Small-diameter implants for single anterior restorations

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Case 1:
Small vestibulo-palatal bone volume

A 42-year-old patient presented with bilateral agenesis of the maxillary lateral incisors (Fig. 1). The smile line analysis indicated a low smile line associated with toned lips. The oral examination showed small mesiodistal spaces in regions #12 and 22, as well as a rather thick gingival biotype.

The patient’s reason for consultation was aesthetic. After discussing alternative solutions with the patient—orthodontic space closure, replacement with fixed prostheses (bridge or crowns)—the patient ultimately chose implant-supported prostheses. We worked in close collaboration with an orthodontist colleague, Dr Frédéric Chalas, who took responsibility for adapting the mesiodistal spaces, which were required for the placement of the endosteal implants in regions #12 and 22. We saw the patient again after 14 months of orthodontic treatment (Figs. 2a & b), which consisted of wearing a multi-bracket appliance to open up the spaces at

Fig. 1. Baseline panoramic radiograph. _The limited bone volume often present in anterior zones means that the use of standard-diameter implants is not always possible. In order to avoid bone grafts, we use narrow implants with satisfactory results.

By reviewing four clinical cases, the author demonstrates how the replacement of maxillary lateral incisors and mandibular incisors can be considerably simplified through the use of small-diameter implants, while providing results that are entirely satisfactory to the patient both aesthetically and functionally.

Figs. 2a & b. The clinical situation at the end of orthodontic treatment.
Figs. 3a–d. CT scan cross-sections showing the small exploitable volume on the vestibulo-palatal plane.
regions #12 and 22, while aligning the apices of the adjacent teeth.

CT scan analysis and choice of implants

The CT scan cross-sections of regions #12 and 22 showed a limited bone volume on the vestibulo-palatal plane, which would not have allowed for standard-diameter implants to be placed without the use of a bone augmentation technique. The cortical bone, however, was preserved (Figs. 3a–4).

Narrow implants (Axiom 2.8, Anthogyr) were used for this restoration. Axiom 2.8 has been designed exclusively to replace mandibular incisors and maxillary lateral incisors. It is equipped with a three-degree Morse taper connection system with an integrated switching platform. The special feature of the system is that the abutment is impacted without a transfixation screw. Abutments are available in several gingival heights and angulations, making Axiom 2.8 adaptable for any prosthetic situation.

Placing the implants and fabricating the prostheses

Placement of the implants in regions #12 and 22 was done during the same procedure. Under local anesthesia, two 2.8 mm x 10 mm implants were placed 0.5 mm sub-crestally (Figs. 5a–d). Very light drilling enabled bone condensation of the specific sites. The correct 3-D positioning of the implant was vital for the final aesthetic result. Temporary crowns were attached to the orthodontic arch wire and left in place for the three months of osseointegration in order to ensure post-orthodontic fixation of the teeth.

Three months postoperatively, the patient’s brackets were removed by the orthodontist and the temporary crowns fabricated directly on the PEEK healing plugs (Fig. 6). The basal surface of the temporary crowns was carefully polished.

After a period of two months of gingival maturation, which was put to good use by performing dental whitening in an outpatient setting, the prosthetic phase could begin. The implant impressions were taken with the pop-in technique (Fig. 7) using an individual impression tray fabricated in the laboratory. The choice of the most suitable abutment by means of the planning kit by the laboratory was a vital step. In fact, the abutments required only very slight adjustments or none at all. Having the option of four gingival heights and four angulations enabled us to adapt to any clinical situation.

The laboratory prepared the metal–ceramic crowns (Figs. 8a–9). The prostheses were verified in the mouth and then the crowns were fixed to the abutment with Fuji PLUS cement (GC) outside of the mouth (Figs. 10–13b). This allowed for perfect control of excess cement and guarded against any risk of gingival inflammation.

The abutment together with the crown was impacted with the Safe Lock system, mounted on the chair unit. The Safe Lock system made it possible to control the impaction. The recommended five impactions were applied to seat the prostheses permanently (Figs. 10–13b). The good aesthetic results were related to the symmetry of the emergence profiles. The narrow diameter of the implant was perfectly adapted to this clinical situation.

Fig. 4_3-D reconstruction of the CT scan cross-sections of the premaxillary zone. The high concavity of the vestibular cortical plates can be observed in regions #12 and 22.

Figs. 5a–d Pre- and post-op radiographs of regions #12 and 22.
Fig. 6 The temporary crowns were fabricated on PEEK healing plugs.
Case 2: Limited mesiodistal space and proximity to the apices of the adjacent teeth

A 20-year-old male patient presented with unilateral agenesis at region #12. This patient had just finished his orthodontic treatment. His brackets had been removed several months before. He was wearing a removable partial denture while waiting for the placement of an implant. The periapical radiographic examinations and CT scan cross-sections showed an extremely small mesiodistal space, especially at the level of the apices of the adjacent teeth (Figs. 14–16).

The treatment of this small space required great precision during the surgical phase. The insertion axis was visualized on the 3-D reconstruction of the CT scan cross-sections using SIMPLANT software (DENTSPLY). Preoperative periapical radiographs were performed at each drilling sequence.

The treatment of this very small mesiodistal space was only made possible by the use of an implant of 2.8 mm in diameter (Axiom 2.8), without which it would have been necessary to resume orthodontic treatment in order to align the apices of the adjacent teeth. That was not what the young patient desired (Figs. 17 & 18).

Cases 3 and 4: Small antero–posterior volume

Case 3

A 25-year-old female patient at the end of orthodontic treatment presented with unilateral agenesis at region #22. The smile line was moderately high, associated with right–left asymmetry of the positioning of the anterior teeth in relation to the midsagittal plane. The analysis of the CT scan cross-sections showed a small bone volume on the vestibulo-palatal plane (Figs. 19 & 20).

A narrow 2.8 mm × 12 mm implant was placed (Fig. 21a). The orthodontic arch wire served as fixation during the osseointegration phase and was removed three months postoperatively. A temporary crown was fabricated on a PEEK healing plug in order to shape the peri-implant soft tissue. The permanent crown was to be fabricated four months after surgery (Fig. 21b).

Case 4

A 59-year-old patient came to our clinic with tooth #31 missing, which had been managed for
years with a glued metal brace. Owing to frequent detachment of this prosthesis, the patient desired a fixed prosthetic solution. The periodontal condition of the surrounding teeth was stable, but the available bone volume around region #31 on the vestibulo-lingual plane was small. There were two surgical options: (a) augment the bone and place a standard implant, or (b) use a narrow implant. A 2.8 mm × 10 mm implant was placed. After a healing period of three months, a standard metal–ceramic prosthesis was fabricated (Figs. 22–24).

**Discussion**

The Axiom 2.8 implant makes it possible to restore single teeth in the incisal area using implant-supported prostheses in cases in which there is a small mesiodistal space. Having narrow implants available...
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allowed us to avoid bone augmentation by guided bone regeneration or an onlay graft—techniques that can be restrictive for patients and are not always accepted.

Small space, proximity to the apices of the adjacent teeth and small bone volume present surgical difficulties in the ideal positioning of implants. We believe it is important to use abutment teeth that integrate platform shifting, including on implants with a small diameter. The large choice of abutments, in terms of gingival height and angulation, makes it possible to adapt to any clinical situation.

Conclusion

Although we do not have the clinical retrospection to offer our opinion on the strength and long-term durability of implants with small diameters at this point, the average success rate of these narrow implants is comparable to that of standard implants. The use of narrow implants for the management of single anterior restorations, especially for the replacement of mandibular incisors and maxillary lateral incisors, constitutes an important option that makes it possible to simplify the surgical approach, sparing patients from more invasive techniques and securing the surgical procedure in relation to the roots of adjacent teeth.

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