Full-arch maxillary implant rehabilitation in a periodontally compromised patient

Rehabilitation of patients with advanced periodontitis presents a complex clinical challenge, particularly when extensive tooth loss, compromised alveolar bone, and deficiencies in the peri-implant soft tissues coexist.

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The staging and grading framework for periodontitis provides clinicians with a structured basis for assessing disease severity, complexity, and progression risk, thereby informing comprehensive treatment planning.[1]

For patients seeking fixed full-arch rehabilitation, treatment planning must integrate the condition and distribution of the remaining teeth with the anatomical limitations of the residual alveolar ridge. A staged surgical approach can facilitate the coordination of implant placement, tissue augmentation, and prosthetic rehabilitation while accommodating the patient's functional and aesthetic requirements. When a removable interim prosthesis is unacceptable, a tooth-supported provisional restoration may provide continuity of function and aesthetics during treatment.

Preservation of the facial alveolar tissues is particularly important in the aesthetic zone, where post-extraction remodelling can compromise the buccal contour and emergence profile of the definitive restoration. Partial extraction therapy (PET) encompasses techniques designed to retain selected portions of tooth roots to help preserve the tissues surrounding an extraction site.[2] The socket-shield technique (SST), one of the approaches within PET, was initially described as a proof-of-principle method involving retention of the facial root fragment during immediate implant placement.[3] Its use, however, requires careful case selection and meticulous surgical execution, given the still-evolving long-term evidence base.

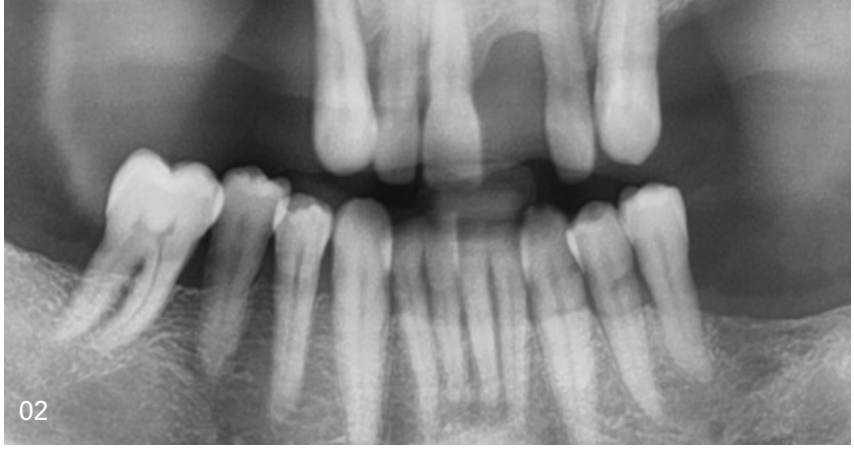
Tissue preservation alone may not address pre-existing deficiencies in alveolar bone volume that limit prosthetically driven implant placement. Guided bone regeneration (GBR) is an established approach for reconstructing deficient alveolar ridges, with outcomes dependent on appropriate graft and membrane management, flap stability, and tension-free closure.[4] The choice of grafting materials and the surgical approach must therefore be tailored to the anatomical defect and restorative objectives. Alongside hard-tissue reconstruction, adequate peri-implant soft-tissue dimensions are important considerations in maintaining implant-supported restorations. Free gingival grafting is an established option for augmenting keratinised mucosa around dental implants, and comparative evidence has evaluated its outcomes against those of xenogeneic collagen matrices.[5] These procedures are best considered as components of an integrated surgical and prosthetic plan.

This case report describes the staged rehabilitation of a patient with advanced maxillary periodontitis using implant placement, GBR, peri-implant soft-tissue augmentation, PET, and progressive provisional conditioning, followed by definitive screw-retained full-arch prosthetic rehabilitation and long-term clinical and radiographic follow-up.



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Initial situation: Generalised periodontitis.

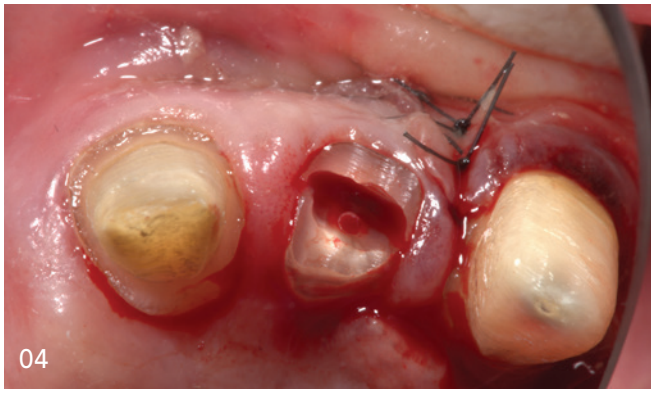
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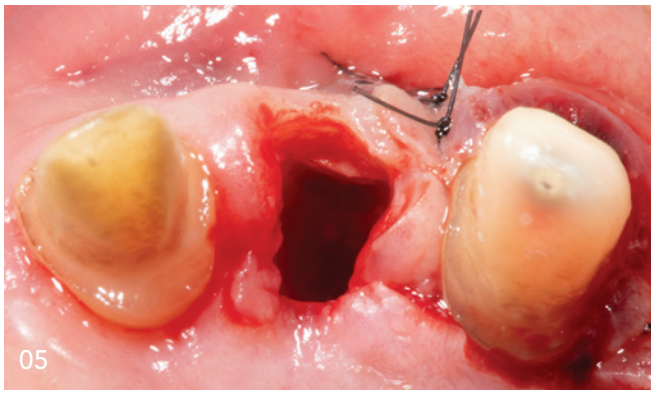
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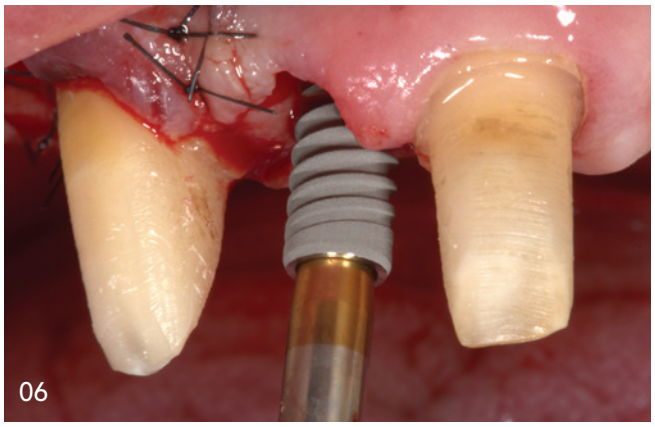
03



04



05



06

Case report

A 66-year-old patient presented with advanced periodontal disease predominantly affecting the maxillary dentition, classified as Stage IV, Grade C periodontitis (Figs. 1+2).[1] The patient reported compromised masticatory function and requested fixed rehabilitation of the maxillary arch. The patient requested a treatment plan that avoided the use of removable partial or complete provisional prostheses at any stage.

The treatment plan was designed to address the compromised dentition and localised hard- and soft-tissue deficiencies while maintaining a fixed provisional restoration. A tooth-supported provisional restoration reinforced with polymethyl methacrylate (PMMA) was fabricated before surgery (Fig. 3).

During the initial surgical phase, local infiltration anaesthesia was administered using articaine with epinephrine 1:100,000. A crestal incision extending from sites 17 to 13 was followed by elevation of a full-thickness mucoperiosteal flap. The maxillary right lateral incisor was extracted according to a PET protocol (Figs. 4+5).

Three copaSKY implants were placed freehand at sites 12 (3.5 × 12 mm), 14 (4 × 12 mm), and 16 (6 × 5.2 mm) according to the prosthetically driven treatment plan (Figs. 6+7). At site 14, implant

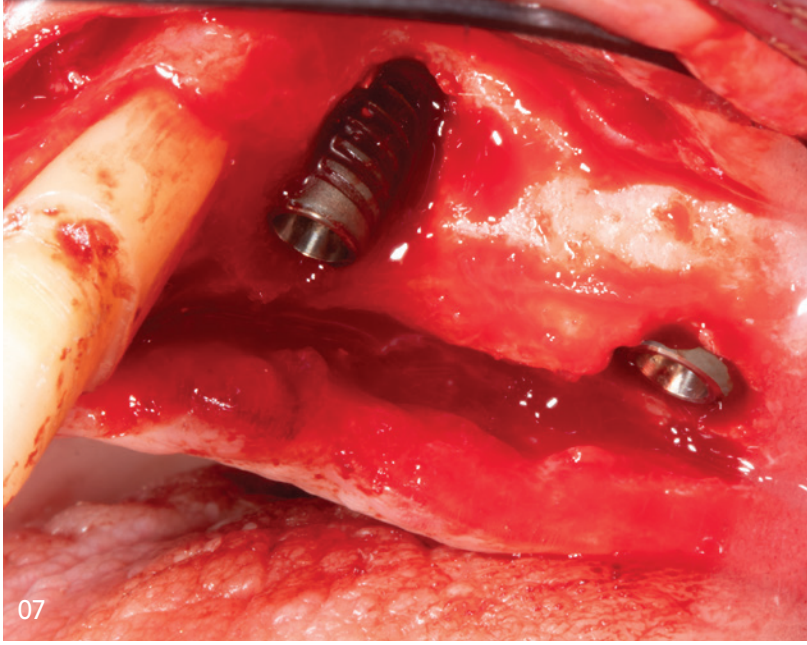
02
Preoperative orthopantomogram (OPG) showing generalised bone loss.

03
Tooth-supported provisional restoration in the maxillary arch.

04
Extraction of tooth 12 according to the partial extraction therapy (PET) protocol.

05
Buccal shield preparation according to the PET protocol.

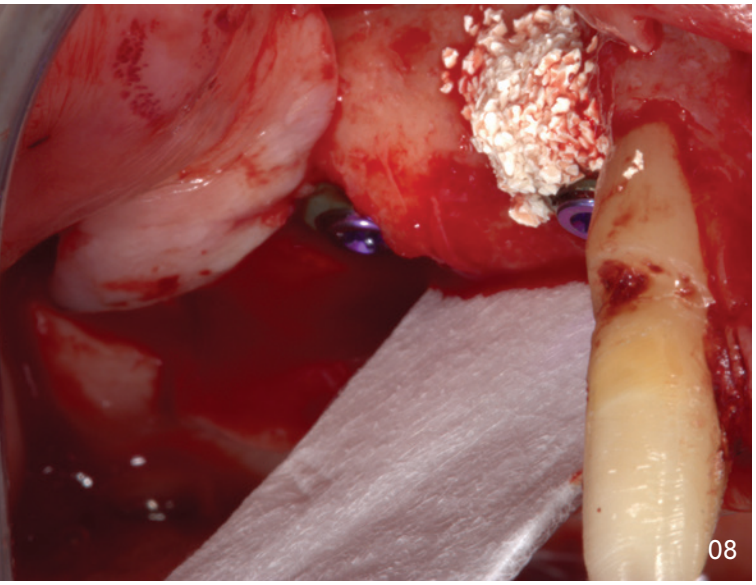
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Implant placement at site 12.

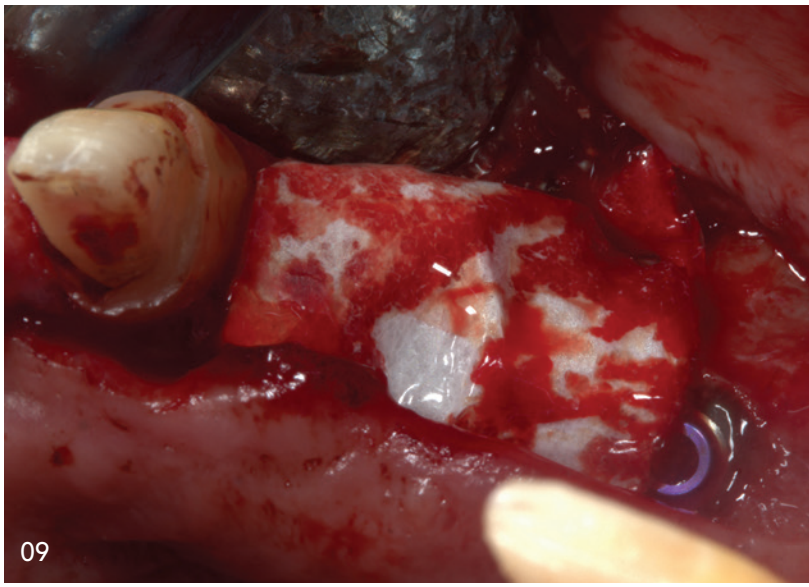


07
Implant placement at sites 14 and 16.

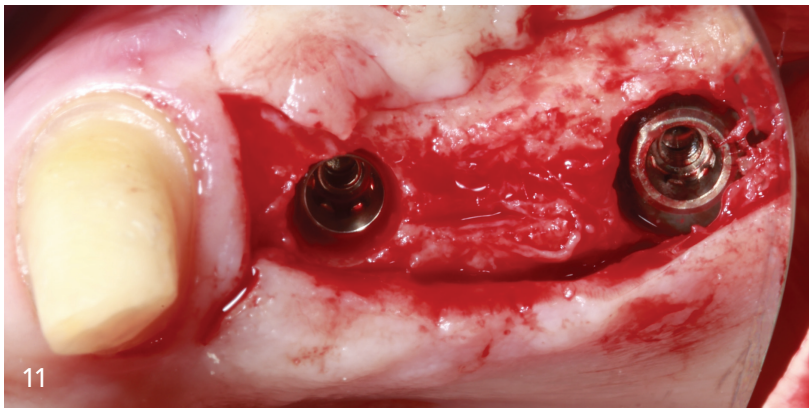
08
Bone graft placement at the buccal dehiscence defect at site 14.

09
Completed guided bone regeneration (GBR) at site 14.





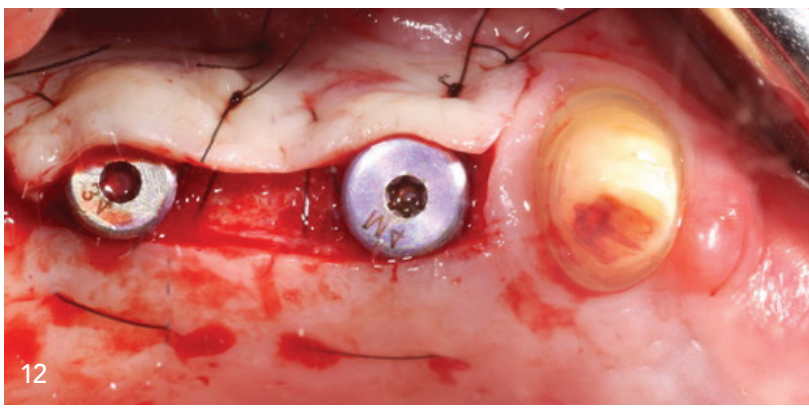




10
Placement of a tooth-supported polymethyl methacrylate (PMMA) provisional restoration.

11
Implant placement in the maxillary left quadrant.

12
Apically repositioned flap to increase the width of keratinised gingiva.



13
Implant placement at site 21.

14
GBR in the anterior maxilla.

15
Membrane stabilised with fixation pins.

16
Primary wound closure.

17
Free gingival graft (FGG) for soft-tissue optimisation.

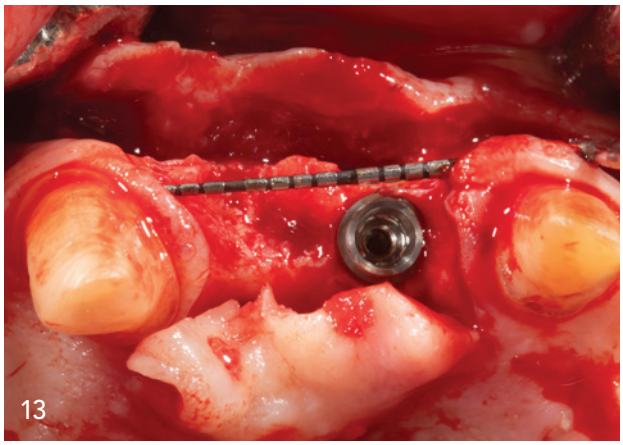
placement was combined with GBR using synthetic biphasic calcium phosphate granules comprising 60% hydroxyapatite and 40% ß-tricalcium phosphate (TIXXU graft, bredent medical; Fig. 8). The graft was covered with a resorbable collagen membrane (TIXXU CONTROL membrane, bredent medical) and stabilised using fixation pins (Fig. 9). Following flap mobilisation, tension-free primary closure was achieved, and the first fixed provisional PMMA restoration was delivered (Fig. 10).

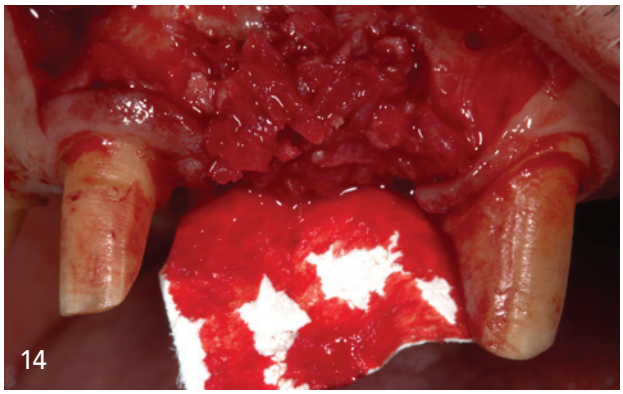
One month later, the left posterior maxillary sextant was treated. A crestal incision extending from sites 27 to 23 was performed, preserving the papilla distal to site 23. Following full-thickness flap elevation, two copaSKY implants were placed: a standard implant measuring 4 × 12 mm in the premolar site and an ultrashort implant measuring 6 × 5.2 mm in the molar region (Fig. 11). Both implants were left submerged during healing.

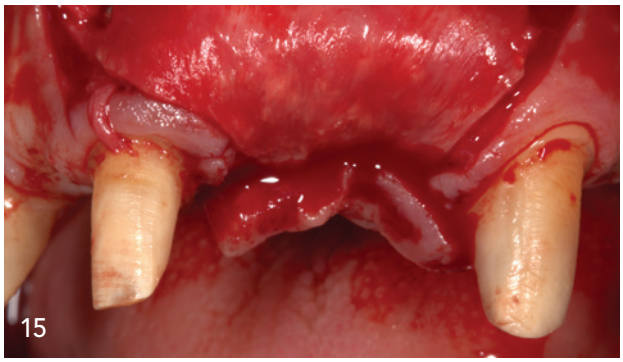
Four months after the initial surgical procedures in the left posterior quadrant, the previously submerged implants were uncovered using apically repositioned flaps to increase the width of the buccal keratinised mucosa (Fig. 12).

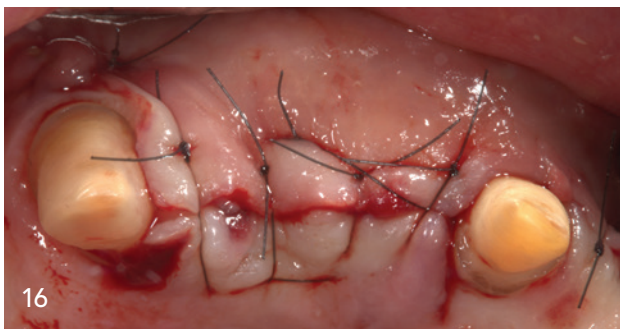
A further surgical procedure was performed at site 21 one month later. A standard copaSKY implant (4 × 12 mm) was placed (Fig. 13), accompanied by GBR using a mixture of autogenous bone chips and porcine-derived xenograft (THE Graft™, Purgo; Fig. 14). The graft was covered with a collagen barrier membrane (THE Cover™, Purgo; Figs. 15+16).

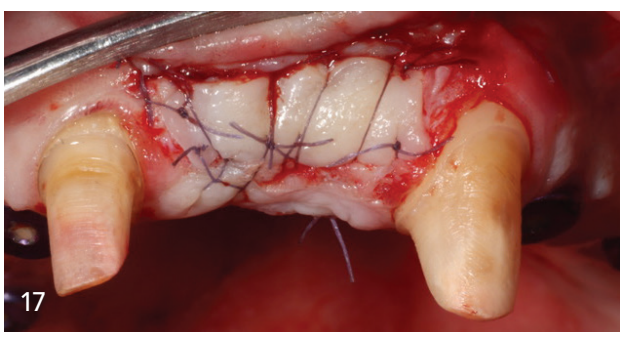
Because of an unfavourable mucogingival junction and insufficient keratinised mucosa, a free gingival graft (FGG) was subsequently performed using the strip technique (Fig. 17).[6]


13

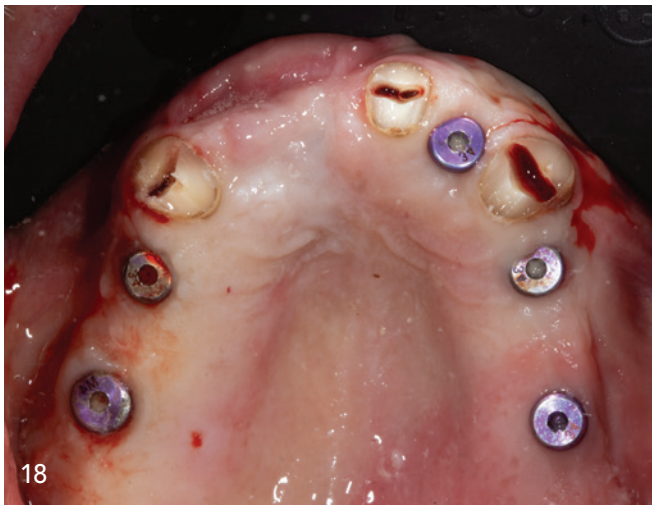

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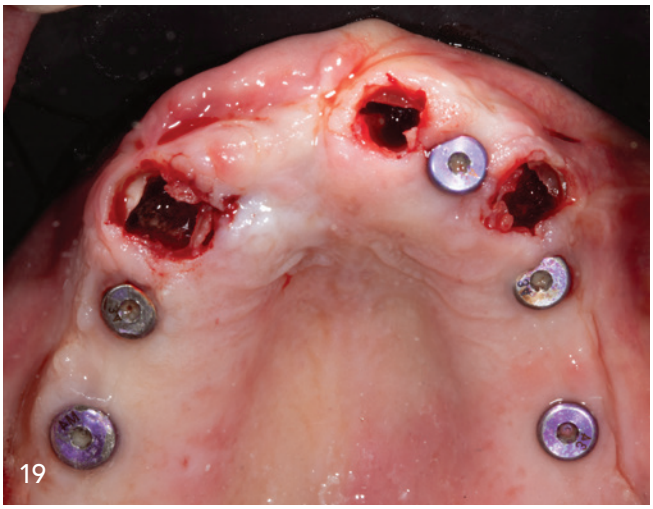

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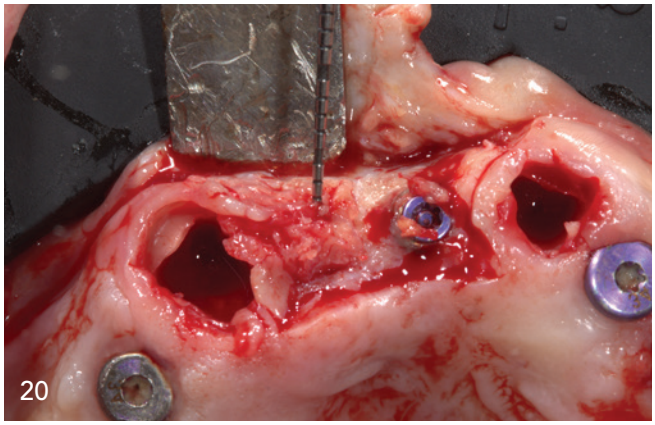

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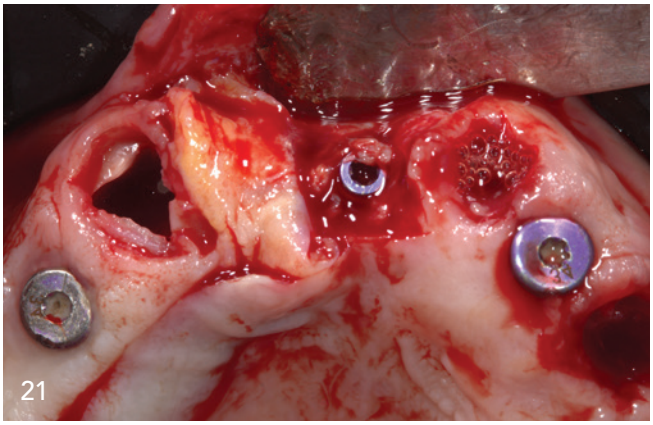

17

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18
Tooth sectioning according to the socket-shield technique (SST) protocol.

19
Retention of the buccal shield.

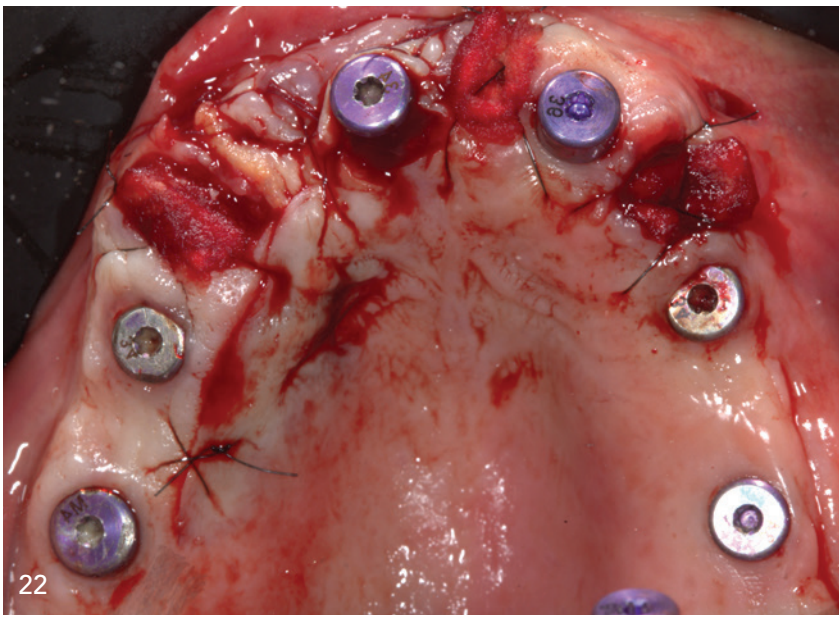
20
Uncovering of the anterior implant.

21
Connective tissue grafting.

22
Primary wound closure.

Following soft-tissue healing, the residual roots at sites 13, 11, and 23 that were intentionally maintained during the initial phases of treatment were sectioned and managed according to the socket-shield technique (Figs. 18+19). The coronal and palatal portions of the roots were removed, while thin, stable buccal root fragments were retained in close contact with the facial socket walls.

The implant at site 21 was subsequently uncovered (Fig. 20). Additional soft-tissue augmentation using a connective tissue graft (CTG) was performed to optimise the buccal profile and the contour of the edentulous span (Figs. 21+22). A second implant-supported provisional resin restoration was delivered immediately following the procedure (Fig. 23).





23
Implant-supported PMMA provisional restoration.

24
Definitive full-arch zirconia prosthesis.

25
Postoperative follow-up at one year.

26
Postoperative follow-up at two years.

27
Postoperative follow-up at four years.

28
Postoperative follow-up at six years.

29
Postoperative follow-up at seven years.

Definitive prosthetic rehabilitation and follow-up

The peri-implant soft tissues were conditioned over a nine month period through incremental additions of composite resin to the second set of provisional PMMA crowns. The provisional restoration was then replaced with a definitive screw-retained zirconia full-arch prosthesis (Fig. 24). Prosthetic screws were tightened to 25 Ncm according to the manufacturer's recommendations.

A mutually protected occlusal scheme was established, with bilateral, evenly distributed contacts in maximum intercuspation. Posterior contacts were adjusted to remain light and predominantly axial. Posterior interferences were eliminated during lateral excursions, with guidance provided by the anterior and canine regions. Posterior disclusion was established during protrusive movements to minimise non-axial loading.





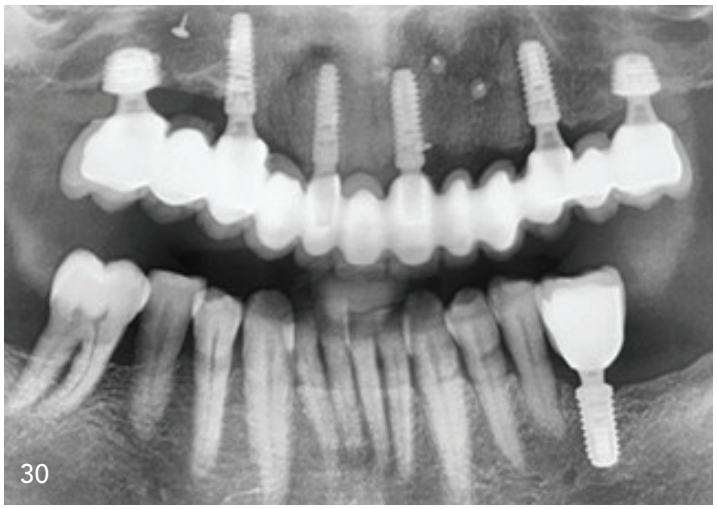








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30
OPG at the four-year follow-up.



31
OPG at the seven-year follow-up.

Clinical and radiographic examinations were performed at one, two, four, six, and seven years. Follow-up records and clinical photographs showed maintenance of the maxillary implant-supported prosthesis and favourable peri-implant soft-tissue contours throughout the documented period (Figs. 25–29). Radiographic evaluations showed stable crestal bone levels around the implants (Figs. 30+31). These observations represent a qualitative assessment.

Conclusion

The key learning from this case is that successful complex implant rehabilitation depends not merely on the execution of individual surgical procedures, but on their integration within a carefully planned treatment sequence.

Addressing hard-tissue deficiencies through site-specific guided bone regeneration, followed by appropriate soft-tissue augmentation and implant uncovering, created a favourable tissue foundation for subsequent prosthetic rehabilitation. The sequential management of extraction sites, peri-implant tissues, and provisional contours further emphasised the importance of coordinating surgical interventions with prosthetic requirements. A planned, staged approach to hard- and soft-tissue management, with each intervention timed to support the next phase of treatment, can contribute to predictable functional and aesthetic rehabilitation in periodontally compromised cases.

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References

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Bone Growth Concept

copa SKY IMPLANT SYSTEM

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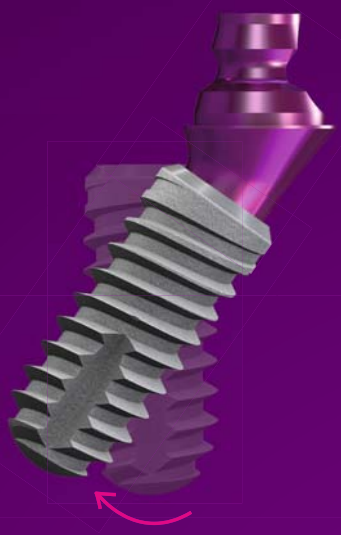
with one connection and microstructured backtaper.

Slim.



3.0 mm

Angled.



Up to 35°

Ultra short.



5.2 mm

Mistake and subject to change reserved

PERFECT

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