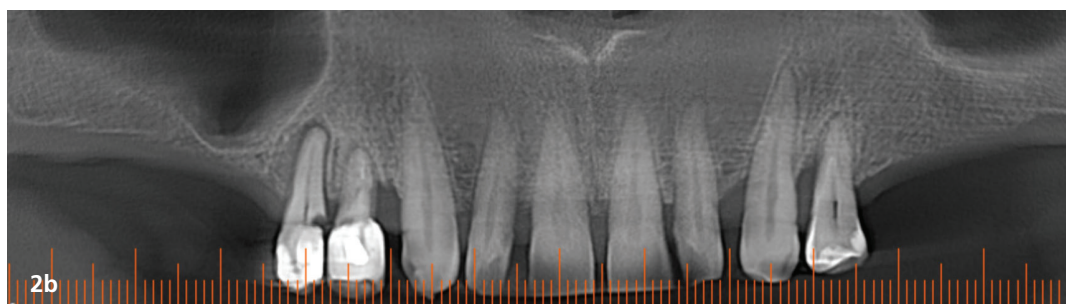
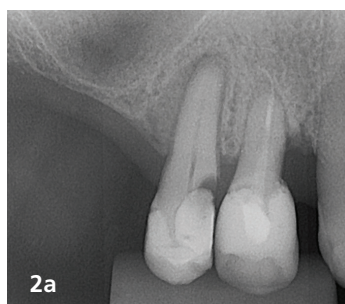
Numerous clinical investigations have confirmed that zirconia dental implants achieve high success rates—ranging from 84.4 to 100%—in observation periods of up to five years, depending on the material formulation and case selection.^{3,4} These performance levels are comparable to those of titanium implants, positioning zirconia as a reliable and effective alternative.

In addition to its structural integrity and aesthetic benefits, zirconia offers several biological advantages. It has low thermal conductivity, minimising discomfort related to temperature fluctuations, and excellent resistance to corrosion and plaque accumulation.^{5,6} These characteristics contribute to the stability and long-term health of the peri-implant tissue. Furthermore, its compatibility with soft and hard tissues provides a favourable healing response and makes it a suitable option for patients who prefer metal-free implant solutions.⁷

Given these characteristics, ceramic implants represent a highly attractive solution in contemporary implant dentistry. This case report aims to demonstrate the



Fig. 1: Initial situation.



Figs. 2a+b: Imaging exam (computerised tomography)—extensive root resorption in the upper left central incisor and the left lateral incisor.

clinical and radiographic behaviour of a patient who received two two-piece ceramic implants to support a three-unit fixed prosthesis using a 17-degree angled abutment, after 24 months of follow-up.

Case report

A 55-year-old male presented with complaints of mobility and pain while chewing in the upper right premolar area.

Clinical examination revealed advanced mobility and decay in the affected teeth (Fig. 1). The patient reported no systemic conditions, did not smoke, and was not on any medication. Radiographs revealed significant vertical and horizontal bone loss surrounding the compromised premolars (Figs. 2a+b).

After reviewing all treatment options, the patient chose the extraction of the affected teeth followed by the placement of two ceramic implants to support a three-unit fixed prosthesis. To avoid sinus grafting, it was decided to use a 17° angled abutment on the distal implant to facilitate a more favourable emergence profile toward the occlusal surface of the first molar. This approach was determined in collaboration with the clinician, considering the patient's age and aesthetic expectations.

Surgical procedure

Surgery was performed by an implantologist with over 20 years of experience using a conventional approach to ensure precise three-dimensional implant positioning.

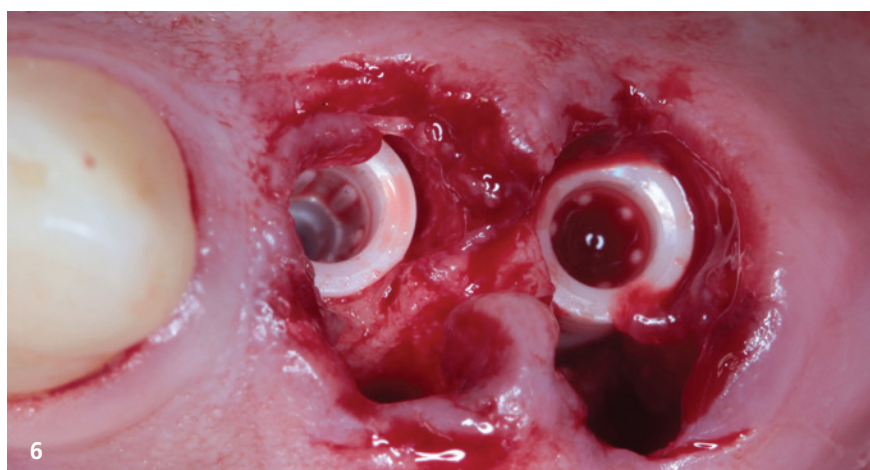


Fig. 3: Forceps and teeth extracted. – **Fig. 4:** Fresh sockets after an extraction with the screw former. – **Figs. 5a+b:** Two two-piece ceramic implants (Neodent Zi), placed at 24 rpm and 35 Ncm torque. – **Fig. 6:** Occlusal view of final positions.

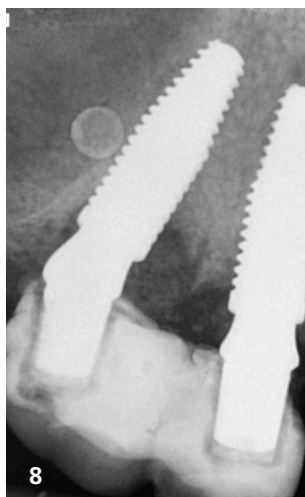


Fig. 7: Immediate postoperative with provisional crowns and sutures. – **Fig. 8:** Immediate postoperative X-ray. – **Fig. 9:** Four months later, without the temporary crowns and peri-implant health in both implants. – **Fig. 10:** Occlusal view of the abutments (anterior straight and posterior angled 17 degrees). – **Figs. 11a+b:** Three-unit fixed prosthesis in lithium disilicate (e.max®). – **Fig. 12:** Three-unit fixed prosthesis cemented. – **Fig. 13:** Occlusal view of the final restoration.

Preoperative protocol

- Antibiotic prophylaxis: 2 g amoxicillin (4x500 mg), one hour before surgery
- Antisepsis: 0.12% chlorhexidine rinse for 30 seconds
- Local anaesthesia: 4% articaine with 1:100,000 epinephrine

Implant placement

Atraumatic extractions were performed (Fig. 3), and implant sites were prepared following Neodent® protocol with abundant irrigation. A screw former was used to optimise bone preservation (Fig. 4). Two two-piece ceramic implants (Neodent Zi, 4.3 × 13 mm) were placed at 24 rpm and 35 Ncm torque (Figs. 5a+b), followed by manual insertion to the final position (Fig. 6). Cement-retained abutments were used: one straight and one 17° angled CR abutment (Neodent).

Provisionalisation

Immediate provisional restorations were fabricated intraoperatively using light-curing resin, consisting of two crowns (premolar and molar; Fig. 7). After cementation, sutures were placed, and a periapical radiograph confirmed proper implant positioning (Fig. 8).

Postoperative course

The patient returned after 14 days for suture removal. Healing was uneventful throughout the four-month osseointegration period.

Prosthetic phase

After four months, the definitive prosthetic phase began (Figs. 9+10). An analogue impression was taken using addition silicone (Yllar) over the CR abutments. A three-unit fixed prosthesis was fabricated using lithium disilicate (e.max®; Figs. 11a+b) and cemented with dual-cure adhesive resin cement (RelyXT™ U200, 3M; Figs. 12+13). A final periapical radiograph confirmed accurate fit and stable bone levels.

Follow-up

At the 24-month follow-up, clinical evaluation revealed healthy peri-implant soft tissues and preservation of the mucogingival profile. A radiograph confirmed no signs of peri-implant bone loss (Fig. 14).

Discussion

This clinical case demonstrates the successful rehabilitation of a posterior maxillary edentulous area using ceramic implants and angled abutments, effectively avoiding the need for sinus grafting. This approach aligns with contemporary trends in implant dentistry, where minimising invasive procedures is a priority.

The use of angled implants has been widely studied as an effective alternative to maxillary sinus augmentation procedures. A systematic review demonstrated that tilted implants, when positioned correctly, have similar clinical success rates to axial implants.⁸ This approach avoids more invasive interventions, such as maxillary sinus lift and bone exercises, significantly reducing treatment morbidity and accelerating patient rehabilitation time.

The survival rates of ceramic implants in posterior regions have been a topic addressed in the current literature, especially with adequate planning. Studies report a survival rate above 90% for a follow-up period ranging from one to five years in posterior regions.^{9–11} In the clinical case presented, a 17-degree angled abutment was used to compensate for the orientation of the implant and improve the prosthetic position. This strategy allowed the installation of an immediate provisional prosthesis, without compromising biomechanical stability or aesthetic results.^{12,13} These findings corroborate the current literature, which supports the use of angled components in cases with anatomical limitations, if surgical and prosthetic planning is carefully executed.

Conclusion

This case illustrates the successful integration of ceramic implants and angled

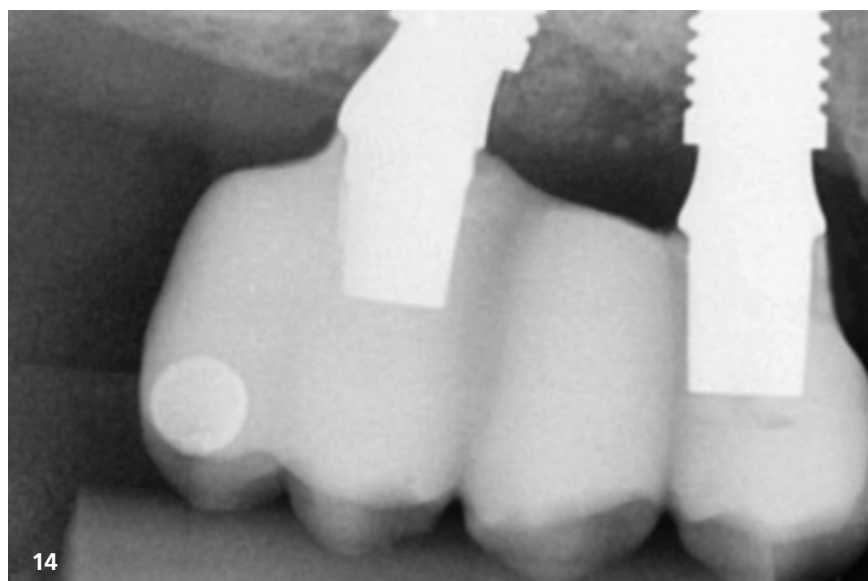


Fig. 14: X-ray 24 months later.

abutments as an effective solution for posterior maxillary rehabilitation provided careful surgical and prosthetic planning is followed. The 24-month follow-up confirms the success of the treatment, with healthy peri-implant tissues and stable bone levels. Future research should continue to investigate the long-term outcomes of ceramic implants, particularly in challenging anatomical situations, to further validate their role in implant dentistry.

Ethical aspects

The study protocol received approval from the Research Ethics Committee of the Pedro Ernesto University Hospital, State University of Rio de Janeiro (HUPE-UERJ; Protocol No. 5.598.463). All procedures adhered to the revised principles outlined in the Declaration of Helsinki. Written informed consent was obtained from the patient prior to the beginning of treatment.

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References



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