The use of dental roots and directed ankylosis in complex anterior aesthetic case—Part I

Following a first article in 2022 that presented the use of root grafts for treating simple cases, this article—published in two parts—explores the use of dental roots in complex anterior peri-implant bone reconstruction and their contribution to treatment protocols. Specifically, it illustrates how the use of root grafts simplifies the surgical workflow and patient journey by reducing both the number of procedures and the number of donor sites.

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The management of bone deficiencies is a daily challenge for practitioners in implantology, particularly in the anterior maxilla. Such deficiencies can compromise implant placement, long-term stability, and aesthetic outcomes. The latter is of particular concern when planning treatment in the anterior maxilla.

In cases of bone defects, two main categories of techniques are commonly used:

1. Guided Bone Regeneration (GBR), involving a membrane and a biomaterial (with several variations depending on the membrane type and materials used).
2. Autogenous bone grafts, used in block or particulate form, applied either as onlay or using the Khoury technique.

These approaches typically require multiple surgical steps and several months before tooth restoration.

This article proposes a third approach based on the principle of ankylosis and root resorption: We suggest grafting the patient's own extracted tooth roots in block form — a process referred to as "directed ankylosis." The extracted root fragments are termed "root grafts."

This technique was first described by Prof. Frank Schwarz's team in 2016 for pre-implant surgery. Through two clinical cases, we illustrate the practical applications of root grafts as implemented in our daily dental practice, particularly in simplifying the management of complex anterior cases. Our philosophy is to minimise the edentulous period, defined as the time during which a patient has no fixed tooth on the arch. Whenever possible, we compress the surgical timeline by performing extractions, bone reconstruction, implant placement, and provisional aesthetics in a single procedure.

Root grafts, due to their biological properties, offer safe, simple, and rapid solutions for managing certain complex anterior cases that would otherwise require extended treatment periods with removable partial dentures.

Materials and methods

First, the root—destined to become the root graft—is extracted (Fig. 1). It is then gently scaled to clean and remove any tartar deposits.



01
Atraumatic extraction of the root intended for use as an autogenous root graft.

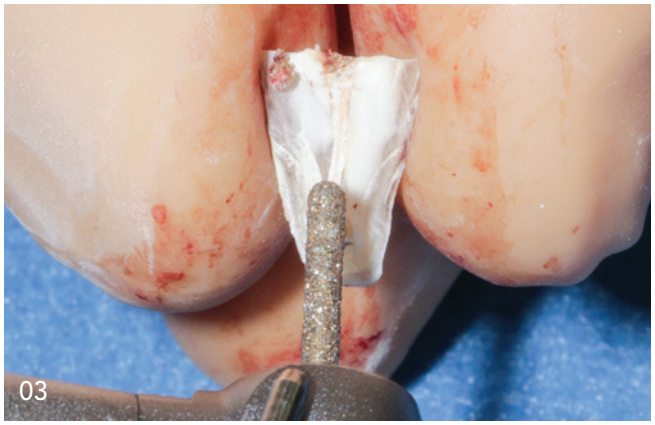
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02
Longitudinal sectioning of the extracted root to obtain graft fragments.

03
Preparation of the root graft using a diamond bur to remove pulpal tissue, endodontic filling material, carious tissue, and other residual debris.

04
Final shaping and drilling of the root graft to fit the recipient site and permit fixation with osteosynthesis screws.





The coronal part and any soft or carious tissue are removed. The root is split in half using a disk. A diamond bur is used to clean the canals and remove all residual filling materials (Figs. 2+3). If needed, it is trimmed to fit the defect and drilled to allow for osteosynthesis screw fixation (Fig. 4).

The graft is fixed and immobilised onto the recipient site using osteosynthesis screws, with the dentin surface facing the alveolar crest and the cementum facing the soft tissues (Fig. 5). Root grafts are polarised; the dentine portion must be in contact with bone to allow ankylosis, while the cementum acts as a biological barrier protecting the graft from soft-tissue resorption.

The graft functions as a biological membrane, forming a containment structure. The space between the graft and the crest is filled with a bone substitute or autogenous bone harvested locally (Fig. 6). In our practice, we use Collapat II (Symatese), a synthetic material composed of collagen matrix and hydroxyapatite.

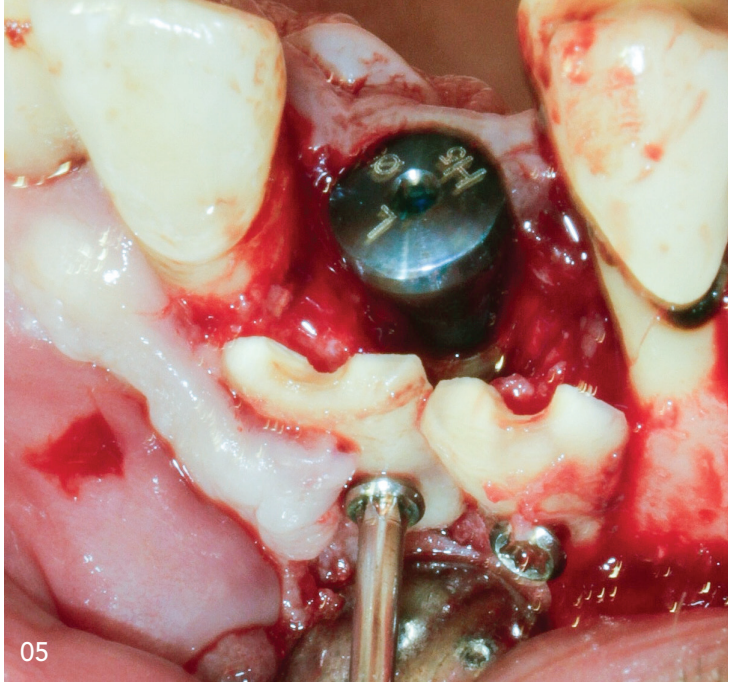
Patients with severe periodontal disease undergo periodontal therapy (prophylaxis, scaling, and root planing) between the initial consultation and the procedure, followed during three-month maintenance phase to ensure adherence to oral hygiene. Periodontal monitoring continues throughout the osseointegration period (six months), with a strict follow-up protocol involving the referring practitioners. Patients are seen annually in our clinic.

Clinical case

A 48-year-old female patient was referred in 2020. A former smoker with no significant medical history, she had long-standing periodontal disease and endodontic lesions affecting teeth #11 and #21, leading to the loss of both central incisors (Fig. 7). She had postponed treatment due to fear of a prolonged edentulous period with a removable prosthesis.

Clinical examination revealed significant buccal bone and gingival tissue loss, particularly in region 21, where the entire buccal wall of the crest was destroyed, and the root was completely detached. A high-attached labial frenulum was also noted. Despite these findings, the soft-tissue architecture—including interdental papillae—and sufficient apical bone volume were preserved (Figs. 8–10).

The treatment objective was to perform extractions, place implants, reconstruct the ridge, and deliver fixed provisional restorations while maintaining the soft-tissue architecture.



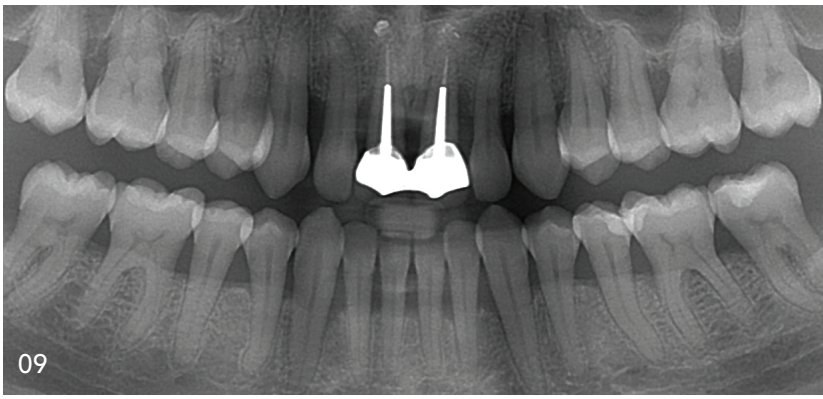
05
Fixation of the root graft to the recipient site. The dentine surface is positioned toward the alveolar bone, while the cementum surface faces the overlying soft tissues.

06
Root graft functioning as a rigid biological membrane and containment wall. The space between the graft and the residual alveolar crest is filled with bone substitute or locally harvested autogenous bone.







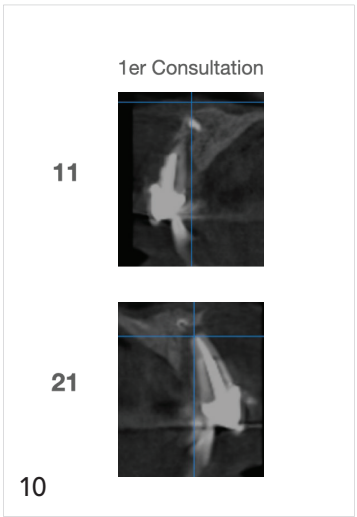


07
Initial presentation of a 48-year-old woman with longstanding periodontal disease and endodontic lesions involving the maxillary central incisors (#11 and #21).

08
Preoperative clinical assessment showing severe loss of buccal bone and gingival tissue in the maxillary anterior region, particularly at site #21.

09
Preoperative OPG demonstrating destruction of the buccal alveolar wall and complete detachment of the root at site #21.

10
Preoperative radiographic assessment showing preservation of the interdental papillae and soft-tissue architecture despite the extensive buccal defect. Sufficient apical bone remained available for implant anchorage.



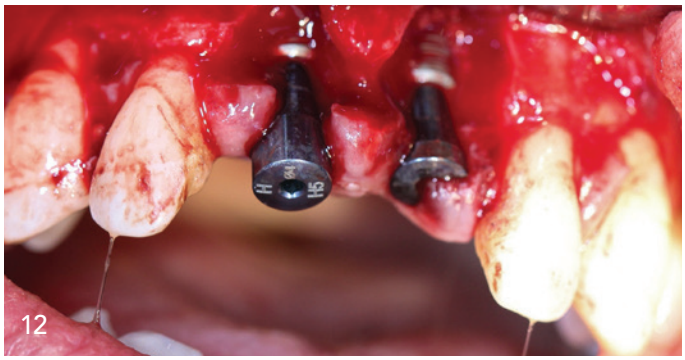
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11
Elevation of a full-thickness flap through a sulcular incision extending from teeth #13 to #23, with preservation of the papillae and vertical releasing incisions distal to the canines.

12
Implant placement following extraction and meticulous socket debridement. Two 4 × 10 mm implants were positioned palatally within the extraction sockets, leaving buccal dehiscence defects.

13
Preparation and positioning of longitudinally sectioned fragments of the extracted root of tooth #11 for reconstruction of the deficient buccal alveolar wall.



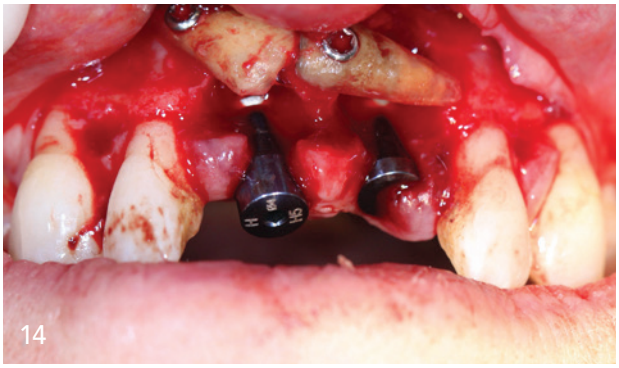


The extracted roots (#11 and #21) were repurposed to reconstruct the buccal wall of the alveoli.

A sulcular incision was made from tooth #13 to #23, preserving the papillae, with vertical releases distal to the canines. A full-thickness flap was elevated (Fig. 11). The teeth were easily extracted and the sockets meticulously curetted. Two implants (4×10 mm) were placed in the palatal aspect of the sockets, with buccal dehiscence remaining (Fig. 12).

Tooth #11's root was split longitudinally and prepared as described. The fragments were screwed onto the buccal crest with two osteosynthesis screws (0.9 mm diameter) to reconstruct the buccal wall (Figs. 13+14). The space between the implant and graft was filled with synthetic material (Collapat II, Symatese).

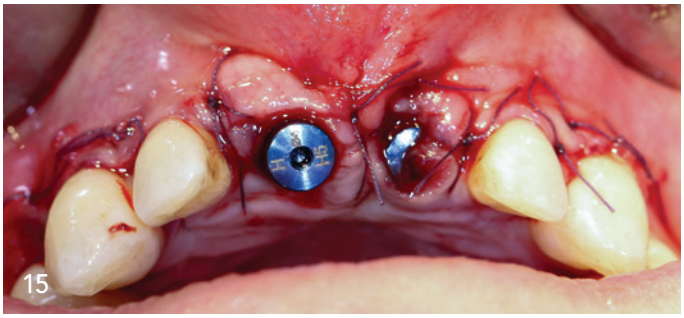
The flap was repositioned and coronally sutured with synthetic braided suture 5/0 (Fig. 15). An impression was taken at the end of the procedure, and the temporary restoration—fabricated the same day by our prosthetic lab—was screwed in that



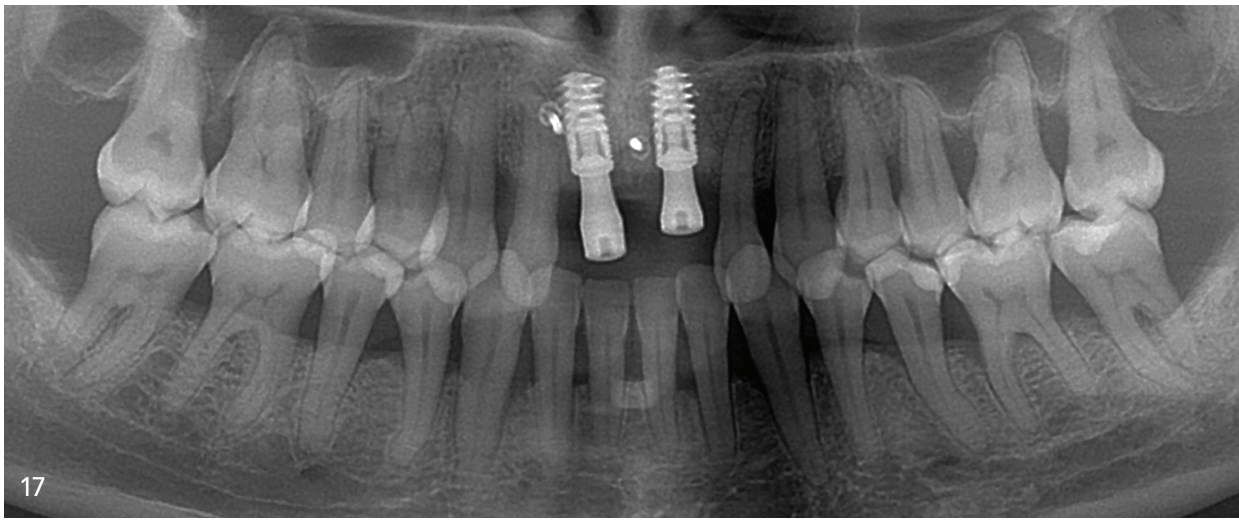
14
Root graft fragments immobilised on the buccal aspect of the alveolar crest using two 0.9 mm diameter osteosynthesis screws.

15
Surgical site after placement of Collapat II between the implants and root graft, followed by coronal repositioning and closure of the flap with 5/0 synthetic braided sutures.

16
Immediate postoperative appearance after placement of the laboratory-fabricated fixed provisional restoration on the day of surgery.







17
Cantilevered provisional restoration supported by implant #11. Implant #21 was not immediately loaded because adequate primary stability was not achieved.



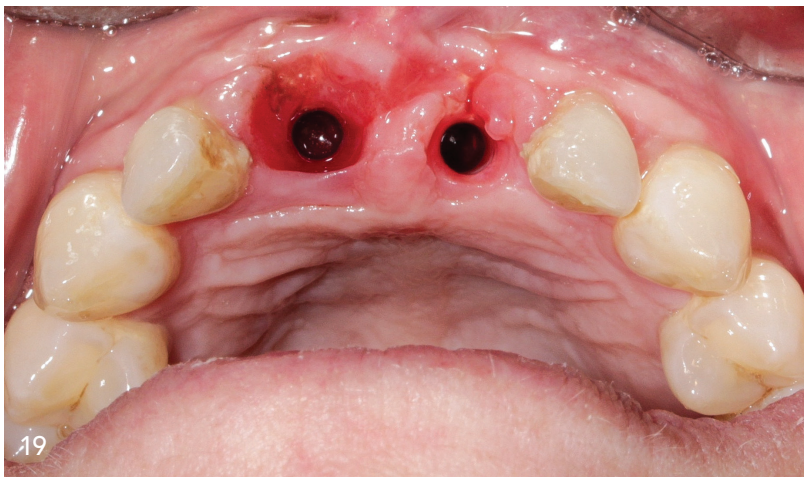
18
Clinical assessment at two months after surgery, showing early healing of the reconstructed maxillary anterior region.

19
Assessment at two months after surgery confirming implant osseointegration and stability of the reconstructed ridge.

20
Clinical appearance of the definitive implant-supported prosthesis delivered nine months after surgery.

evening (Fig. 16). Implant #21 lacked sufficient torque for immediate function, so a cantilevered provisional crown was screwed directly onto implant #11 (Fig. 17).

Sutures were removed after 15 days. Osseointegration was assessed at two months post-op (Figs. 18+19). The final prosthesis, fabricated by our referring dentist, was placed at nine months (Figs. 20+21). Annual clinical and radiographic follow-ups monitor the ankylosis, resorption of root grafts, and maintenance of graft volume (48-month follow-up, Fig. 22).





Discussion

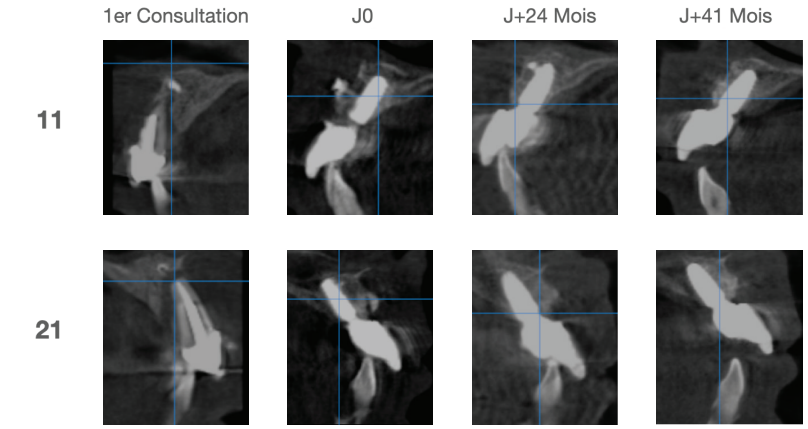
Root grafts share many properties with autogenous bone and offer some advantages over biomaterials. They are autogenous materials composed of mineral, organic (patient proteins), and water fractions in proportions comparable to alveolar bone, and are

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21
Clinical and/or radiographic assessment at definitive prosthesis placement, demonstrating preservation of the reconstructed ridge and peri-implant tissue architecture.

22
Radiographic findings at the 48-month follow-up, showing long-term maintenance of the reconstructed ridge and peri-implant tissues, with monitoring of root-graft ankylosis and resorption.



recognised as native by the body—thus avoiding foreign body inflammatory reactions.

They integrate well with soft tissues, provided no sharp edges remain upon closure, leading to rapid, high-quality healing.

Root grafts can be used as standalone blocks or as biological membranes combined with biomaterials or autogenous bone chips. Initially, ankylosis occurs between the graft and the crest, followed by gradual replacement resorption—root tissue is resorbed and replaced by bone. When placed away from the crest, new bone formation occurs in contact with the dentine. The material is both osteoconductive and osteoinductive.

Grafts are easy to harvest, do not require special storage protocols, and can be left in the open surgical field before placement without adverse effects. They are solid, not influenced by muscle pull, and easy to shape with a bur or disk. Their slight flexibility allows gentle bending without fracture.

Their slow resorption ensures long-term volumetric stability of the grafted site. However, their main limitation is availability—typically limited to extracted roots from implant-extraction procedures, wisdom teeth, or hopeless teeth.

Conclusion

In both presented cases, this technique successfully combined implant placement, bone reconstruction, and immediate provisional restoration. Surgical, mechanical, and aesthetic objectives were achieved while minimising surgical trauma and treatment time. In the long term, full ridge reconstruction, complete graft resorption at three years, and stable volume were observed. Given their properties and numerous advantages, root grafts have become our first-line choice when non-restorable roots are available.

Scan the code and find the article from 2022.

References

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