Immediate two-piece ceramic implants with immediate provisionalisation in the posterior region

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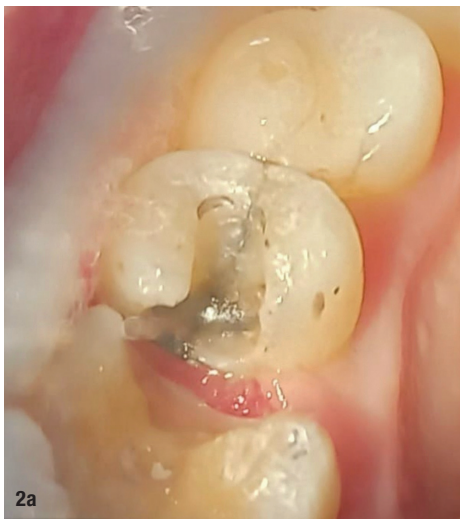
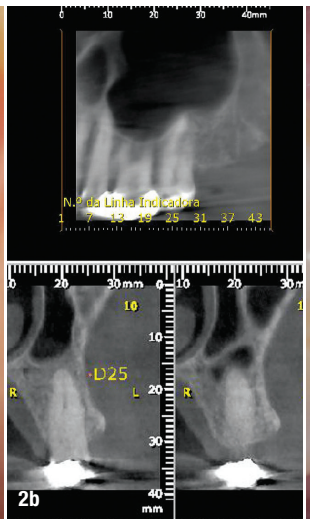
The present case report aims to describe the clinical and radiographic performance of ceramic implants placed in the posterior regions of two patients who visited the private SobreImplantes clinical study centre in Rio de Janeiro in Brazil. CBCT was used to carry out surgical planning, and periapical radiographs were used in the immediate postoperative period and in the follow-up consultations. The implants were placed into fresh sockets (immediate) and immediately provisionalised. After receiving the implants, the patients remained under follow-up for three months after surgery. The temporary prostheses were then removed and replaced with definitive crowns. The patients remained under follow-up for 18 months, over which time it was possible to observe clinical and radiographic success in relation to osseointegration, stability of the marginal bone level and peri-implant health of both implants. The patients were asked at the end of treatment and in follow-up consultations about their degree of satisfaction with the aesthetic result of the treatment using a visual analogue scale, and both patients were very satisfied. No mechanical or biological complications were observed during this period.

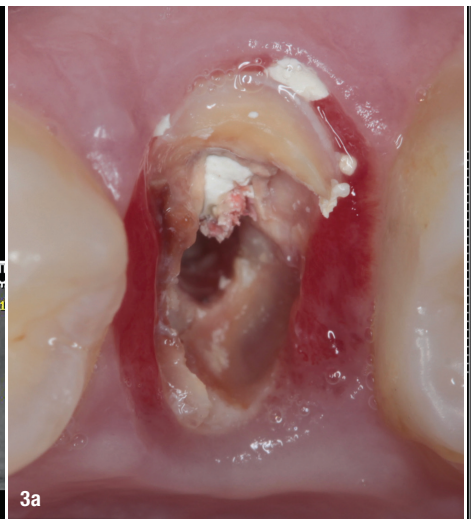
Fig. 1: Neodent Zi Ceramic Implant System.

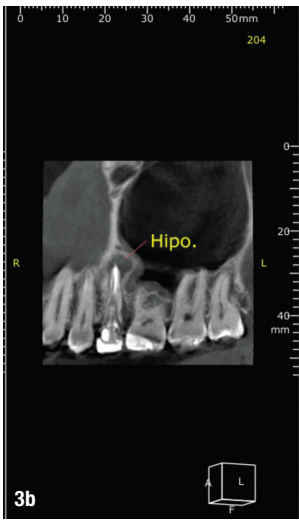
Introduction

The possibility of having a more aesthetic alternative capable of withstanding masticatory forces has expanded the use of zirconia implants in recent years.[1] Among its advantages, we highlight its aesthetics (colour similar to that of teeth), resistance (high flexural strength of 900–1,200 MPa, hardness of 1,200 Vickers, and Weibull modulus of 10–12), and biocompatibility (low affinity for bacterial plaque).[2]









Figs. 2a & 3a: Initial clinical situation. **Figs. 2b & 3b:** Initial tomographic imaging examination.

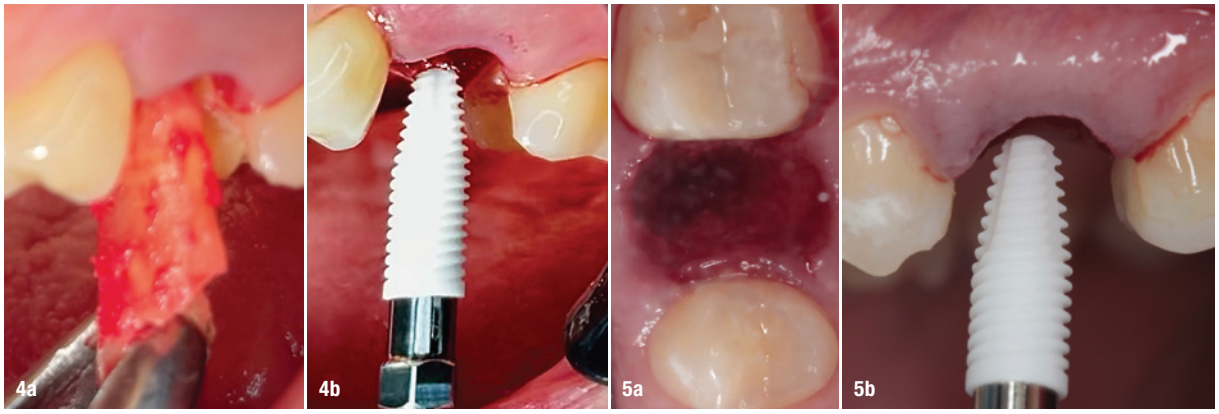


Fig. 4a: Minimally invasive extraction. **Fig. 4b:** Neodent Zi 4.3 × 11.5 mm. **Fig. 5a:** Fresh socket oclusal view. **Fig. 5b:** Neodent Zi 4.3 × 10.0 mm.

The first ceramic implants to be designed and manufactured were of the one-piece type;[3,4] however, this implant design presents surgical and prosthetic limitations: there may be wound healing complications and unintentional loading during the healing period, especially in cases where primary stability has not been achieved, and poor positioning of the implant may result in the need to refine the most coronal portion of the implant, thus reducing its mechanics.[5] With the aim of overcoming these limitations, several two-piece ceramic implant systems have emerged more recently, minimising these problems and providing prosthetic versatility, such as the possibility of angulation of the abutment and better positioning of the implant.[6,7]

The objective of this case report is to demonstrate the clinical and radiographic performance of a two-piece ceramic implant system (Neodent Zi, Straumann; Fig. 1) employed in two patients who visited the SobreImplantes private clinic located in the city of Rio de Janeiro in Brazil in order to undergo oral rehabilitation of posterior teeth with single implants and to report the degree of satisfaction of these patients in relation to the aesthetics of the treatment. Both patients were non-smokers and had good general health or controlled systemic conditions. For planning and diagnosis, the patients were asked to undergo CBCT (Figs. 2 & 3).

Surgical procedure

The same surgical protocol described by da Silva et al. was applied to both patients.[8] Antibiotic prophylaxis (four tablets of 500 mg amoxicillin) was performed one hour before, and the patients rinsed their mouths with 0.12% chlorhexidine for 30 seconds before receiving local anaesthesia with 4% articaine and 1:100,000 adrenaline.

Tooth extraction was performed according to a minimally invasive surgical approach, using delicate periotome to rupture the periodontal ligament and elevate the tooth. After extraction, the tooth socket was thoroughly debrided in order to ensure removal of any type of inflammatory lesion of endodontic and/or periodontal origin, and abundant irrigation with saline solution was employed. Once the instrumentation had been performed, the ceramic implant was inserted into the socket using a contra-angle handpiece previously adjusted to 24 rpm and 30 Ncm (Figs. 4 & 5), and the socket was subsequently filled with bone substitute material (0.5 cm^3 maxresorb, 0.5–1.0 mm, Straumann; Fig. 6). The dimensions of the implants were 4.3 × 11.5 mm and 4.3 × 10.0 mm, respectively. To receive the immediate temporary crowns, abutments were selected for prostheses cemented to zirconia: an abutment angled at 17° in one case and a straight component in the other (Figs. 7 & 8). Finally, the temporary crown was seated, and a periapical radiograph was performed in the immediate postoperative period (Figs. 9 & 10).

After three months, the patients were re-evaluated, and there had been no complications during the healing period. Following a conventional workflow, the definitive crowns were manufactured. It is important to highlight that the gingival emergence profile was carefully copied, using a light-polymerised flowable resin (Master Flow, Biodinamica; Fig. 11). One patient received a milled crown (IPS e.max, Ivoclar Vivadent; Fig. 12) and the other a milled monolithic zirconia crown (Fig. 13), and the pros-

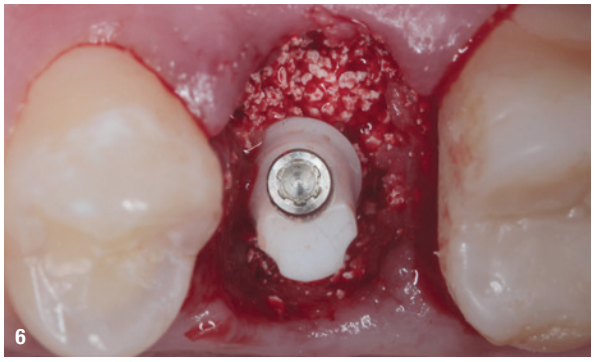
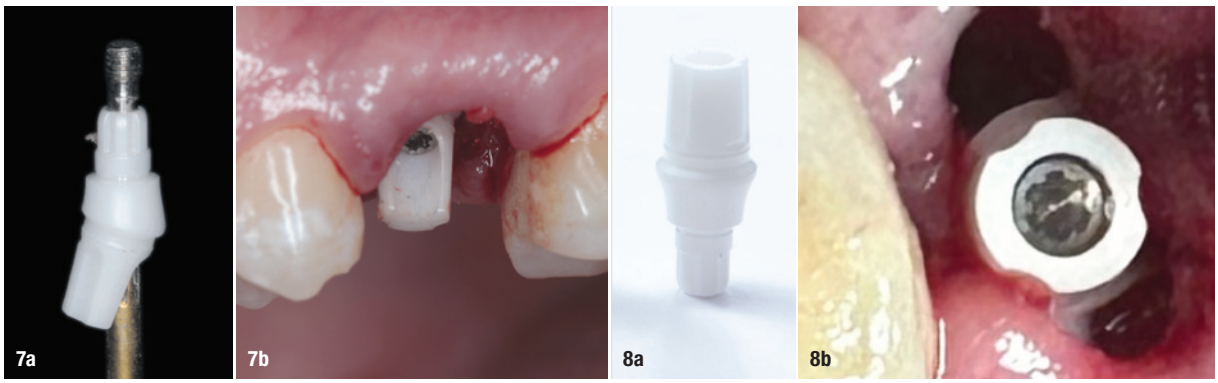
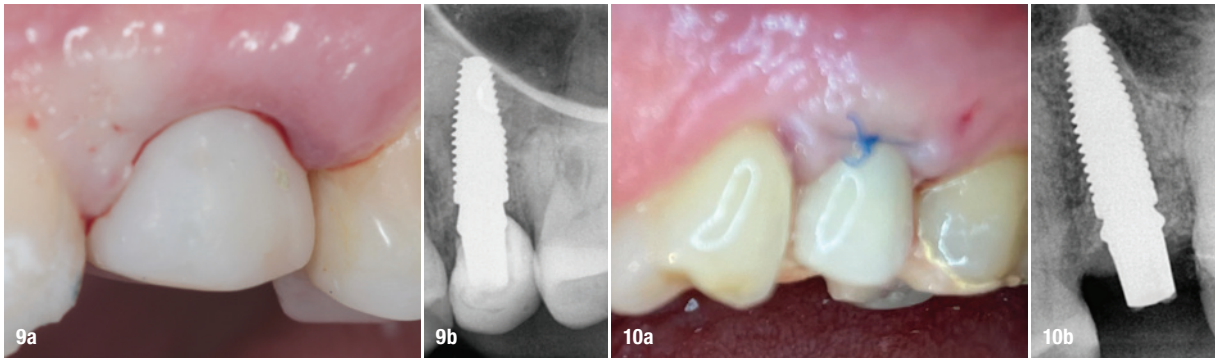


Fig. 6: Occlusal view annulled abutment and bone substitute (maxresorb).



Figs. 7a & b: Angled CR abutment. **Fig. 8a:** CR Straight Abutment. **Fig. 8b:** Oclusal view of CR Straight Abutment.



Figs. 9a & 10a: Provisional crown—immediate postoperative. **Figs. 9b & 10b:** Immediate postoperative radiograph.

thetic abutments were cemented to the implants with adhesive cement (Relyx U200, 3M).

Radiographic analysis

At the end of the prosthetic treatment, once the definitive crowns had been cemented to their respective implants, a periapical radiograph was taken to observe the stability of the marginal bone level (Fig. 14) in comparison with the immediate postoperative radiograph. To analyse changes in the marginal bone level, ImageJ software (National Institutes of Health) was used. The diameter of the implant was used as a reference point for calibrating the radiographic images, as it is a precise measurement and known by the operators. Bone changes after 18 months of follow-up were measured on radiographs using the implant–abutment interface (easily identified) as a reference up to the point of the first bone–implant contact in the mesial and distal regions of each implant, comparing them with the radiograph taken postoperatively. These measurements were carried out by two experts, who were first subjected to the inter-examiner kappa test (0.86—almost perfect agreement).

Level of patient satisfaction

The patients were followed up periodically for 18 months, and at the time of writing, there had been no complications. At the end of the treatment, both patients said they were very satisfied when asked about their level of satisfaction with the aesthetic result of the treatment according to a visual analogue scale (Fig. 15).

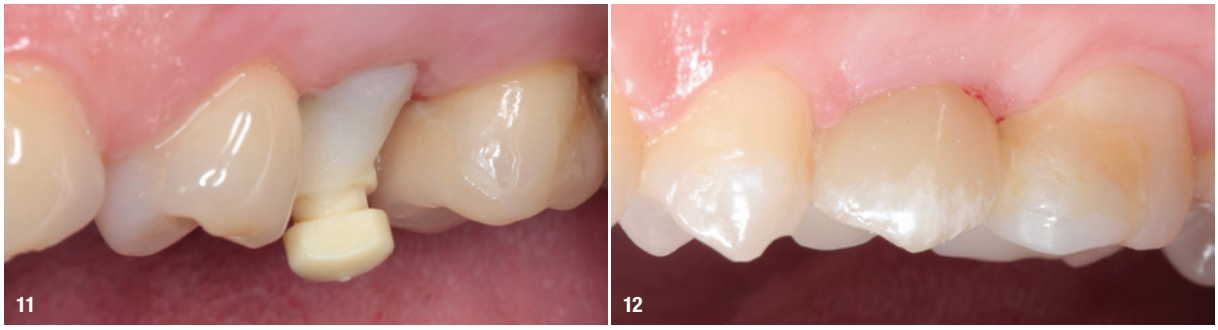
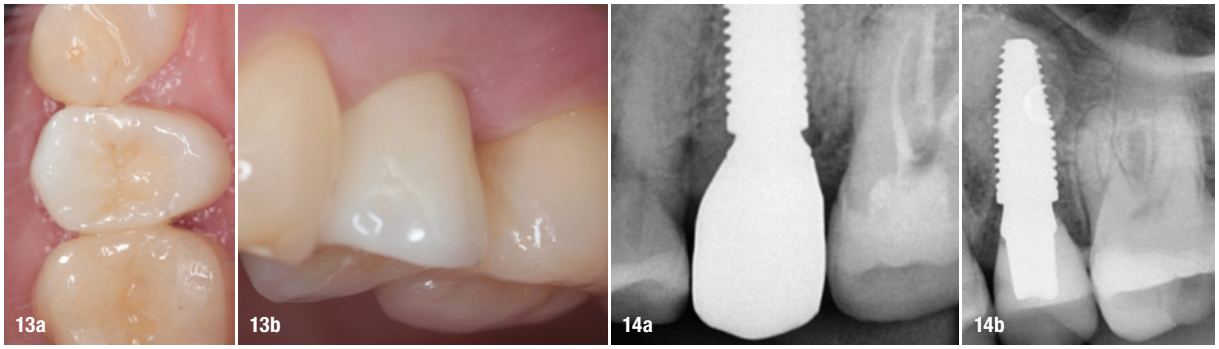


Fig. 11: Analog flow—emergency profile molding. **Fig. 12:** Cemented definitive crown (e.max).



Figs. 13a & b: Milled monolithic zirconia crown. **Fig. 14a:** X-ray of the last follow-up appointment (18 months)—milled monolithic zirconia crown. **Fig. 14b:** X-ray of the last follow-up appointment (18 months)—milled e.max crown.

Discussion

The objective of the present case report was to evaluate the clinical and radiographic performance of the Neodent Zi two-piece ceramic implant system in the posterior regions of two patients. After 18 months of follow-up, no technical or biological complications were observed, demonstrating clinical and radiographic success of the implants and satisfactory preservation of the shape of the soft and hard tissue. Other studies using this ceramic implant system have shown results like ours after 12 months.[7–10] Both patients presented with properly osseointegrated implants during the first three months, in agreement with animal studies that reported that the osseointegration of zirconia implants is similar to that of titanium implants under different loading conditions, and osseointegrated zirconia implants have increased removal torque values.[11, 12]

Another very important point observed in the present study was the health of the peri-implant tissue around the ceramic implants after 18 months. According to current literature, zirconia surfaces have a lower affinity for bacterial plaque compared with titanium surfaces.[13]

It is worth mentioning that, although an 18-month follow-up period is short, during this entire period, there were no clinical or biological complications in these cases, and the bone level around the implants was maintained. The implants showed no marginal bone loss, a result similar to that of other studies that evaluated the same implant system.[8–10]

Fig. 15: Visual analogue scale (VAS).

Conclusion

Despite the limitations of the present case report, after 18 months of follow-up, the two-piece zirconia implant system used appears to be a safe and reliable alternative in oral rehabilitation involving posterior teeth. Further studies must be carried out to confirm our findings, and the cases presented here will continue to be monitored.

Literature

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