There is a growing demand among patients for implant restorations that provide a high-quality, long-lasting aesthetic outcome that mimics the natural dentition. Many surgical and prosthodontic techniques can contribute to achieving harmony between pink and white aesthetics. However, there is no ‘cookbook’ that describes one ideal technique for restoring a lost tooth. Instead, it is vital to fully assess each patient and draw up a case-specific treatment plan.

If a tooth has been lost or must be extracted, the primary aim is to preserve or restore as much of the surrounding hard and soft tissue as possible. A range of factors contribute to the achievement of long-term tissue stability following the loss of a tooth. However, a minimally invasive approach during every stage of treatment is likely to make an aesthetically successful restoration easier to achieve. This case report describes the treatment protocol that was followed to provide an optimal combination of function and aesthetics using an implant restoration to replace an upper right central incisor with a vertical root fracture.

Initial situation. The upper right central incisor (Figure 1) had a vertical root fracture and persistent infection. The patient presented with a very high smile line, medium-thick gingival biotype and a small excess of gingival tissue, compared with the contralateral central incisor. The cone-beam CT images (Figures 2 and 3) revealed a small vertical bone defect around the root fracture. Bone was present on the mesial and distal aspect of the root (arrow).

Initial treatment. A careful extraction of tooth 11 was performed (Figure 4) with preservation/augmentation of hard and soft tissues. Bovine bone hydroxyapatite (Endobon, Biomet 3i, Palm Beach, USA) and a collagen membrane (Osseoguard, Biomet 3i, Palm Beach, USA) were used to augment the bone defect (Figure 5). A large connective tissue graft, harvested from the palate, was inserted and sutured with 6-0 monofilament sutures (Seralene, Serag Wiessner, Naila, Germany) in a buccal and palatal pouch to cover the socket and augment the soft tissues (Figure 6).

Implant placement. After 3 months, a 4x15 mm implant (NT Osseotite, Biomet 3i, Palm Beach, USA) was inserted using a flapless approach (Figure 7). Pre-operative evaluation revealed an adequate quantity of bone and soft tissue. Additional steps were taken to fulfil all requirements for immediate implant placement as the bovine bone substitute was still immature. A definitive abutment was prepared to install immediately after implant surgery (Figure 8). The outline of the abutment and the biocompatible material were optimised to act as a scaffold encouraging the soft tissue to heal. Additional soft tissue corrections were achieved by adapting the shape of the acrylic provisional crown (Figure 9).

Outcome. Figures 10 and 11 illustrate the final result with definitive crowns on the implant and neighbouring central incisor. Note the excellent soft tissue volume at the buccal side of the implant. At a follow-up of three years, the peri-implant bone level remained stable (Figure 12). (Prosthodontist: Erik Van den Bogaert)
Questions by Dr Martin Brient, Paris, France, with responses from Tommie Van de Velde

How did you manage the membrane placement in the extraction socket? Would you choose the same surgical approach with a larger bony defect of the buccal bone?

The membrane was positioned on the buccal bone wall after careful elevation of the periosteum around the bone defect. The size of the defect was narrow but deep, and allowed for this minimal approach. In cases where we find larger bone defects, a larger extension of the buccal flap is necessary to position and stabilise the membrane.

We understand that the bone substitute was still immature after three months. How did you manage to obtain sufficient primary stability for immediate provisionalisation?

Primary stability of the implant was obtained using a similar protocol to immediate implant placement (anchorage apically and palatally; under-preparation; tapered implant design).

How do you design the marginal shape of your tailor-made zirconia abutment with respect to the final soft tissue level and shape?

The design of the final abutment was based on the level and profile of the neighbouring tissues. As the peri-implant tissues were augmented after extraction, an ideal implant bed was created. The excess in height and width of the soft tissues allowed for a minimal flap design during implant placement. An ideal profile was designed for the final abutment allowing the soft tissues to heal around the biocompatible ZrO2 abutment, which acted as a scaffold. The buccal margin of the abutment was placed 0.5 mm apically from the future gingival outline. By adding acrylic to the provisional crown, additional changes to the gingival architecture were accomplished. In this case, this was mainly necessary at the buccal level to shift the gingival zenith in an apical and distal direction.

You used a zirconia abutment for the implant-supported restoration. Did you also use zirconia as a prosthetic framework for the two crowns?

Yes, the crowns were made by the referring dentist, Erik Van den Bogaert. A glass fibre reinforced post was placed to build up the 21. Two separate Zirconia crowns were made on the implant-abutment and the natural tooth.

How would you disassemble the cemented crown if a reintervention was required (for example as a result of ceramic chipping or screw loosening)? How would you control the removal of the excess cement?

The implant crown was cemented with a provisional cement enabling it to be retrieved in the case of technical complications such as ceramic chipping or screw loosening of the abutment. During the cementation process, a retraction cord was used to prevent cement inclusion at the submucosal level of the abutment. This is a very delicate procedure and is often done under local anaesthesia. A duplicate (die) of the abutment can be used to remove excess cement prior to placement intraorally.

Would you be able to show us a 3 year follow-up X-ray?

X-rays taken three years post-operatively show excellent marginal bone preservation, as well as the presence of biomaterial in what is presumed to be newly-formed bone.