Full-arch maxillary rehabilitation using Y-TZP protheses on ceramic implants—18 month follow up

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Nowadays, ceramic materials are increasingly used in the dental field. Ceramic implants, which can be successfully included in different treatment workflows and indications, are today considered reliable thanks to the development of new surfaces, innovative materials and enhanced clinical protocols.

The demand for such metal-free solutions is continuously growing, and there is increased scientific evidence available owing to the growing desire for metal-free treatments and a natural, highly aesthetic appearance, as well as to meet the needs of patients with metal hypersensitivities.

Scientific publications have shown promising preclinical results of ceramic implants and a favourable response of peri-implant tissue thanks to significantly reduced biofilm formation.[1] For example, a prospective clinical study reported a 100 per cent survival rate for ceramic implants and a marginal bone loss of 1.2 ± 0.76 mm after seven years.[2] In addition, a systematic review from 2022 found that all-ceramic restorations supported by ceramic implants demonstrated promising survival rates over a medium-term observation period.[3]

The following case report describes immediate implant placement followed by an immediate restoration protocol using the Straumann PURE Ceramic Implant for the full-arch rehabilitation of the maxilla.

Initial situation

A healthy 63-year-old female patient came to our clinic seeking dental treatment for her upper jaw. She reported being a non-smoker and having no relevant medical history or allergies. Her chief complaint included aesthetic and functional issues. She had generalised dental pain and mobile teeth that did not allow her to eat properly and affected her quality of life. Moreover, she was dissatisfied with the shape, distribution and colour of her maxillary teeth. She also requested an immediate fixed metal-free solution.

The extra-oral examination revealed a smile that slightly exposed the gingiva. The cervices of crowns #12 and 23 were visible. A central diastema was present, and the absence of the maxillary premolars, right molars and left molars was noted (Fig. 1). The intra-oral examination showed missing teeth in the mandible too. The periodontal examination revealed generalised tooth mobility, clinical attachment loss, inflammation, deep periodontal pockets, plaque and bleeding upon probing (Fig. 2). Furthermore, the CBCT examination before treatment showed vertical and horizontal bone loss, periapical lesions and bilateral sinus pneumatisation in the upper jaw (Fig. 3).

Treatment planning

The clinical and radiographic examination indicated that the prognosis for the maxillary teeth was not favourable, and all were considered hopeless.

After discussing various treatment options with the patient and considering her wishes, it was decided on full-arch rehabilitation with yttrium tetragonal zirconia polycrystal (Y-TZP) prostheses with ceramic implants.


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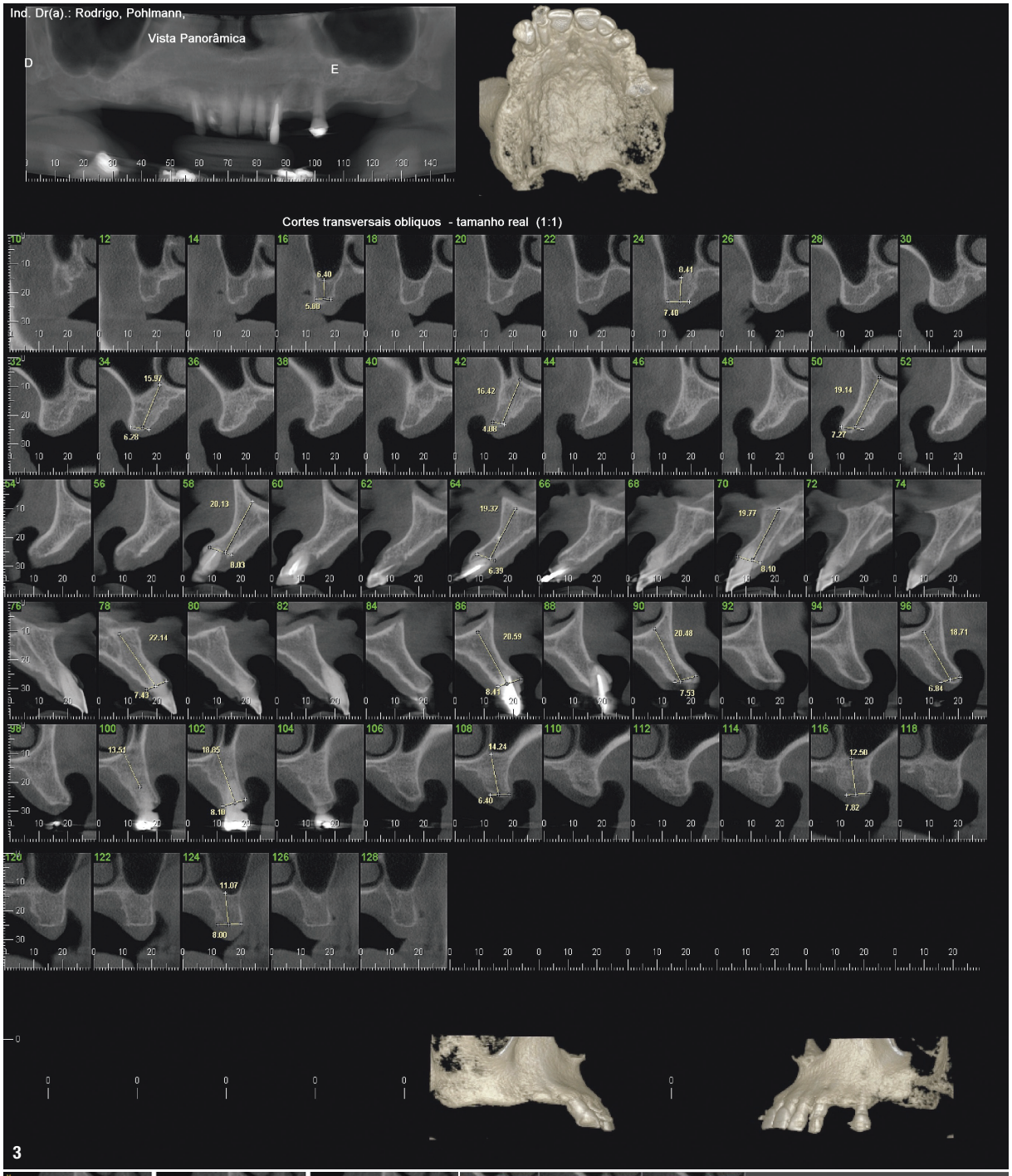
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The main steps for the treatment workflow were the following:

1. oral hygiene instructions, restoration of caries and periodontal treatment in the lower jaw;
2. digital assessment and planning in coDiagnostiX (Dental Wings);
3. positioning of the first surgical guide to define the positions of the anchor pins based on a tooth-supported guide;
4. full-arch extractions of the hopeless teeth in the maxilla;
5. use of two surgical guides for ridge reduction, and drilling protocol stabilisation to enhance the 3D-position of the implants;
6. immediate placement of Straumann PURE Ceramic implants in positions #16 (4.1 x 10 mm), 13 (4.1 x 12 mm), 11 (4.1 x 12 mm), 21 (4.1 x 12 mm), 23 (4.1 x 12 mm), and 26 (4.1 x 10 mm);
7. seating of PEEK temporary abutments for the provisional prosthesis; and
8. final prosthetic restoration with screw-retained proth-eses on implants.

The patient received oral hygiene instructions as part of the cause-related therapy. The lower jaw was periodontally treated, and cavities were restored. Given the patient's financial constraints, it was decided to proceed first with treating the upper jaw, maintaining the periodontal health of the lower jaw until the second phase, when one-piece ceramic implants would be placed.

The treatment planning was defined by full-arch extractions with a guided procedure for ridge reduction and implant placement.

The 3D wax-up model was uploaded to coDiagnostiX to define the amount of ridge reduction and the optimal prosthetically driven 3D implant position (Figs. 4 & 5). The three-guide sequence was drawn to create the perfect ridge contours. The surgical planning was exported to the laboratory to create the perforations in the provisional prosthesis based on the implant positions (Figs. 6 & 7).

Surgical procedure

The surgery was performed under intravenous sedation. Before surgery, the surgical guides were checked for proper fit. The first guide was used to define the position of the anchor pins, and this was based on the tooth-supported guide (Fig. 8).


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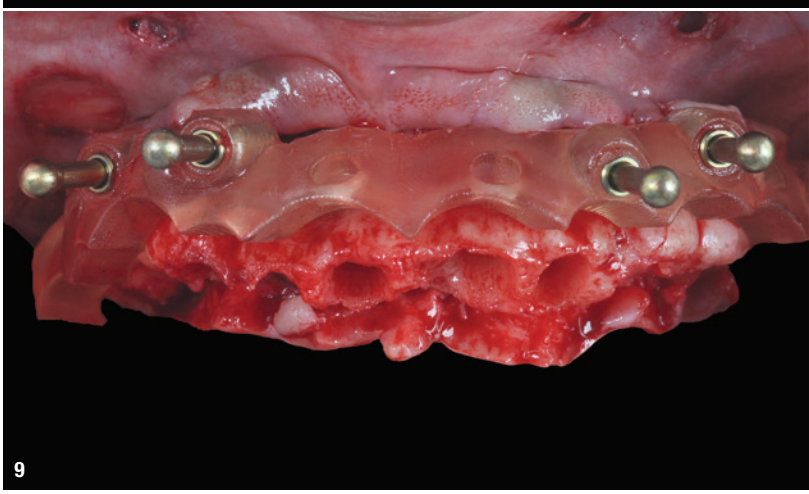
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After atraumatic extractions of the teeth that could not be saved, a full-thickness mucoperiosteal flap was raised with a crestal incision to remove inflammatory tissue and access the bone ridge. The anchor pin marks were located to insert the second guide for ridge reduction (Figs. 9 & 10).

The goal of bone reduction in the case of failing dentition is to improve the alveolar ridge profile and create the planned inter-arch space. The ridge was reduced with a bur using the pre-planned guide contours to achieve the intended inter-arch space for optimal prosthetic dimensions. The third guide was fixed on this guide to drive the implant site preparation and placement. The Straumann surgical cassette was used, and the manufacturer's instructions in the full Straumann technique guide were followed (Fig. 11).

These implants were selected for their design and surface characteristics, which enable excellent primary stability to be achieved in extraction sockets and soft bone. Since the primary stability of all the implants was between 40 and 45 Ncm, immediate loading could be performed using the PMMA pre-milled provisional prosthesis and Straumann PURE temporary abutments (Figs. 12–15).

A VITA CAD-Temp temporary cylinder abutment was attached to each implant with a multi-unit abutment screw. Next, the provisional prosthesis was seated, a passive fit on the abutments was achieved and the occlusion was checked. Since the provisional prosthesis was passively adapted and the occlusion was fine, acrylic resin was used to join the abutments to the prosthesis. Finally, the screws were tightened to 25 Ncm.

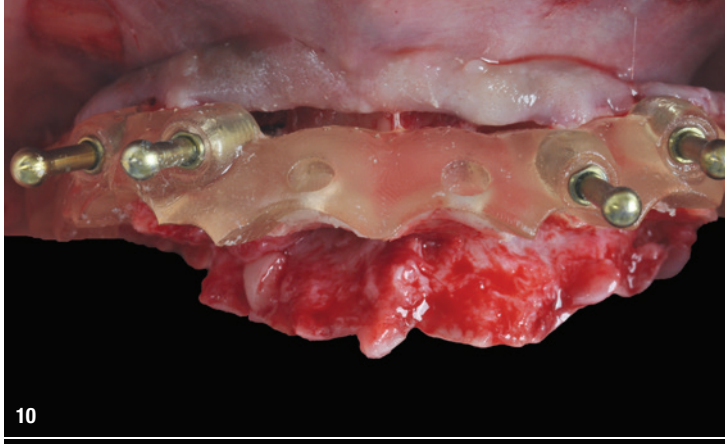
Detailed postoperative instructions were given on oral hygiene and the avoidance of extreme loading when chewing. A liquid diet was recommended for the first two days and only soft food for 30 days thereafter.

The suture removal appointment was scheduled for two weeks postoperatively. Healing was found to be uneventful (Fig. 16).

Final restorative procedure

After four months, the patient had adjusted very well to the new prosthesis and was eager to move forward with the treatment plan (Fig. 17). The soft-tissue contours were exactly as digitally planned (Fig. 18). Implant healing was outstanding, and osseointegration had been achieved.

Therefore, a conventional impression was taken to deliver Y-TZP restoration in three parts for optimal load distribution (Figs. 19 & 20). Straumann PURE Ceramic abutments were used. The occlusion was checked, and no further adjustments were needed (Figs. 21 & 22). Clinical examination at the 18-month follow-up indicated excellent maintenance of the treatment (Fig. 23).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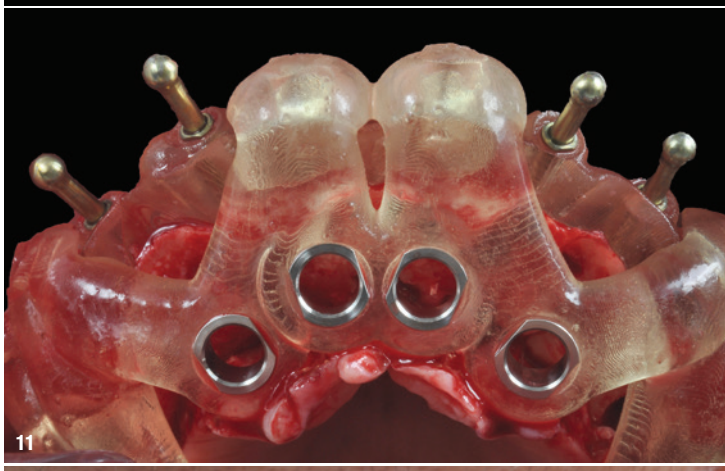
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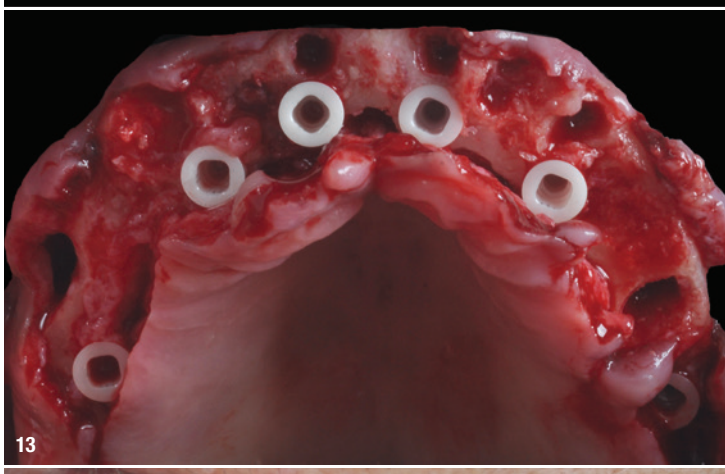
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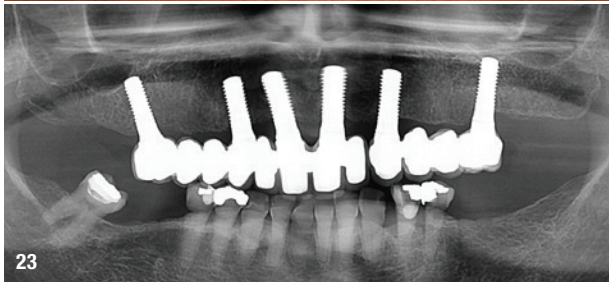
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Conclusion

The outstanding health of both hard and soft tissue was achieved thanks to prudent clinical selection, good planning, accurate 3D implant positioning and an appropriate treatment protocol. These were essential for the treatment success and outstanding aesthetic outcome, which met the patient's requirements.

Straumann PURE Ceramic two-piece implants allow clinicians to use zirconia implants not only for single-tooth cases but also as a reliable solution for multiple teeth, treatment in the posterior zone and challenging clinical situations. Correct planning with coDiagnostiX is essential for achieving successful results by placing the implant with Straumann Guided Surgery.

Literature

about the authors

Dr Rodrigo Pohlmann has been practising dentistry in his clinic for 26 years in the state of Rio Grande do Sul, Brazil. As a specialist in dental prosthesis and implant dentistry, he became acquainted with ceramic implant dentistry at the first IAOCI congress in San Diego, USA and then encouraged this philosophy in Brazil. In addition to applying ceramic implantology in his private clinic, he is now dedicated to coordinating a postgraduate course in implantology in Rio Grande do Sul, Porto Alegre, where case studies documented by students disseminate this new and already important practice among academics. Within a team of ceramic implant experts, Dr Pohlmann experiences in practice the benefits already demonstrated by scientific research.

Dr Rodrigo Gomes Beltrão graduated in dentistry from the Federal University of Rio Grande do Sul in Porto Alegre, Brazil in 2001. After pursuing his master's degree specialising in oral and maxillofacial surgery at the Pontifical Catholic University of Rio Grande do Sul in 2003, he got his PhD in dentistry (oral and maxillofacial surgery) at the same alma mater in 2009. He has been an advanced surgical implant trainee at UCLA, USA and received a post graduate degree in digital dentistry.
Dr Beltrão is CEO of the BeEasy School, Innovation Advisor at Biolab3D, a founding member of ABICeram Brazil as well as an ITI member. He has a private practice in Porto Alegre, Brazil and also works as an adjunct professor in the master's programme of dentistry at the Porto Alegre campus.

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