Immediately placed two-piece zirconia implant with customised healing abutment in the maxillary molar region

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Over the past two decades, the utilisation of metal-free materials for oral rehabilitation has surged and emerged as an alternative to titanium in the production of dental implants.[1] Among these materials, yttria-stabilised tetragonal zirconia polycrystal has gained recognition as the preferred choice for such applications owing to its superior mechanical properties and reduced tendency to accumulate bacterial plaque.[2]

It is important to highlight that in the aesthetic region there is a risk of peri-implant tissue recession, which can cause titanium implants to become visible through the soft tissue. This is especially problematic in cases where the biotype is thin, compromising the overall aesthetics of the restoration.[3]

Initially, zirconia was primarily used to make one-piece implants.[4] However, this limits the prosthetic options available, as there is no possibility of adjusting the implant to the prosthetic component. This is especially concerning in the aesthetic region.[5] In contrast, two-piece implants can minimise this problem by providing prosthetic abutment angulation to improve implant positioning in certain situations. This can significantly enhance prosthetic versatility.[6]

In addition to their aesthetic demands and request for metal-free materials, in recent years, patients have come to desire a reduction in the number of surgical and clinical steps.[7] To reduce the total treatment time, extraction followed by immediate implantation has proved to be a

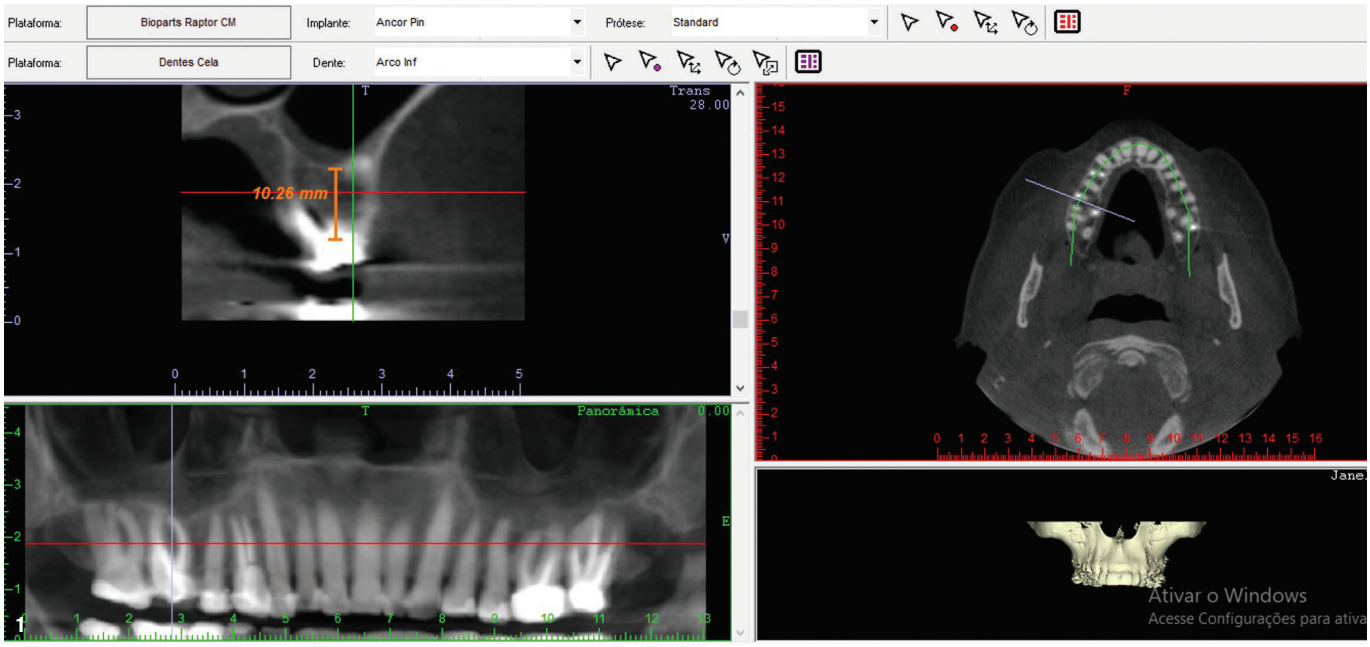


Fig. 1: Pre-op CBCT scan of the patient.

safe option with predictable results, but this does not prevent tissue shrinkage.[8,9] Nevertheless, when this is combined with alveolar ridge preservation procedures, post-extraction tissue loss can be significantly reduced.[10] To preserve the transgingival profile immediately after extraction, the socket sealing abutment technique was proposed.[11] This technique also allows for primary wound closure and protects the alveolar clot and biomaterial particles underneath.[12] The aim of this case report is to demonstrate the use of a two-piece ceramic implant system and a custom healing abutment to replace the maxillary right first molar and review the clinical and radiographic situation after ten months of follow-up.

Case presentation

This study was submitted to the ethics committee of the State University of Rio de Janeiro in Brazil and approved under No. 5.598.463. The patient was invited to participate in and informed about the study and signed informed consent to participate, and all ethical requirements were met.

The patient, a 60-year-old woman, was referred to a private clinical study centre in Rio de Janeiro complaining about pain at the first molar on the right side of the upper jaw. The patient was a non-smoker and in good general health, but reported having type 2 diabetes, which was however well controlled. To carry out the correct planning and diagnosis, a CBCT scan was obtained (Fig. 1). The radiographic examination showed unsatisfactory endodontic treatment and the presence of periapical periodontitis. According to the patient, the tooth had already undergone endodontic retreatment, but without success. Thus, the decision to extract and replace the tooth was taken.

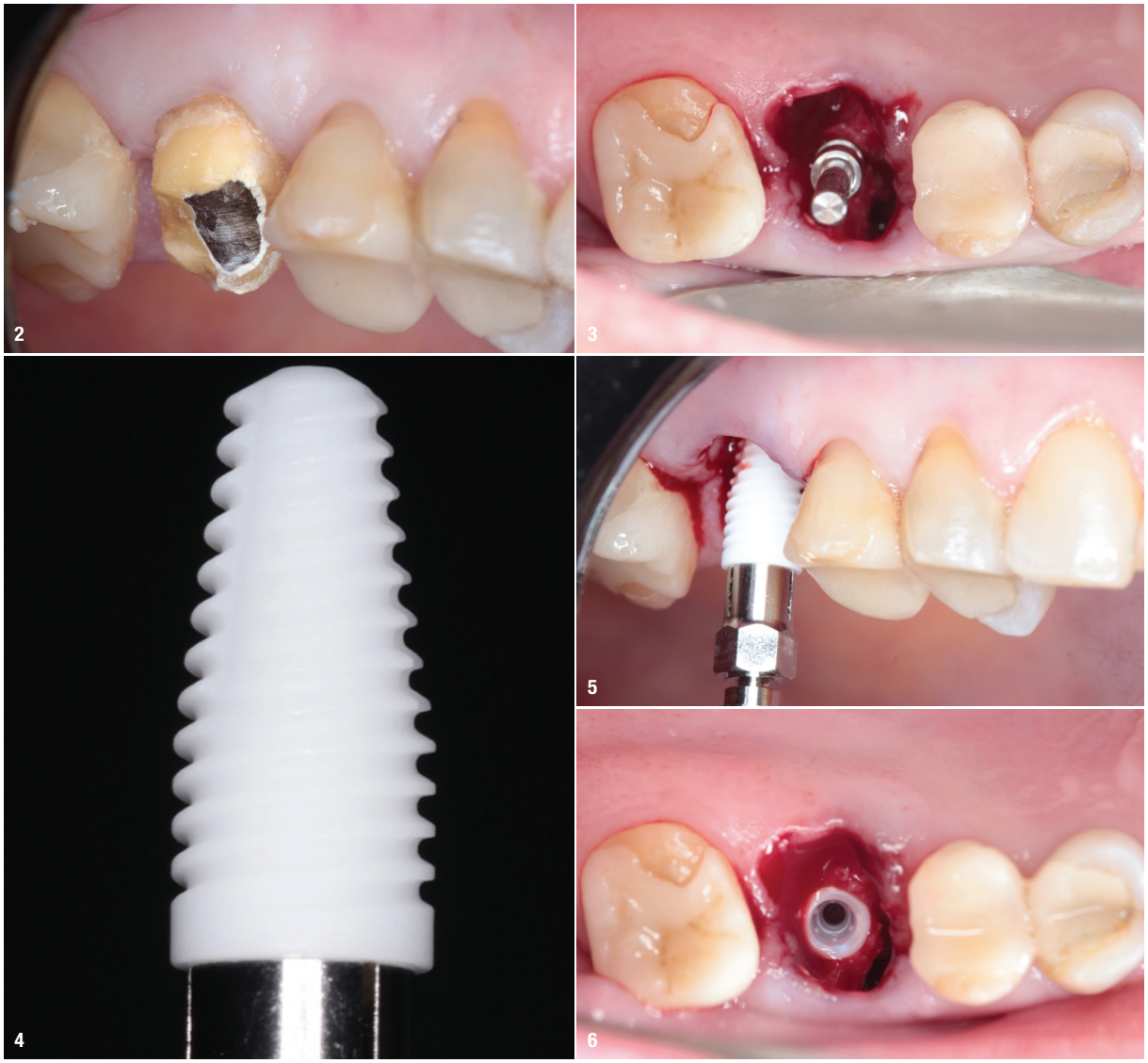


Fig. 2: Pre-op situation before sectioning of the roots. **Fig. 3:** Socket preparation. **Fig. 4:** GZi implant. **Fig. 5:** Placement of the implant **Fig. 6:** Final bone-level position of the implant.

Surgical procedure

After local anaesthesia (4% articaine with 1:100,000 adrenaline, DFL), tooth extraction was performed via a minimally invasive surgical approach. The roots of the first molar were sectioned and extracted separately using delicate periotomes to sever the periodontal ligament and lift the tooth pieces without flap raising (Fig. 2). After extraction, the alveolus was thoroughly curetted to remove any inflammatory tissue and abundantly irrigated with saline solution. The recipient site preparation sequence was performed according to the manufacturer's recommendations (Zi ceramic implant, Neodent) as described in a previous study (Fig. 3).[13] A two-piece yttria-stabilised zirconia implant (4.3 × 10.0 mm) was placed into the socket to a final insertion torque of 45 Ncm (Figs. 4–6).

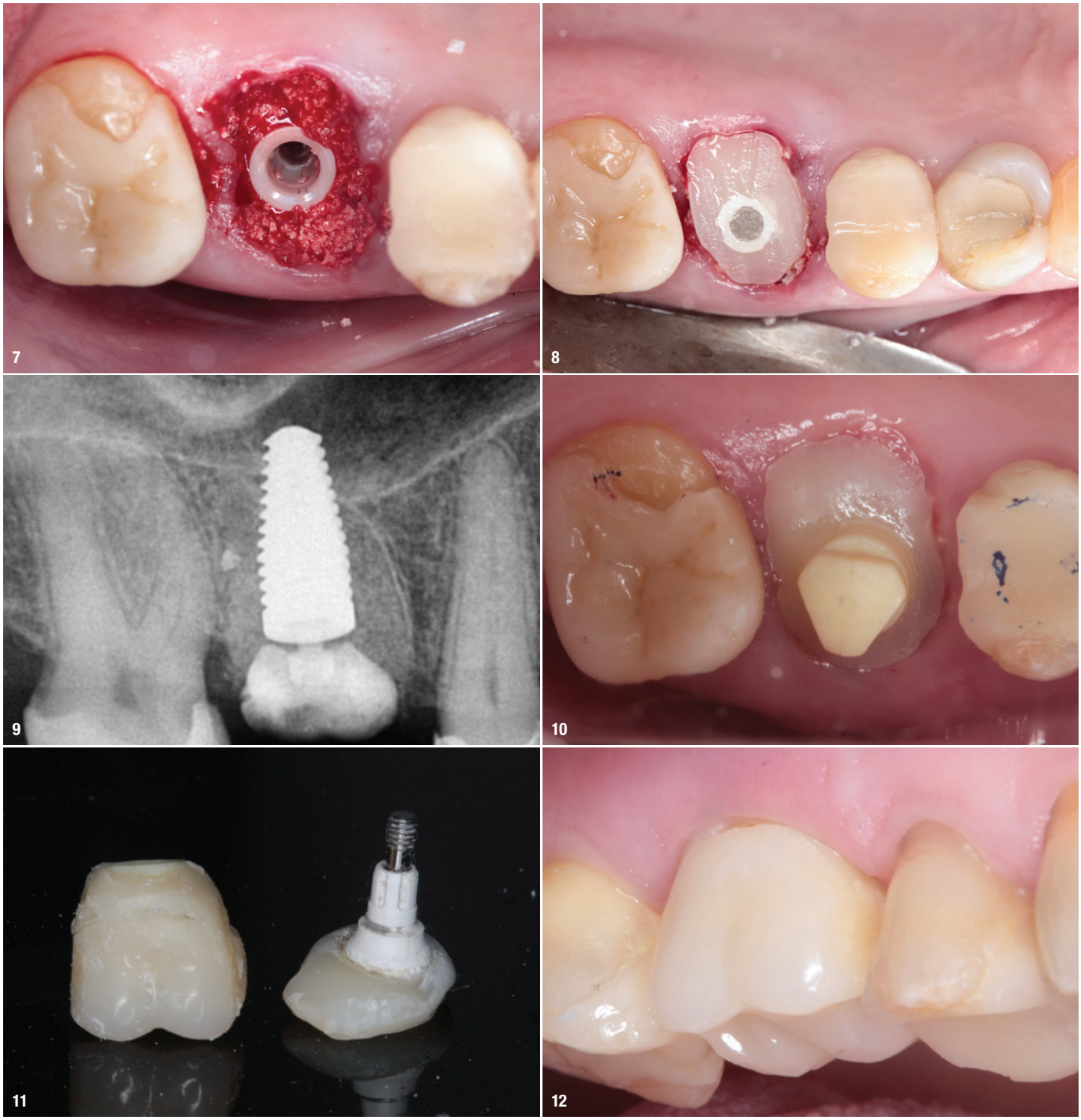


Fig. 7: After placement of the bone substitute material. **Fig. 8:** Customised healing abutment *in situ*. **Fig. 9:** Post-op radiograph with customised healing abutment. **Fig. 10:** Gingival emergence profile carefully copied using light-polymerised flowable resin. **Fig. 11:** Provisional crown and customised healing abutment. **Fig. 12:** Provisional crown *in situ*.

In addition, a bone substitute material (0.5 cm^3 of 0.5–1.0 mm maxresorb granules, Straumann) was used to fill the gaps between the fresh socket walls and the external face of the implant (Fig. 7). A PEEK abutment was selected, and a customised healing abutment was made using light-polymerised flowable resin (Fig. 8). It was not necessary to use a suture to close the surgical wound. At the end of the surgery, a radiograph was taken (Fig. 9).

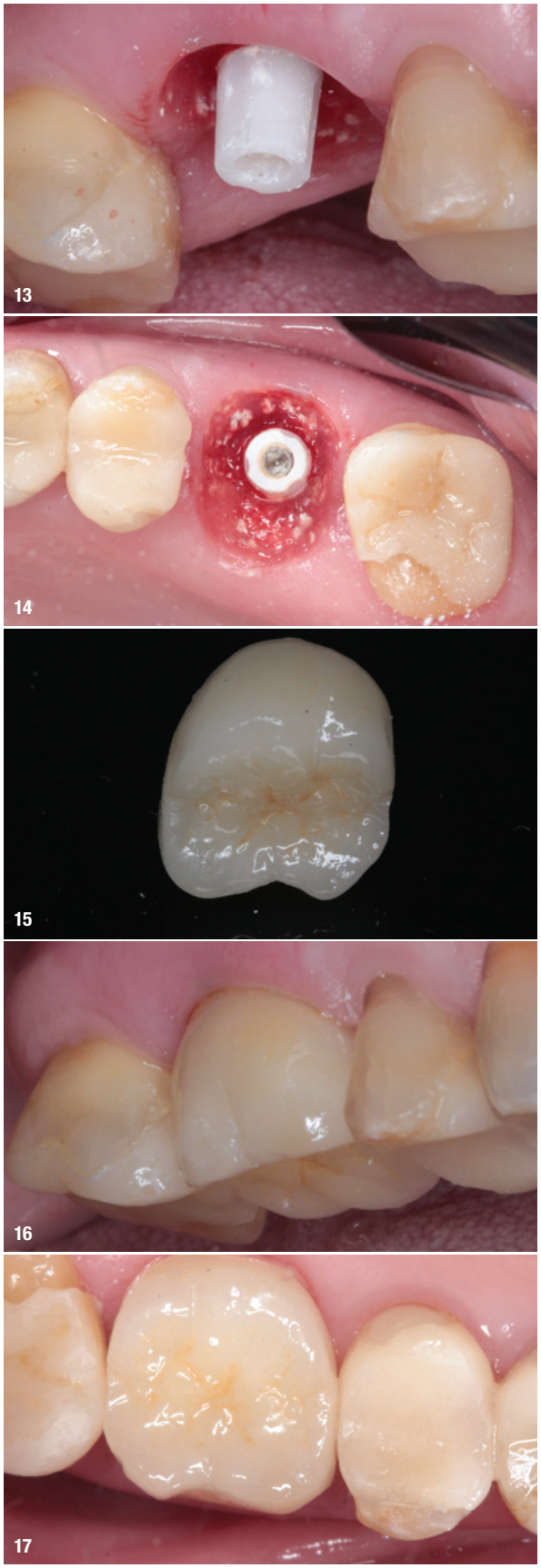
The three-month postoperative period was uneventful. The customised healing abutment was carefully removed, and conventional impressions were taken with a putty and medium-bodied addition-cured silicone using the closed-tray technique. A provisional crown was made with self-polymerising resin and seated. It remained in the patient's mouth until the day of cementation of the definitive crown. It is important to highlight that the gingival emergence profile was carefully copied using light-polymerised flowable resin (Figs. 10–12). A lithium disilicate crown was manufactured and cemented on to the prosthetic abutment with adhesive cement (Figs. 13–18).

After cementation of the definitive crown, the stability of the marginal bone level was observed on the final radiograph in relation to the immediate postoperative radiograph. The patient has been followed up periodically for the last ten months, and there have been no complications to date. At the end of the treatment, she was asked to rate her degree of satisfaction with the aesthetic results of the treatment according a visual analogue scale and selected "very satisfied".

Discussion

To our knowledge, this is the first ten-month follow-up clinical report on the use of this two-piece zirconia implant system in the molar region using a customised healing abutment. According to a European Federation of Periodontology consensus report, peri-implant soft-tissue health is an important criterion for implant success.[14] In the present study, after ten months of follow-up, seven of them under occlusal loading, the soft tissue around the ceramic implant appeared healthy and to be of a natural colour. It should be noted that the use of a customised healing abutment favoured the maintenance of the soft- and hard-tissue architecture around the ceramic implant, as previously reported in another study, which used PEEK healing abutments seated on titanium implants replacing posterior teeth.[15]

Studies on animals have shown that the osseointegration potential of zirconia is comparable to that of titanium implants.[13,16] The implant in this case achieved osseointegration during the first three months, and no bacterial plaque adhering to the surface of the implant or prosthetic abutment was observed during the follow-up



Figs. 13 & 14: Clinical views of the healthy peri-implant tissue free of inflammation. **Fig. 15:** Lithium disilicate crown. **Figs. 16 & 17:** Clinical views of the definitive crown.

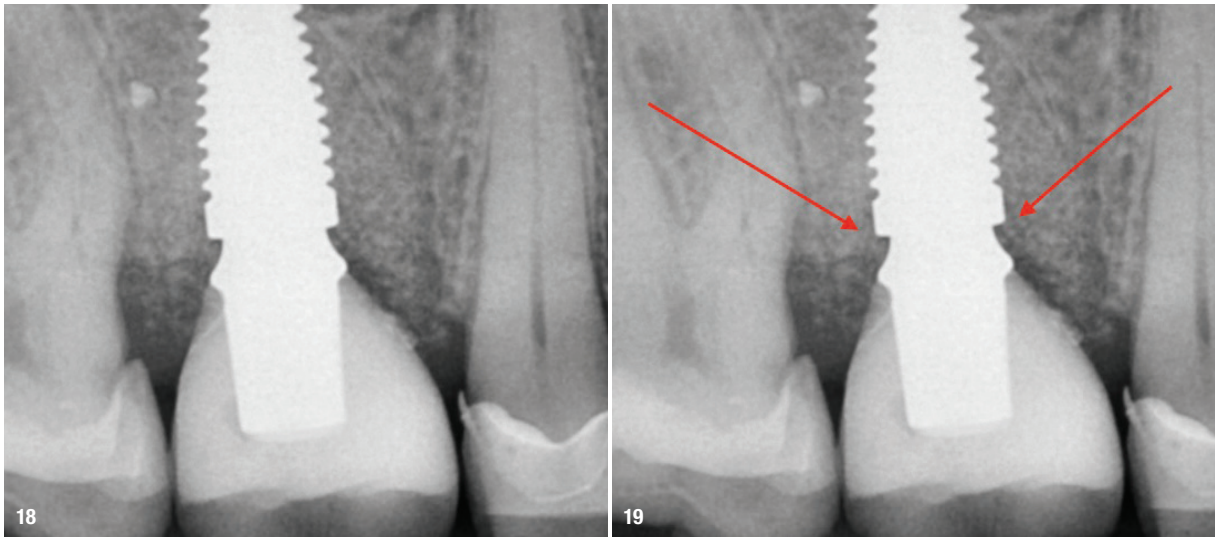


Fig. 18: Final radiograph with the definitive crown. **Fig. 19:** Radiograph at ten months showing marginal bone stability.

consultations. This is an important finding, since the adhesion of bacterial plaque is a critical problem and can be the first stage of peri-implant disease.[17] Indeed, studies show less affinity for bacterial plaque on zirconia surfaces compared with titanium surfaces.[18] A prospective clinical study showed that patients who received two-piece zirconia implants had low plaque and bleeding rates after six years, suggesting healthy peri-implant tissue.[19] In this same research, as well as in our study, the authors observed that the marginal bone levels remained stable over time.[19]

Yttria-stabilised zirconia, such as used for the system employed in the present study, is the material of choice for the manufacture of ceramic implants, not only because of the aesthetic advantages, but also because it is a material resistant to corrosion, wear and tear, and especially masticatory forces.[20] Another important point reported in the current study was the high patient satisfaction reported, also found by another study that investigated the performance of zirconia implants.[21]

It should be noted that, although ten months is a short follow-up time, there were no clinical, biological or radiographic complications, and both the bone level around the implant and peri-implant health were maintained.

Conclusion

This clinical case suggests that treatment with this new two-piece zirconia implant using a customised healing abutment for soft- and hard-tissue maintenance is a safe and reliable alternative in oral rehabilitation involving a posterior tooth. Studies with a higher number of implants and a longer follow-up time are necessary to confirm our findings, and the patient involved in this case will continue to be monitored.

about the author

Dr Alexandre Marques Paes da Silva graduated in dentistry from the former Universidade Gama Filho in 2005 and obtained a master's degree in dentistry from the Universidade Veiga de Almeida in 2017 and a PhD in dentistry from Estácio de Sá University in 2020, all in Rio de Janeiro in Brazil. He is currently pursuing postdoctoral research in dental prosthetics with an emphasis on implant dentistry (ceramic implants) at the State University of Rio de Janeiro. He is a member of the International Team for Implantology and of the International Academy of Ceramic Implantology. Dr Marques has experience in dentistry and focuses mainly on immediate placement and loading in implantology, ceramic implants and oral rehabilitation in atrophic maxillae.

Literature

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