12-months follow-up—case series

Oral rehabilitation with two-piece ceramic implants

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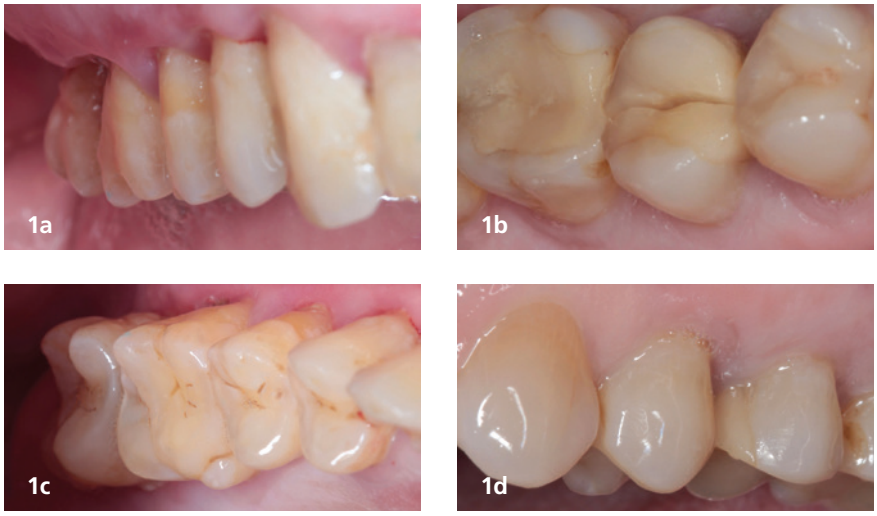
This case series aimed to describe the clinical and radiographic performance of four two-piece ceramic implants placed in two patients in posterior sites of the upper jaw.

Cone beam computed tomography (CBCT) was used in both cases for surgical planning, and periapical radiographs were used during the implant follow-up period. The implants were placed in fresh (immediate) sockets, immediately positioned, and the gaps in the sockets were filled with a bone substitute. Three months after surgery, the temporary prostheses were removed and three lithium disilicate crowns and one milled monolithic zirconia crown were made by impression with addition silicone. Both patients were followed for at least 12 months, during which clinical and radiographic success was observed with respect to osseointegration, stability at the marginal bone level, and peri-implant health of all implants.

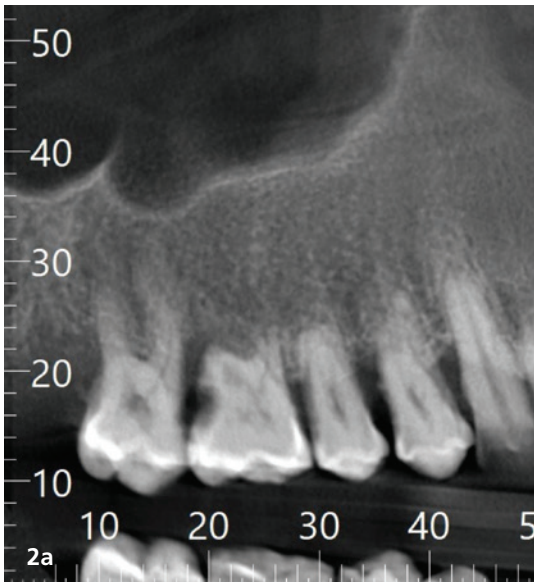
Introduction

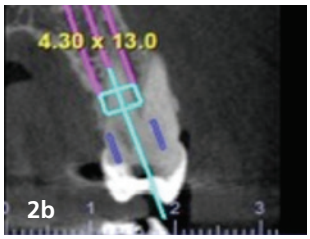
Metal-free restorative solutions, especially zirconia implants, have received increasing attention in implant dentistry due to their superior easthetic and biocompatible properties compared to traditional titanium implants.[1,2] Although titanium has been widely and successfully used, its disadvantages include possible allergic reactions and sensitivities in some patients.[3] Due to their white colour, zirconia implants integrate better with the gingival tissue and natural dentition, especially in aesthetically sensitive areas with grayish discolouration that may be visible, especially in cases of patients with thin gingival phenotype.[4] In response to these limitations, zirconia implants, a high-strength ceramic, have emerged as an attractive alternative for the rehabilitation of not only anterior and posterior teeth. Recent studies indicate that zirconia offers excellent mechanical strength and chemical stability, in addition to being highly biocompatible due to its low affinity with bacterial plaque, reducing the risk of inflammation and, consequently, favouring the maintenance of peri-implant health over time.[5,6]

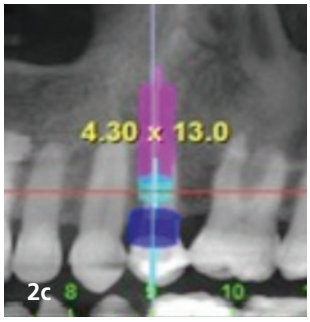
From a clinical point of view, zirconia implants demonstrate success rates comparable to titanium implants, with promising results in terms of osseointegration.[7,8] However, the literature still points to the need for long-term studies, especially regarding the resistance of ceramic implants under conditions of extreme functional loads and their performance in complex rehabilitations. In this sense, the objective of the present study was to observe the clinical and radiographic performance of two-piece ceramic implants in posterior areas of the upper jaw after a follow-up period of 12 months.



Figs. 1a–d: Initial clinical situation of patient 1—Upper right premolars and first molar (a & b). Initial clinical situation of patient 2—Left second premolar (c & d).







Figs. 2a–c: Initial tomographic images.

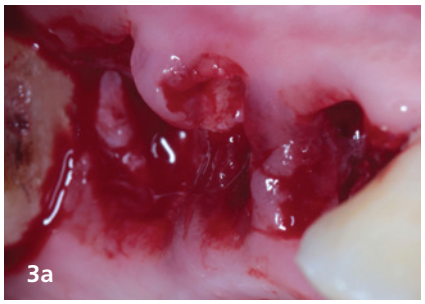
Case reports

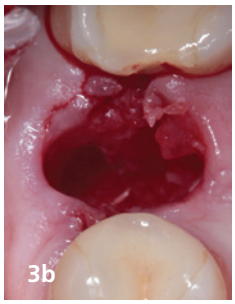
In March 2023, two patients presented to the private clinical trial center Sobre-Implantes in Rio de Janeiro, Brazil, seeking oral rehabilitation with single dental implants—immediate or delayed, with or without immediate loading. One patient required removal of the upper right premolars and first molar due to root resorption of the same (Figs. 1a & b), and the other patient had a fractured left second premolar (Figs. 1c & d). Comprehensive planning and diagnosis were facilitated by performing cone beam computed tomography (CBCT) scans (Figs. 2a–c) and using periapical radiographs during the immediate post-operative period and subsequent follow-ups to assess marginal bone stability. All patients in this case series were non-smokers in good general health, or had controlled systemic conditions. Despite effective bacterial plaque control, all patients underwent supragingival scaling and root planning.

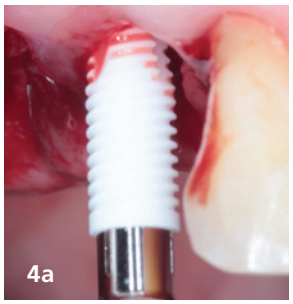
Surgical procedure

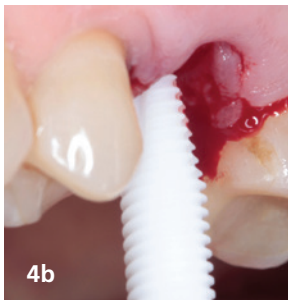
All patients received identical surgical procedures, starting with antibiotic prophylaxis: four 500 mg tablets of Amoxicillin administered one hour prior to surgery. They rinsed their mouths with 0.12 % chlorhexidine for 30 seconds before receiving local anaesthesia with Articaine 4 % (1:100,000).

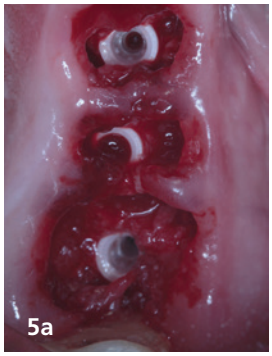
The implants were placed in fresh sockets. Tooth extractions were performed using a minimally invasive surgical approach with delicate periotomes to sever the periodontal ligament, allowing for complete tooth removal without raising a flap (Figs. 3a & b). Post-extraction, each socket was meticulously examined to eliminate any inflammatory lesions of endodontic or periodontal origin, followed by abundant saline irrigation. After appropriate bur instrumentation, each ceramic implant was inserted into its respective socket using a contra-angle adjusted to 30 rpm and

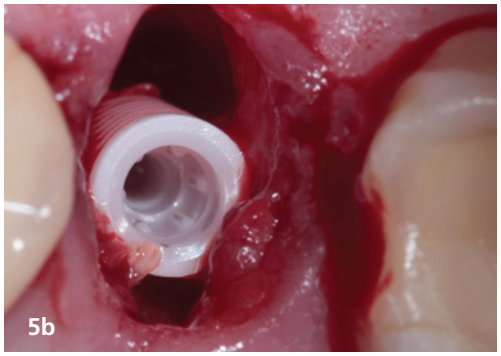


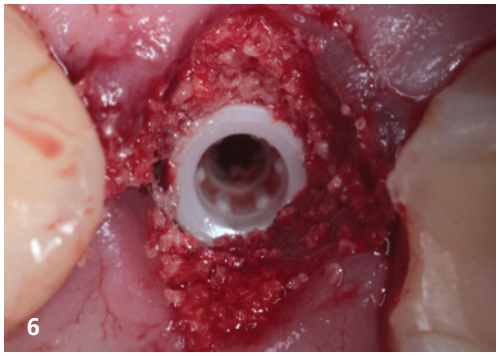




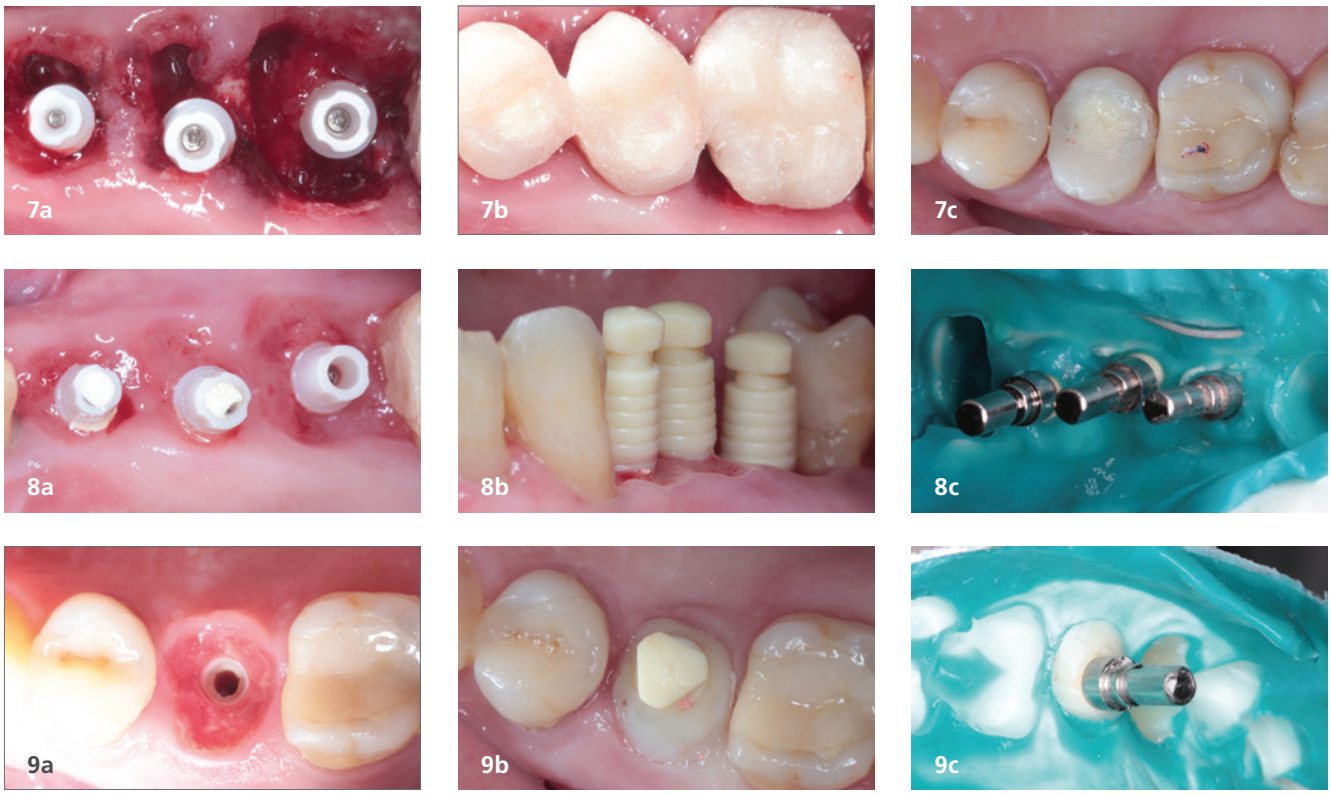








Figs. 3a & b: Preservation of fresh sockets after atraumatic tooth extraction. **Figs. 4a & b:** Implant placement. **Figs. 5a & b:** Occlusal view of fresh sockets. **Fig. 6:** Implant and bone substitute.



Figs. 7a & b: Occlusal view of the three zirconia Implants with the CR abutment and provisional crowns, respectively. **Fig. 7c:** Occlusal view of the temporary crown in the second premolar area. **Figs. 8a–c:** Conventional workflow with closed tray technique with the aid of addition silicone for molding premolars and first molar. **Figs. 9a–c:** Conventional workflow with closed tray technique with the aid of addition silicone and flow resin (emergence profile) for molding the second premolar area.

35 Ncm (Figs. 4a–5b). Gaps were filled with bone substitute material (maxresorb® 0.5–1.0 mm, 0.5 cc, Straumann®; Fig. 6).

Immediate provisional restoration

In this case series, immediate provisional restorations were performed using cemented zirconia retention pillars (CR Zi Pillar®). At the time of surgery, provisional crowns made of self-curing acrylic resin were installed (Figs. 7a–c).

Prosthetic procedure

Three months post-implant placement, the patients returned for definitive prosthetic work. All implants showed no complications during the healing period. Conventional impressions were taken using addition silicone with a regular body and mass, employing the closed tray technique (Figs. 8a–c). Notably, in one case, the gingival emergence profile was carefully replicated using light-cured flow resin (Master Flow, Biodinâmica; Figs. 9a–c). Three Lithium disilicate crowns (e.max®, Ivoclar Vivadent) and one milled monolithic zirconia crown were fabricated (Figs. 10a & b) and cemented to the prosthetic abutments using adhesive cement (Dual RelyX™ U200, 3M; Figs. 11a & b).

Follow-up

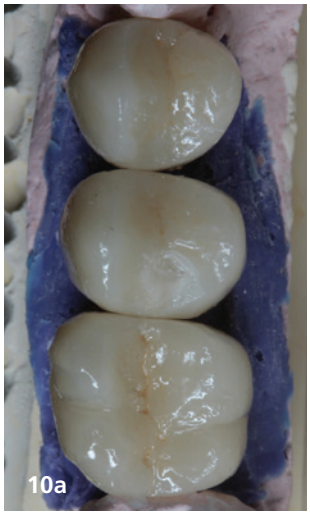
An X-ray was taken after cementation of the definitive crowns, revealing stable marginal bone levels compared to the immediate postoperative X-ray. Patients were followed up periodically for 14 months, with no reported complications in either clinical or radiographic examinations (Figs. 12a & b).

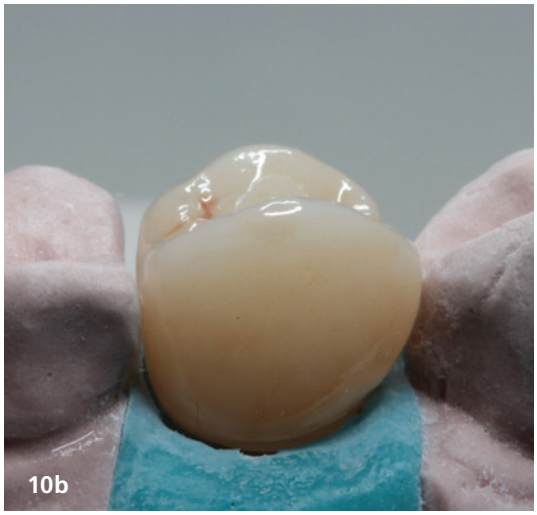
Results

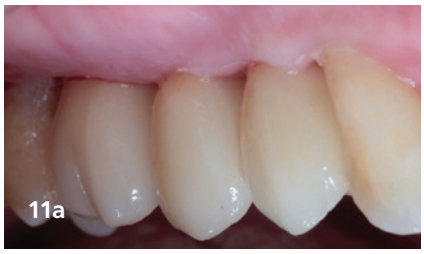
This case series involved four ceramic implants placed in two healthy individuals in March 2023, monitored over a 12-month period. One patient was a healthy 40-year-old man who received three implants, while the other was a 55-year-old healthy woman who received one implant. All implants had a diameter of 4.3 mm and a length of 13 mm. The insertion torque for the implants ranged from 35–40 Ncm, enabling immediate provisional placement. After 12 months of follow-up, both soft- and hard-tissue stability was observed, with no bone loss detected in any of the implants included in the study.

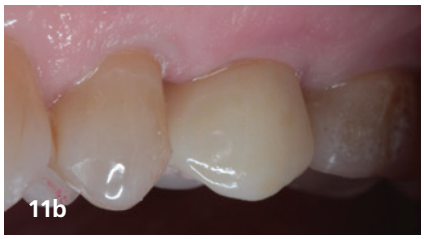
Discussion

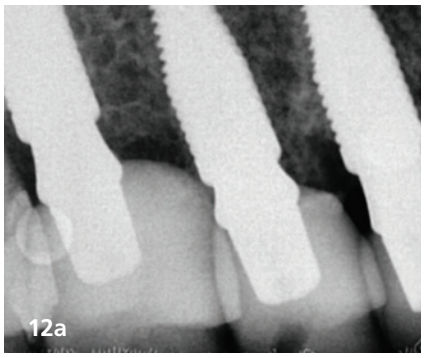
This case series aimed to evaluate the performance of four implants of a two-piece ceramic implant system (Zi ceramic implant®, Neodent) placed in the posterior region of two patients. After at least 12 months of follow-up, no technical or biological complications were observed in any of the cases, demonstrating clini-











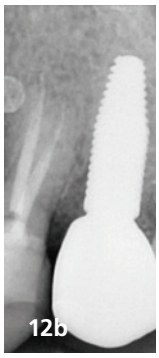


Fig. 10a: Definitive crowns in lithium disilicate. **Fig. 10b:** Definitive crown in monolithic zirconia. **Figs. 11a & b:** Clinical appearance after 12 months of follow-up. **Figs. 12a & b:** 12-month follow-up periapical radiograph.

cal and radiographic success of implant osseointegration and satisfactory preservation of the shape of soft and hard tissues, in agreement with the findings of other studies that used the same implant system and were followed for the same 12-month period.[8,10] Previous studies performed in animals have demonstrated that osseointegration of zirconia implants is reliable and safe under different loading conditions.[11,12] As previously described in this case series, all four implants achieved successful osseointegration during the 12-month follow-up.

There are previous studies showing that zirconia surfaces have a lower affinity for biofilm formation when compared to titanium surfaces.[13] In the present study, it was possible to observe peri-implant tissues free of inflammatory processes and with a healthy appearance (Figs. 12a & b). A prospective clinical study that used the same implant system used in this case series demonstrated that after at least 12 months of follow-up, they did not present any type of peri-implant disease, indicating healthy peri-implant soft tissues.[8] In this same research, as well as in our case series and a prospective clinical study, the authors observed that marginal bone levels were stable over the observed time.[8,10,14] The two patients reported here received ceramic implants in the posterior maxilla and no complications such as implant or abutment fracture were observed. This fact reinforces the findings of other studies that stated that yttria-stabilised zirconia (YTZP) implants are the material of choice for the manufacture of ceramic implants, not only due to their aesthetic and biological advantages, but also because they are resistant to corrosion, wear and especially to masticatory forces.[15] It is worth mentioning that the present series of cases had a follow-up period of 12 months, which is still short, however, during this entire period there were no clinical or biological complications, with emphasis on the maintenance of the bone level around the implants.

Conclusion

Given the limitations of this case series, the two-piece zirconia implant system used is a safe and reliable alternative in the oral rehabilitation of posterior teeth after 12 months of follow-up. Further studies should be performed to confirm our findings and the cases presented here will continue to be monitored.

References

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