Ceramic implant placement in a medically compromised patient

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Introduction

While dental implants are becoming a standard treatment for tooth loss, there is emerging but steadily growing patient demand for reliable, metal-free, natural-looking ceramic implants. This demand is particularly pronounced not only in patients with metal sensitivity but also in those who would like to have highly aesthetic restorations. I personally have experienced that the latter group are patients who have had restorations before, done extensive research about the topic online and come to my practice specifically asking for ceramic implants. The challenge I face is that those patients would like to have a reliable ceramic implant and expect successful treatment outcomes irrespective of their age, lifestyle or medical history.

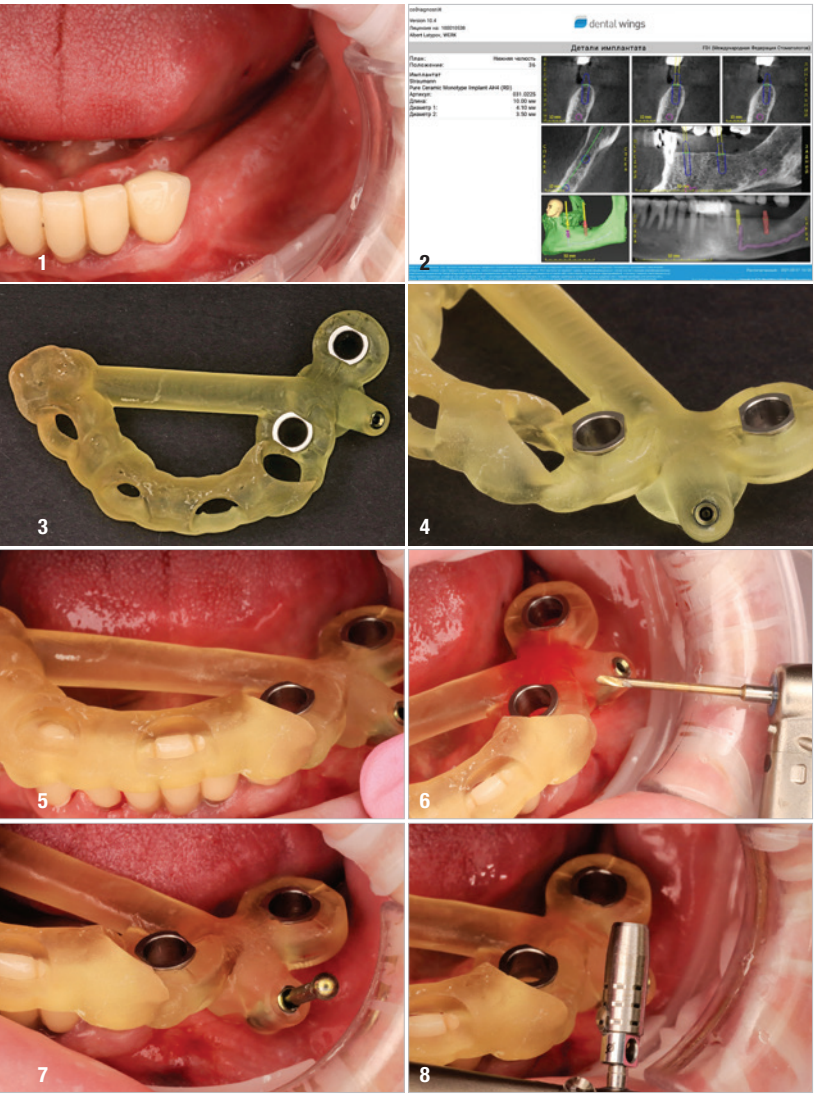


Fig. 1: Initial situation. **Fig. 2:** coDiagnostiX planning in the molar region. **Fig. 3:** Guided surgery template. **Fig. 4:** Guided surgery template close up. **Fig. 5:** Checking precision fit of the guided surgery template. **Fig. 6:** Drill for the fixation pin preparation. **Fig. 7:** Fixation pin in place. The template was securely fixed. **Fig. 8:** Tissue punch, the pilot instrument.

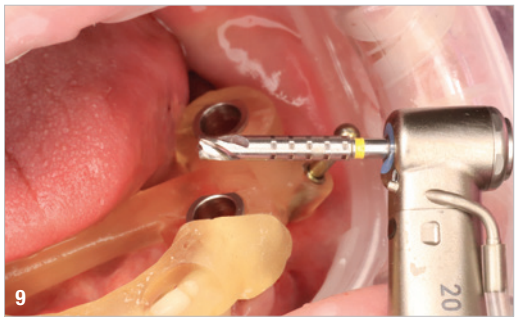
The following clinical case report describes a three-unit bridge restoration on ceramic implants in a medically compromised patient who came to my practice seeking a natural-looking, metal-free restoration.

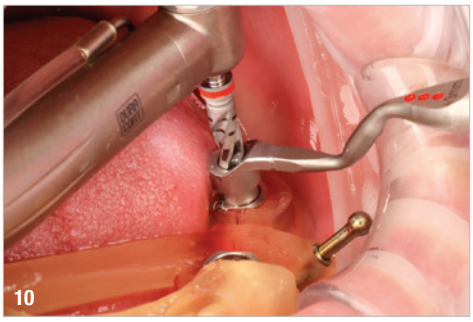
Initial situation

A 53-year-old diabetic patient who was a smoker and had good hygiene and no parafunctional habits presented to the clinic for the replacement of the missing premolars and molars in the left mandible (Fig. 1). The patient had received metal–ceramic restorations in the past and was dissatisfied with the experience, complaining about a grey metal margin that became visible with time and had a non-aesthetic appearance. The patient was well informed about the subject and wanted to have a natural-looking, metal-free restoration which would nevertheless be strong and reliable. He also was concerned about the surgery itself and had a strong preference for a minimally invasive surgical procedure. Further anamnesis and routine testing revealed elevated haemoglobin A1C at 9%.

Treatment planning

It was discussed with the patient and his endocrinologist that Straumann PURE monotype ceramic implants (zirconia implants with the ZLA surface) restored with a full-ceramic three-unit bridge would provide a metal-free, aesthetic and mechanically strong restorative solution in this clinical case. It was also agreed to use a fully guided surgery approach to avoid incisions and minimise surgical trauma.





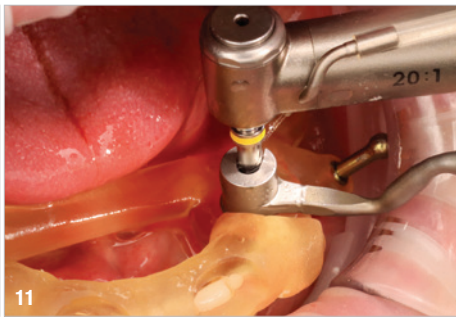


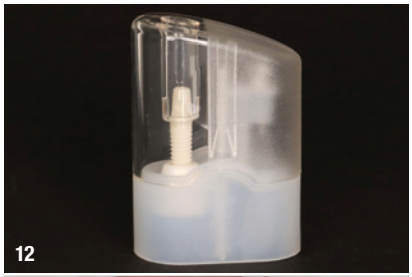
Fig. 9: Milling cutter, to flatten the bone ridge. **Fig. 10:** Guided drilling with the use of a guided handle. **Fig. 11:** Guided tapping. **Fig. 12:** Vial containing the PURE monotype implant. **Fig. 13:** Monotype implant with PURE transfer piece. **Fig. 14:** Fully guided implant insertion in the molar region. **Fig. 15:** Monotype implants right after insertion. **Fig. 16:** Monotype implants in place after the template was removed. **Fig. 17:** Closed-tray impression copings. **Fig. 18:** Analogues inserted into the impression. **Fig. 19:** Protective caps fixed. **Fig. 20:** Laboratory model with analogues. **Fig. 21:** Finished three-unit bridge restoration on the laboratory model.

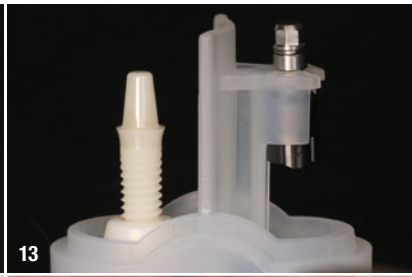
The patient was referred for a CBCT scan of the area, and we performed a digital scan using an intra-oral scanner (TRIOS 3, 3Shape). Upon receipt, the DICOM data was imported into the implant planning software (coDiagnostiX, Dental Wings), and the scan files were imported into the laboratory software (Straumann CARES Visual). Since the ceramic implants used are mono-bodies in design and it is not recommended to modify the abutment, our task was to plan the most parallel placement of the implants relative to each other, considering all anatomical formations (Fig. 2). Once the planning had been completed, the guided surgery template was 3D-printed (Figs. 3 & 4).

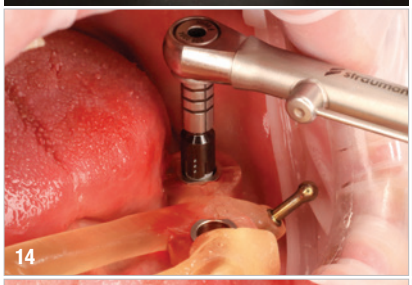
> “Patients would like to have a reliable ceramic implant and expect successful treatment outcomes irrespective of their age, lifestyle or medical history.”

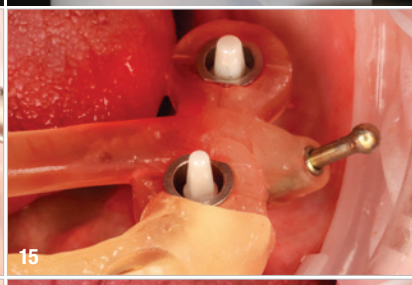
Surgical procedure

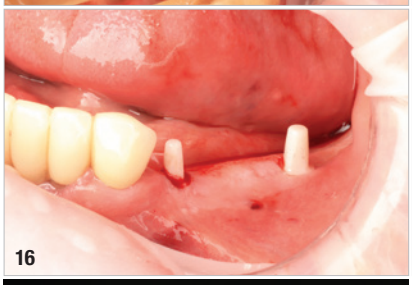
At the first stage, the surgical template was applied, and the precision of its fit was checked (Fig. 5). The fixation pin drilling and insertion were then done after the top-up of the infiltration anaesthesia (Figs. 6 & 7). The first instrument used was a tissue punch to facilitate an optimal soft-tissue cuff and reduce trauma (Fig. 8). The design of the PURE ceramic implant is a combination of tissue-level and bone-level implant—the implant neck mirrors the Straumann tissue-level implant, and the implant body mimics the Straumann bone-level implant

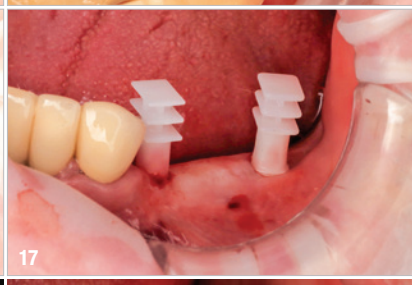


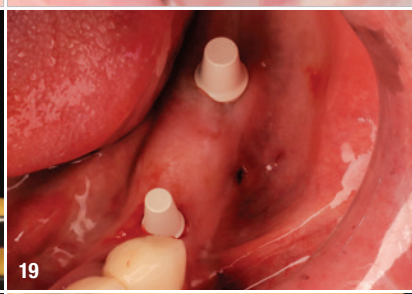












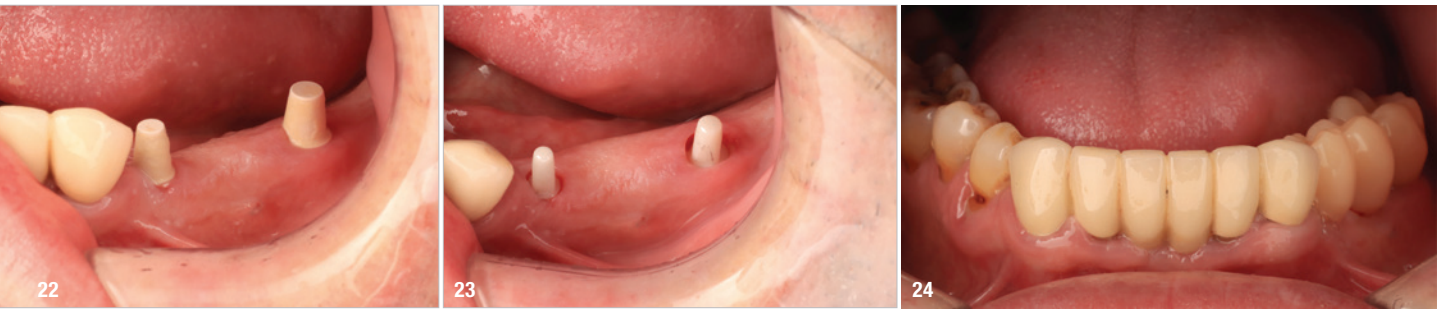


Fig. 22: Healed sites five days post-op. **Fig. 23:** Healed sites before cementation and after removal of the protective caps. **Fig. 24:** Final restoration.

design. Thus, the surgical protocol for osteotomy preparation for PURE is the same as for the corresponding bone-level implant. For this case, the osteotomy preparation guide was used according to the protocol established for bone-level implants provided by coDiagnostiX (Figs. 9–11).

The basic implant bed preparation was done using pilot drills followed by twist drills: for the 3.3 mm diameter implant, the final drill was 2.8 mm in diameter; for the 4.1 mm diameter implant, the final drill was 3.5 mm in diameter. The fine implant bed preparation was done using the respective profile drilling and tapping for the 3.3 mm and 4.1 mm diameter implants. The PURE implant comes with a separate transfer piece that locks securely into place (Figs. 12 & 13).

Three points on the driver line up with the flat surface of the implant abutment and indicate the distance to the shoulder (1, 2 & 3 mm; Fig. 14). This design greatly facilitates implant placement and makes it very straightforward. The implants were placed in the positions of the first premolar (diameter: 3.3 mm; narrow diameter; length: 12.0 mm; abutment height: 5.5 mm) and second molar (diameter: 4.1 mm; regular diameter: 12.0 mm; abutment height: 5.5 mm), respectively. The implants were placed precisely in the planned positions regarding the insertion depth and relative to the centre of the sleeve (Figs. 15 & 16).

Prosthetic procedure

Since good primary stability was achieved (about 45 Ncm), and there were no teeth in the maxilla, it was decided to take a closed-tray impression right after the surgery and fix the implant analogues in the clinic (Figs. 17 & 18). Appropriate protective caps were placed on the abutment portions of the implants (Fig. 19). The impressions were transferred to the laboratory, and within four working days, a one-piece anatomical bridge of zirconia was made (Figs. 20 & 21).

After five days, the patient came to the clinic for fixation of the final restoration. At this appointment, plaque was seen on the protective caps (Fig. 22), but the healed mucosa appeared a healthy pink (Fig. 23). The abutment parts of the ceramic implants were cleaned and prepared for cementation. Excess cement was removed. A follow-up visit seven days after cementation was arranged. No further crown adjustments were required, and the patient was very comfortable with the final restoration (Fig. 24).

Treatment outcomes

At the one-year follow-up, there were no biological or technical complications. The treatment option of ceramic implants and a zirconia restoration appears to be a valid alternative to titanium implants in patients requiring metal-free restoration, even in a diabetic patient. The soft tissue around the implant remained stable over time, indicating the excellent biocompatibility of the ceramic. The tissue-level design of the implant places the cementation line at or above the gingival margin to facilitate hygiene maintenance. The tooth-like colour of the body enables the achievement of high aesthetics. The patient was satisfied with the functional and aesthetic outcomes.

about the author

Dr Alexandr Bortsov graduated with a DDS from South Ural State University in Chelyabinsk in Russia. As a surgeon, his focus areas are implantology and guided surgery, aesthetic dentistry and digital dentistry. Dr Bortsov is the director of the Dental Art clinic in Chelyabinsk and of the International Team for Implantology study club in Chelyabinsk.

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