Photos: Dr. Jens Tartsch (2018)

# Reversibly screwed and metal-free single tooth supply with ceramic implants

Jens Tartsch

**In addition to holistic dentistry, ceramic implants are also becoming increasingly important in general dental implantology. Not only the increased demand from patients [1] contributes to this, but also the technical advantages such as improved aesthetics [2] and soft tissue conditions [3-5] are becoming more and more popular. Due to a consistent further development of the material [6], the surface design [7] and the restorative treatment options [8], the success and survival rates have come close to the titanium implants or are even at the same level [9].**

The most common indication for implants is the single tooth gap [10]. If it applies to the anterior region according to the SAC classification [11] as a "complex" due to the aesthetic requirements, the premolar and molar region should be classified as "simple" if there is sufficient bone. The single tooth gap in the molar region is therefore the ideal indication to become familiar with ceramic as an implant material. The following case report was therefore selected as an entry-level indication for ceramic implants.

## Case report

In December 2016, a 43-year-old patient with a good general condition and a desire for a metal-free restoration of the existing single tooth gap in region 36 presented to our practice. Tooth 36 was removed by your family dentist in September 2016.

## Selection of the implant

In modern implantology with titanium implants, two-part systems with screwed abutments are the gold standard today. They cover almost all indications, enable unloaded healing phases and one-step augmentative procedures. They are reversible and fl exible.

Depending on the material, ceramic implants are mainly offered as one-piece implant systems. With these, however, the restoration can only be cemented. However, the removal of cement from a 1.0-1.5 mm subgingival crown rim can no longer be reliably guaranteed [12]. The trend and the development are therefore also towards two-part screwed solutions. In the present case, too, a metal-free, screwed and two-part implant system made of zirconium oxide was used (Zeramex P6, Dentalpoint).

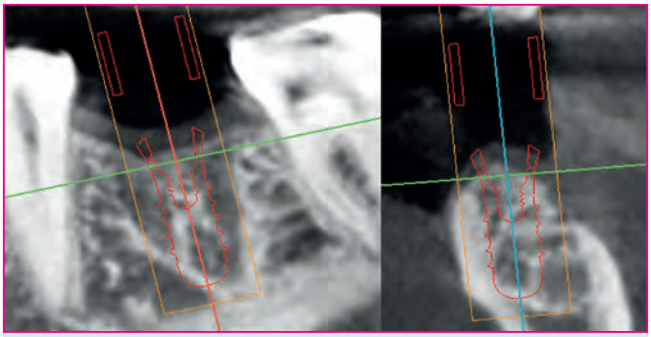

*Fig. 1: Implant planning using DVT and Smop software.*

## Diagnosis

The implant diagnosis and the implant selection were carried out using DVT. In this case, a template-navigated implantation was dispensed with for reasons of cost and because of the manageable situation. We planned the implant position with the Smop software (Swiss Meda). The Zeramex P6 implant has the same shape as the Straumann Standard Plus Implant, so the Straumann SP Template can be used (Fig. 1). The alveoli of tooth 36 were still clearly visible three months after the explantation. However, there were sufficient bone conditions and a sufficiently wide distance to the mandibular nerve so that an implant with a diameter of 4.1 mm and a length of ten millimeters could be selected. It should be noted here that this type of implant was designed as a classic tissue level implant. This means that the implant shoulder should be placed epigingivally up to a maximum of one millimeter subgingivally in the posterior region. The specified implant length relates to the endosseous portion to which - analogous to the Straumann SP implant - a 1.6 mm tulip-shaped neck area must be added.

## Surgical phase

At the end of January 2017, the implant was inserted under local anesthesia. After a crestal incision without vertical incisions, a well regenerated cortex was found after opening. The implant bed was prepared in stages according to the Zeramex P6 drilling protocol. The most important step in

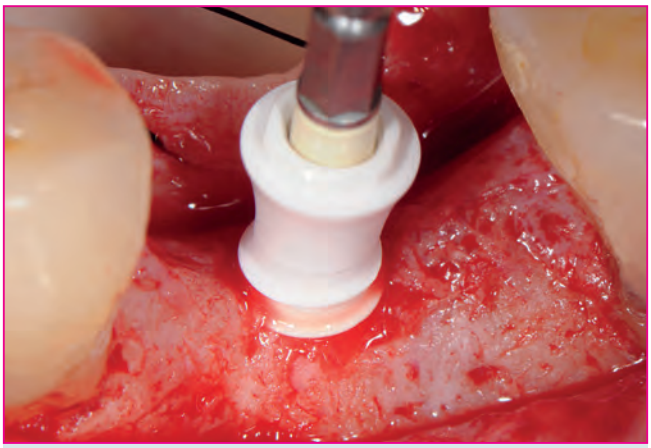

*Fig. 2: Insertion of the implant by hand.*

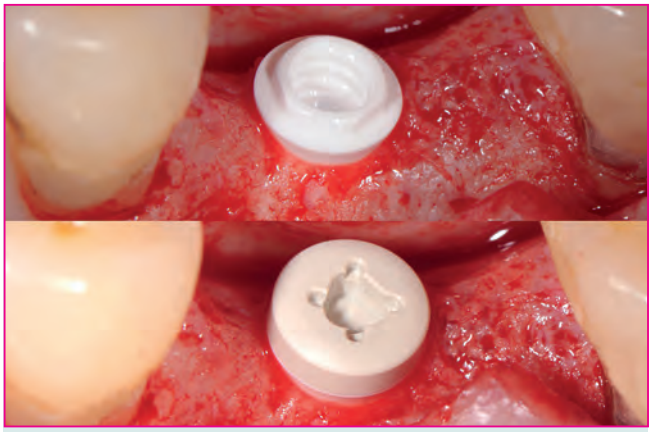

*Fig. 3: Implant in situ / healing cap in situ.*

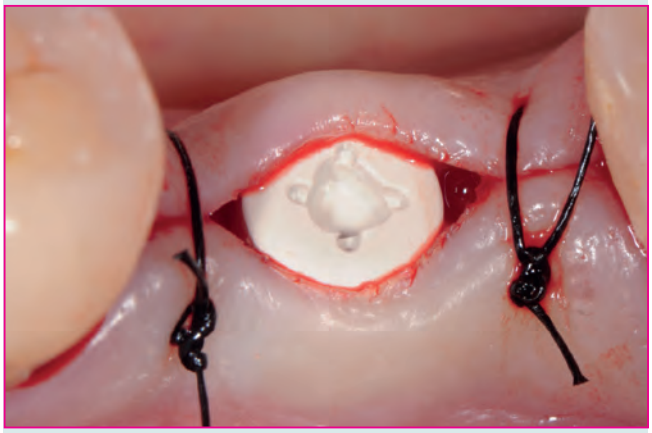

*Fig. 4: Transmucosal wound closure.*

The preparation is the use of the thread cutter. Since the implants are not self-tapping and the ceramic material does not dissipate temperature from the depths, the thread must be cut through to the full length of the implant. Accordingly, the implant should be introduced by hand at the beginning with as little torque as possible (Fig. 2). Only in the last two to three revolutions does the implant-tat begin to maintain its primary stability and can then be tightened with a torque of up to 35 Ncm. Since the gingiva thickness was less than two millimeters and penetration of the implant shoulder should be avoided, the implant was placed one millimeter deeper than intended in this case (Fig. 3). After inserting the healing cap (Fig. 3, see below), the wound edges were adapted for transmucosal healing (Fig. 4). After ten days the sutures were removed.

Usually, even with ceramic implants, the reopening takes place after a healing phase of three months. In this case, due to the fact that the alveolus was not yet fully ossified, four months were waited for safety reasons. But here, too, the x-ray control image (Fig. 5, see first x-ray from left) does not show any complete radiological healing of the alveolus, but the implant was osseointegrated and stable (Fig. 6). The recognizable bone remodeling in the neck area, like the Straumann SP implant, is typical of this implant geometry and remains stable over the long term [13].

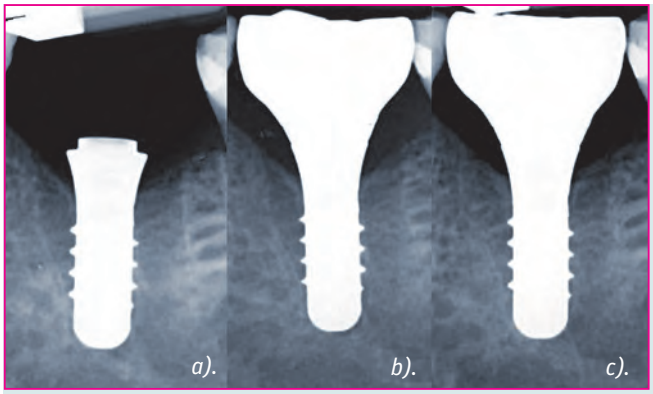


*Fig. 5a-c: Control image four months postoperatively / control image after restorative treatment / control image four months after restorative treatment.*

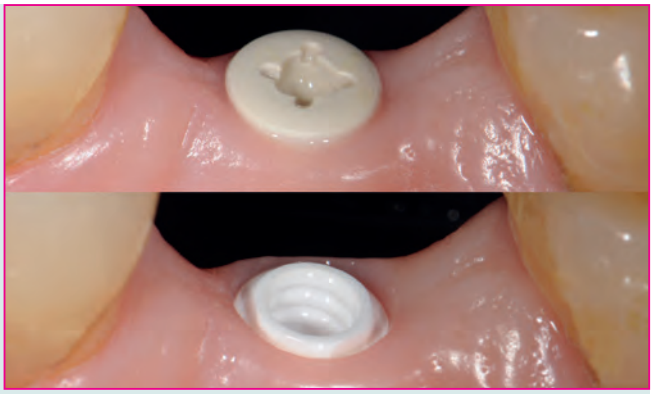

*Fig. 6: Irritant soft tissue conditions after exposure.*

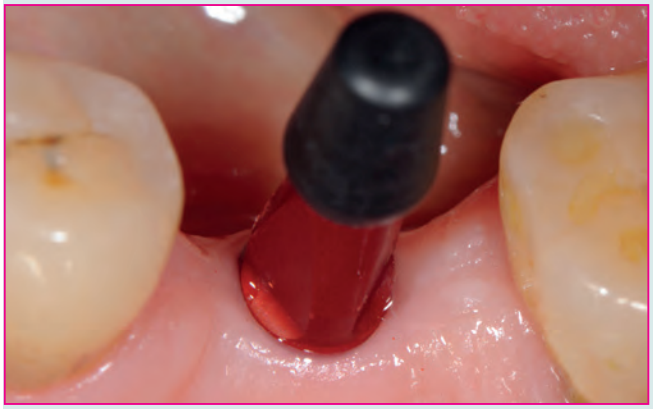

*Fig. 7: Precise impression-taking through an open impression.*

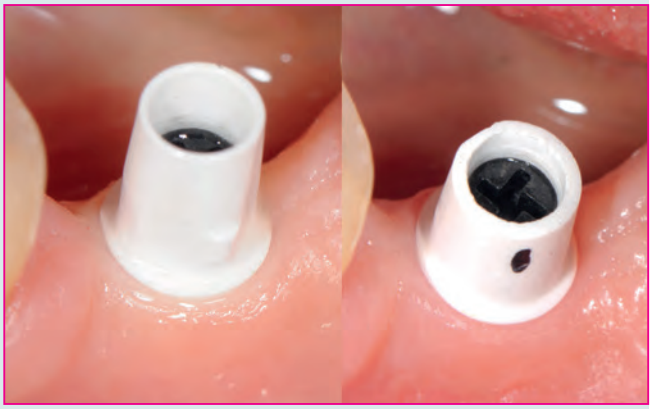

*Fig. 8: Customized abutment.*

*Fig. 9: Monolithic zirconium oxide crown with occlusal screwing on the master model (red screw = laboratory screw).*

*Fig. 10: Closure of the screw channel in the abutment with Teflon tape in preparation for bonding.*

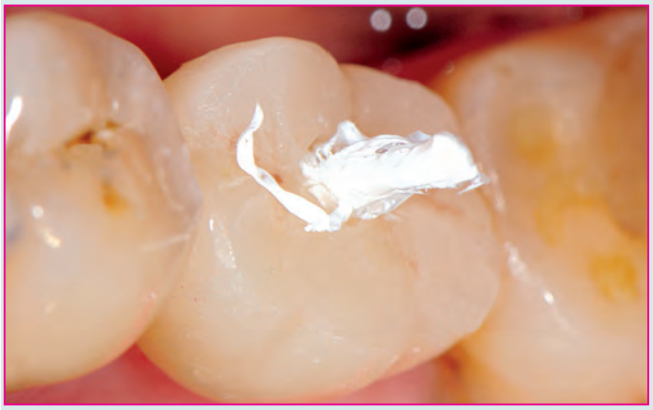

*Fig. 11: Restoration bonded in situ, Teflon tape is already removed through the screw channel.*

*Abb. 12: Extraorale Zemententfernung und Politur.*

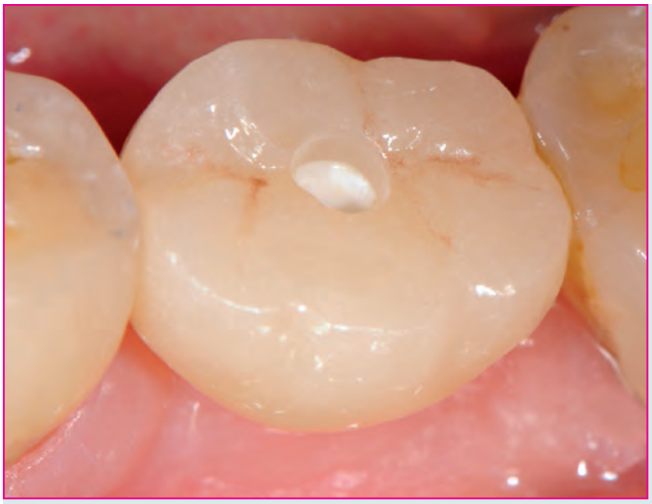

*Fig. 13: Closure of the screw channel in the crown with Teflon tape.*

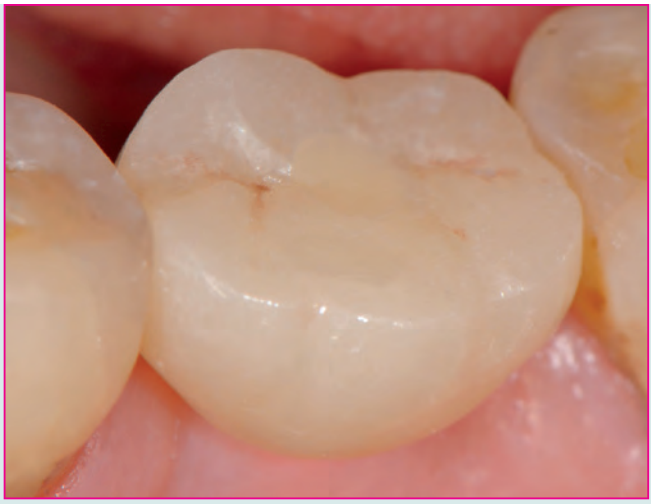

*Fig. 14: Crown with closure of the screw access channel with composite.*

## Prosthetic phase

The impression was taken analogously to the usual procedure by means of a closed impression (Fig. 7). As it is a two-part system, the abutment can be adapted to the requirements and individualized by grinding (Fig. 8). The external hexagon of the implant enables the exact repositioning of the abutment, serves as a rotation lock and prevents the introduction of forces into the implant body. The connecting screw consists of a PEEK matrix with a 60% share of embedded carbon fibers. This material allows a screw tightening torque of up to 85 Ncm, with 35 Ncm being clinically recommended. A monolithic zirconium oxide crown (Fig. 9) (Zolid FX, Amman Girrbach) with ok-klusalem access to the screw channel was fabricated on the customized abutment using the CAD / CAM process (Studio für Zahntechnik, D. Tartsch).

In order to avoid possible internal stresses in the ceramic implant-abutment connection, the finished restoration was glued to the abutment intraorally in the patient's mouth in the same way as a titanium adhesive base [RelyX unicem, 3M Espe] (Fig. 10, 11). The restoration bonded to the abutment can now be removed, the excess cement can be safely removed and the transition can then be polished (Fig. 12). The specified tightening torque of 35 Ncm for the abutment screw must be observed for the definitive integration. After filling the screw channel with Te fl on tape, the access cavity is sealed with composite as usual (Fig. 13).

The result is a metal- and cement-free, screw-retained and reversible single-tooth restoration (Fig. 14). A radiological follow-up image was taken after the operation and four months later when the restoration was being inserted. In comparison, stable peri-implant bone conditions were found (Fig. 5, center / right picture). Another comparison will be made at the first annual inspection.

## Conclusion

In addition to evidence and safe application, the ability to fall back on proven and familiar treatment protocols is an important factor for the acceptance of a new technology. On the basis of the described case it could be shown that these treatment processes with the Zeramex system hardly differ from the known treatment protocols with titanium implants. Indications and manufacturer guidelines must be observed accordingly.

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