Ceramic implants for aesthetic transformations

Dr Paresh B. Patel, USA

With new emerging technology, ceramic implants have become innovative products that provide an alternative to traditional titanium implants. They have been shown to be strong, aesthetic and peri-implant tissue-friendly. Some modern ceramic implant systems allow for a metal-free solution for long-term success. This offers a choice to those patients who have a titanium sensitivity or otherwise wish to use a non-metal solution.[1–3] In the aesthetic zone, the maxillary anterior region, placing any type of implant can be challenging, especially with adjacent natural teeth. Ceramic offers an inherent white colour, avoiding the grey show-through of titanium. A thin periodontal biotype is a characteristic that especially poses an aesthetic risk, and this can be minimised with an innovative ceramic implant system and its natural tooth colour. Zirconia has also been shown to provide optimal blood circulation around the implant body, thus increasing the long-term stability of the periodontium–implant complex. The following clinical case demonstrates the use of the Zeramex XT two-piece ceramic implant (Dentalpoint), which uses a unique carbon fibre fixation screw to offer a truly metal-free solution for the aesthetic zone and which has a reversible screw-in prosthetic connection. The implant is made of alumina-toughened ceramic (ATZ), and it is sandblasted and etched on the body to create a micro-roughened surface with a zone near the neck of the implant that is to not allow for true tissue adhesion.

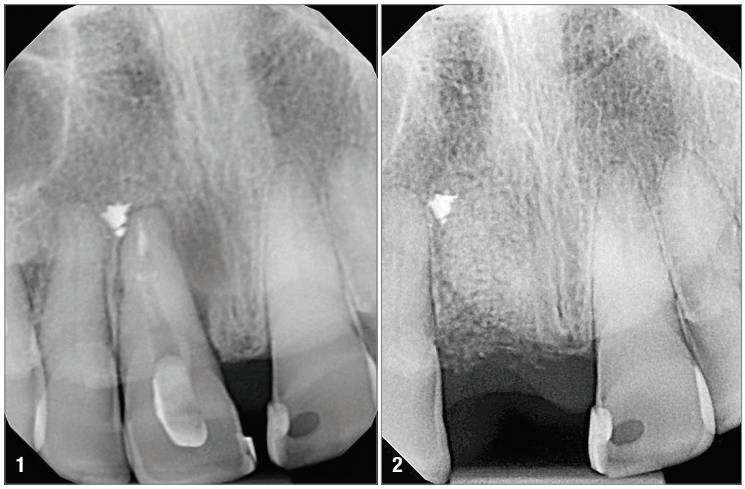


Fig. 1: Pre-op situation: a failing endodontically treated tooth with a poor prognosis for retreatment. **Fig. 2:** Healing five months after tooth extraction and placement of corticocancellous bone.

Case presentation

A 54-year-old female patient presented to our office to learn about options to restore her failing partially endodontically treated maxillary right central incisor (Fig. 1). The tooth was extracted using instruments to reduce the risk of a buccal fracture and to thus preserve the alveolar bone. The site was preserved with a corticocancellous allograft and allowed to heal for five months (Fig. 2). After healing, smile photographs were taken to assess the overall aesthetic risk of the case. Treatment options were discussed with the patient. Having a ridge width of less than 6.5 mm, the patient opted for a ceramic implant to avoid the potential for grey show-through (Fig. 3). We proposed a veneer graft and a connective tissue graft to minimise these risks were a titanium implant to be placed. The patient declined these surgical interventions.

Surgical phase

Following the protocol suggested by the manufacturer, the site was prepared for ceramic implant placement in a manner very similar to that of a titanium variant. It is important to note that the site must be prepared adequately to prevent excessive implant insertion torque and that the use of a bone tape is necessary. The ceramic implant must also be placed 1.6–0.6 mm supra-crestally, and the connection point is to be above the bone crest.

A Zeramex XT implant with a reduced diameter of 4.2 mm and a length of 12.0 mm was placed under local anaesthesia with minimal flap formation (Figs. 4–8). A cover screw was then placed, and the tissue was repositioned and sutured (Figs. 9–11).

Soft-tissue management and final prosthetic restoration

After the healing phase had been completed, the implant was exposed with a diode laser and a 3 mm high Zeramex PEEK healing abutment was placed (Figs. 12 & 13).

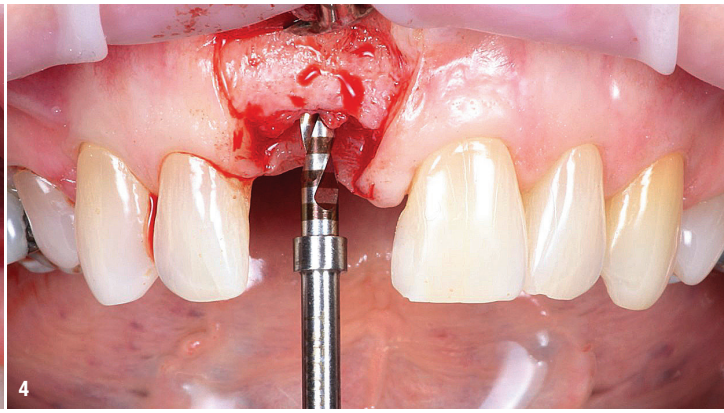
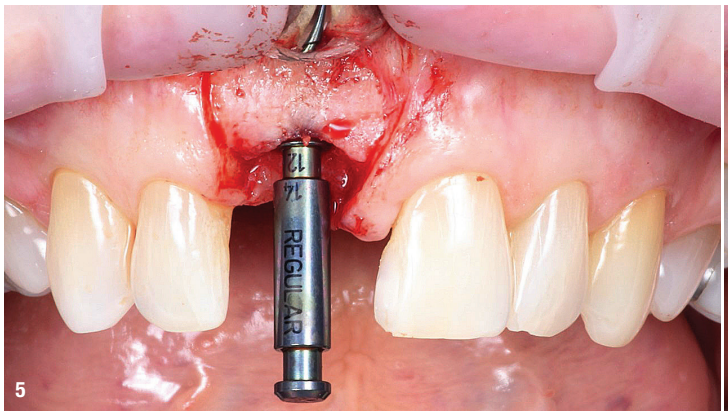


Fig. 3: Healed site pre-op situation, occlusal view. **Fig. 4:** Papilla-sparing incision to visualise the reconstructed site and initial osteotomy to depth.



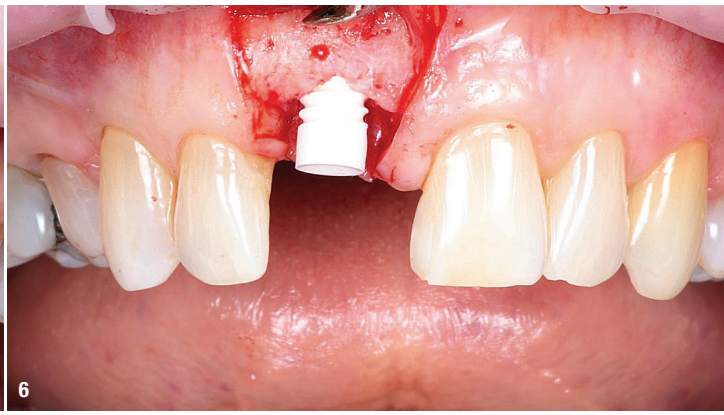
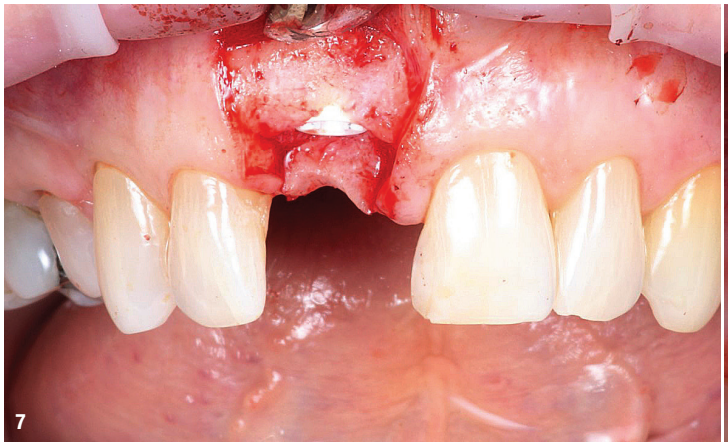


Fig. 5: Regular-platform final shaping drill taken to depth. **Fig. 6:** The two-piece ceramic implant with a carbon fibre final abutment screw in place.



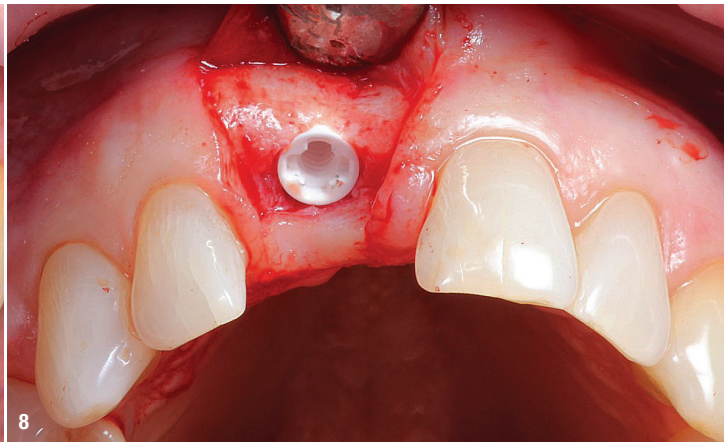


Fig. 7: Buccal view of the final implant placement 0.6 mm supra-crestally. **Fig. 8:** Occlusal view of the final implant placement.

Healing was allowed to continue for another two weeks (Figs. 14 & 15). After the soft-tissue healing phase, the gingiva was evaluated. It showed no signs of inflammation, demonstrating the excellent biocompatibility of the materials.

A standard restorative process using a closed-tray impression coping was planned. After verification with an intra-oral periapical radiograph, a polyvinylsiloxane impression was taken. This was sent to the laboratory to fabricate an all-zirconia crown (Fig. 16). A Zeramex standard abutment also made of ATZ was fixed in the implant with a VICARBO screw (Zeramex XT). This screw is made of carbon fibre longitudinal strands and moulded slightly larger than the internal aspect of the implant, allowing transmission of the forces of mastication to be absorbed while providing a tight, hermetically sealed connection. The carbon fibre screw gives this complex almost twice the tensile strength of a titanium fixation screw. The final crown was tried in and cemented (Figs. 17–19).

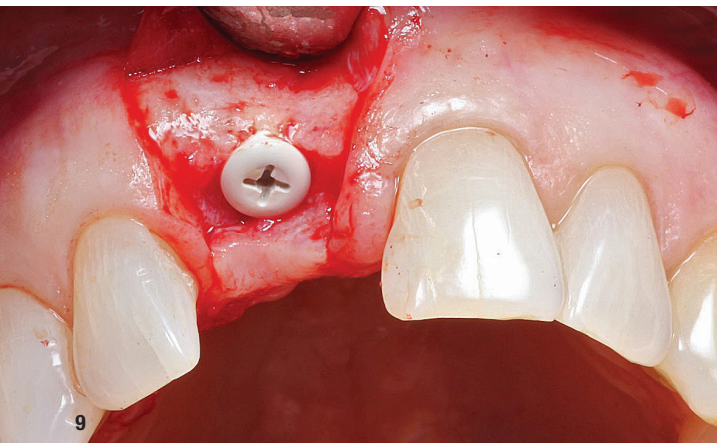
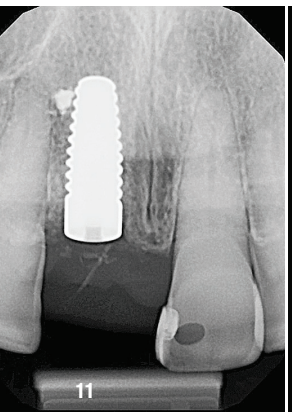


Fig. 9: Flat cover screw installed into the implant and hand tightened. **Fig. 10:** Closure with resorbable suture.



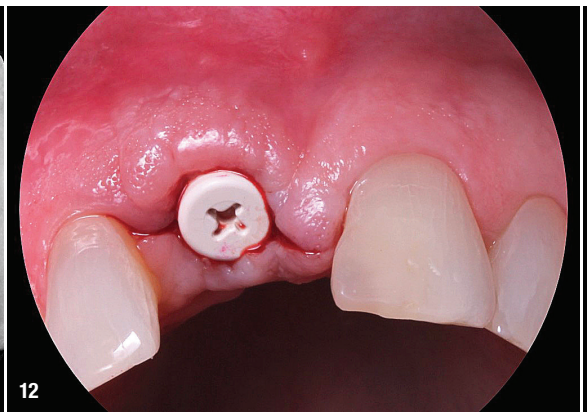
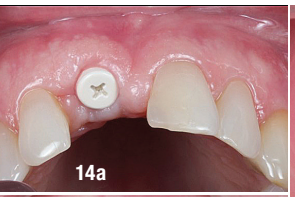
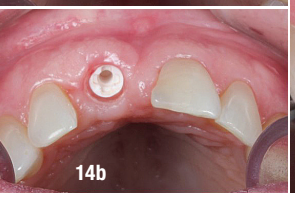


Fig. 11: Final radiograph verification of implant placement 1.5 mm from the adjacent tooth and outside of the nasopalatine canal. **Fig. 12:** Uncovering of the implant and healing abutment placed. **Fig: 13:** Uncovering of the implant (buccal view), showing robust tissue health with no grey show-through of the material.





Figs. 14a & b: Situation at two-week healing check of tissue health, occlusal view. With **(a)** and without **(b)** healing abutment. **Fig. 15:** Situation at two-week healing check, buccal view. **Fig. 16:** Final crown on a customised stock abutment.

Discussion

As the number of titanium-based implants being placed per year continues to rise, so does the clinically observed incidence of peri-implantitis. Since the osseointegration rate of ceramic implants closely approximates that of titanium, an alternative exists that can offer a viable solution for reducing the amount of biofilm around the fixture and the peri-implant soft tissue.

With the inherent grey colour of titanium-based fixtures, colour matching and blending into the soft and hard tissue will remain a challenge. This has been minimised with the use of ceramic abutments; however, this does not always reduce the darkened appearance of the peri-implant soft tissue. Ceramic implants, with their white colour, offer optical properties that allow for more natural, lifelike aesthetic results similar to that of the natural tooth.

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Fig. 17: Tissue profile on the day of delivery of the customised ceramic abutment and BruxZir crown (Glidewell). **Figs. 18a & b:** Final aesthetic outcome.

Conclusion

In conclusion, ceramic implants now have overcome the limitations of previous generations by being milled from ATZ to offer high strength. A strong, metal-free connection has been designed to minimise bacterial colonisation and deposition on the surface of the abutment. The naturally white colour avoids dark show-through and promotes optimal blood circulation that is more similar to that of a natural tooth, thus promoting inflammation-free gingival tissue.

These are very positive clinical results, but long-term studies are necessary to further verify the effectiveness and success rates of zirconia implants. As zirconia implants have a remarkably similar surgical and prosthetic protocol to those of titanium implants, most clinicians can transition to offering patients another choice with minimal training and practice. This treatment offered the patient a natural aesthetic result with minimal additional procedures while maximising gingival health and bone health.

Literature

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about the author

Dr Paresh B. Patel is a graduate of the University of North Carolina at Chapel Hill Adams School of Dentistry and the Medical College of Georgia and American Academy of Implant Dentistry (AAID) MaxiCourse, both in the US. He is a clinical instructor at the Reconstructive Dentistry Institute in Las Vegas in the US. Dr Patel has placed more than 5,000 implants, published numerous articles in leading dental journals, and worked as a lecturer and clinical consultant on dental implants and prostheses for various companies. He belongs to a number of dental organisations, including the American Dental Association, the North Carolina Dental Society and the AAID.

contact

Dr Paresh B. Patel
Lenoir, USA
lenoirdentistry@gmail.com

Author details

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