Autotransplantation of the closed apex donor tooth with simultaneous sinus floor elevation by using computer-aided planning and 3D printed replica: A case series study

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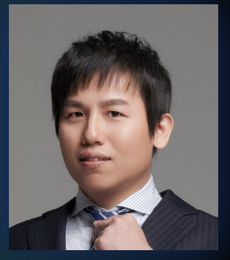

Po-Jan Kuo [1,2] * ; Yi-Chia Kuo [2]

Introduction

Replacing two adjacent hopeless teeth in the aesthetic zone can be quite challenging in implant dentistry. Often, it requires multiple staged procedures to reconstruct compromised extraction sites. This case illustrates how combining these approaches allows for the management of both soft and hard tissues at the same time during adjacent immediate implant placements in the aesthetic zone.

Case report

A 48-year-old male presented with discomfort in teeth #21 and #22, both exhibiting vertical root fractures with associated bone loss. Following digital smile design (DSD) analysis, the future gingival margin was established and an esthetic stent was fabricated. Crown lengthening was performed on teeth #12, #11, and #23 to achieve harmonious gingival contours. Tooth #21 was atraumatically extracted,.

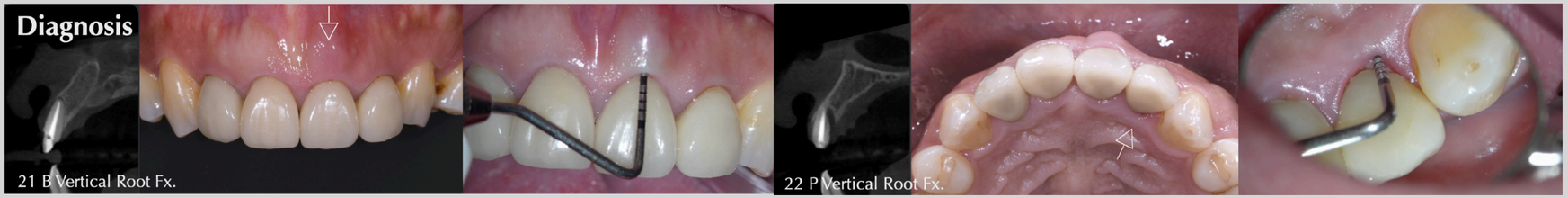

Figure 1. Preoperative clinical view showing a buccal vertical root fracture at #21 and a palatal vertical root fracture at #22.

Figure 2. DSD-based esthetic analysis and treatment plan: CLP at #13–#11 and #23; IIPP and IDR at #21 and #22.

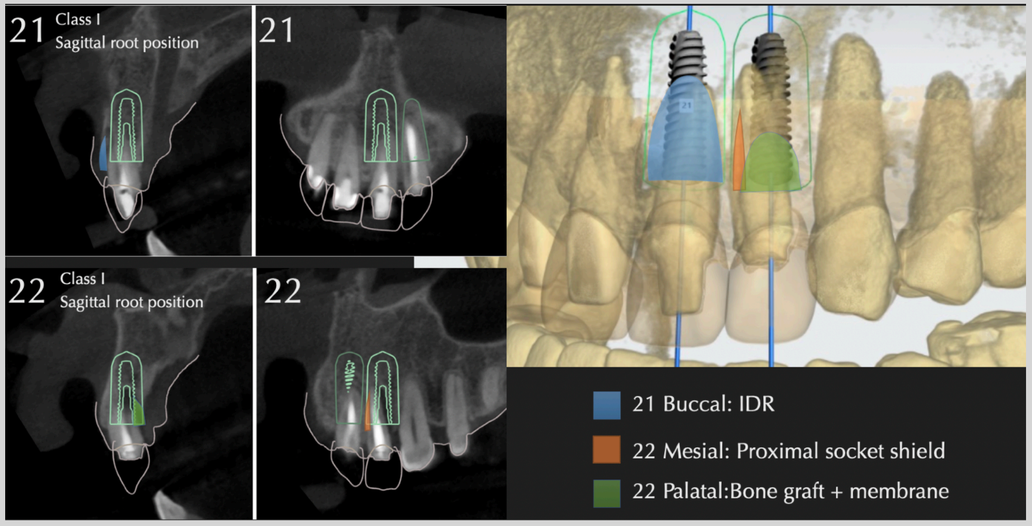

Figure 3. CBCT evaluation of implant angulation and positioning, demonstrating IDR, grafting, and root shield areas.

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Case report

Then, a mesial root shield was preserved at #22 to maintain crestal hard and soft tissue architecture. Guided implant placement was then performed at both sites.
At #21, an autogenous bone plate harvested from the maxillary tuberosity was rigidly fixed buccally following the immediate dentoalveolar restoration (IDR) protocol to reconstruct the buccal defect. The palatal defect at #22 was augmented with particulate bone graft and a resorbable collagen membrane.
Immediate provisionalization was completed according to the Esthetic Biological Contour (EBC) concept. A connective tissue graft (CTG) was stabilized using supra-crestal sling (SCS) sutures to support the gingival margin and enhance soft tissue stability.

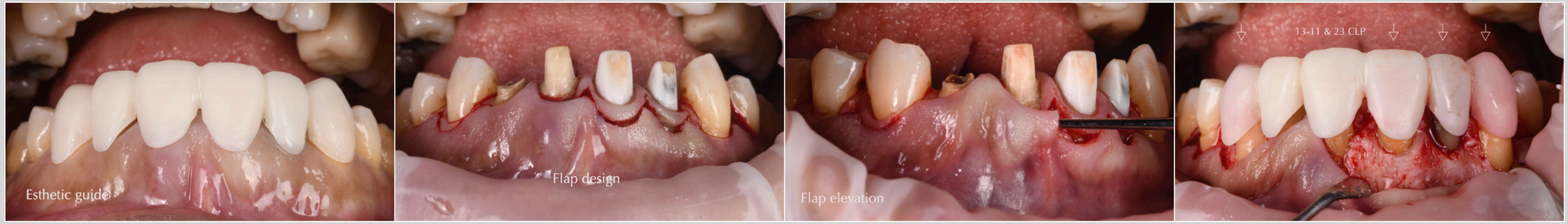

Figure 4. Esthetic stent try-in demonstrating the planned future gingival margin and serving as a surgical reference for soft tissue recontouring. Incisions were performed according to the stent-guided design, followed by careful flap elevation. An interdental tunnel was created between #21 and #22 to facilitate subsequent soft tissue management. Crown lengthening was completed through osseous recontouring to establish a harmonious gingival architecture in accordance with the esthetic plan.

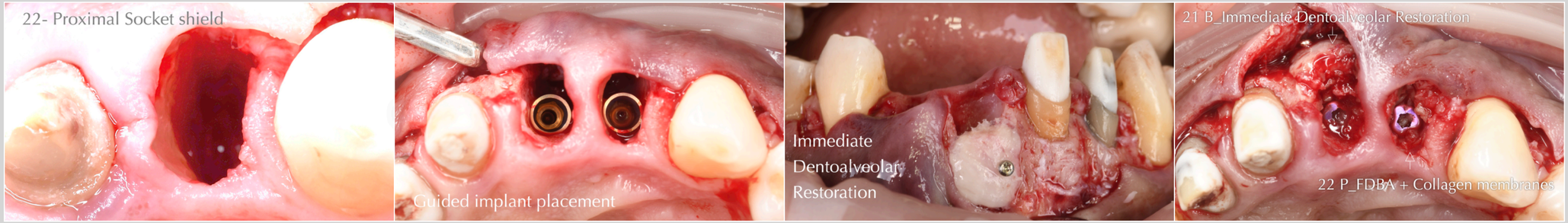

Figure 5. A proximal socket shield was prepared at the mesial aspect of #22 with preservation of the root fragment. Tooth #21 was extracted, followed by implant placement. The buccal defect at #21 was reconstructed using the IDR technique, while the palatal defect at #22 was augmented with bone grafting.

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Results

The healing process was uneventful. At the 3-month follow-up, Cone Beam Computed Tomography (CBCT) confirmed ideal bone regeneration. Clinical evaluation demonstrated stable soft tissue with well-maintained inter-implant papillae and a harmonious gingival architecture. The final prosthesis was delivered 8 months post-operatively. The clinical outcomes were highly satisfactory, as evidenced by the objective Pink and White Esthetic Score (PES/WES) analysis, reflecting optimal esthetic integration.

Conclusion

This combined approach integrating IDR, proximal socket shield, and SCS suture stabilization of CTG enabled IIP and provisionalization in a single visit, potentially reducing surgical time and morbidity. Favorable functional and esthetic outcomes were observed; however, the technique remains technique-sensitive and requires further long-term evaluation to validate its predictability.

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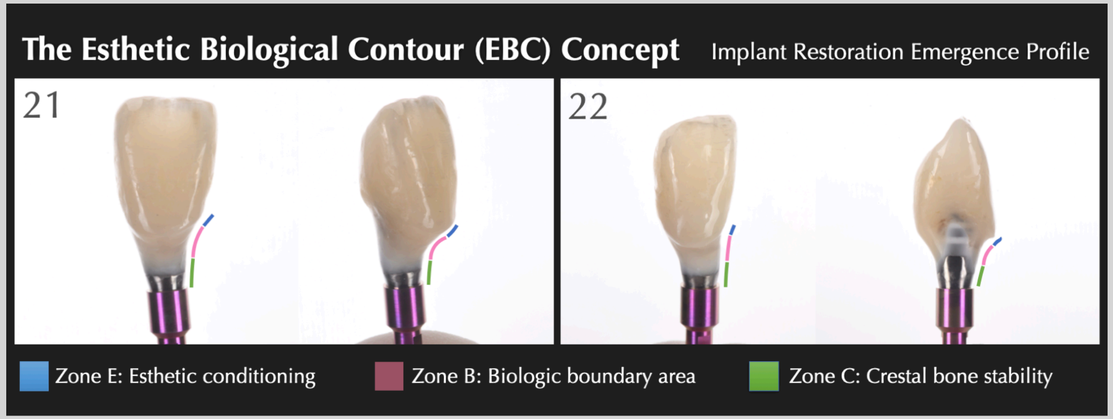

Figure 6. Immediate provisionalization following the Esthetic Biological Contour (EBC) concept to guide soft tissue healing.

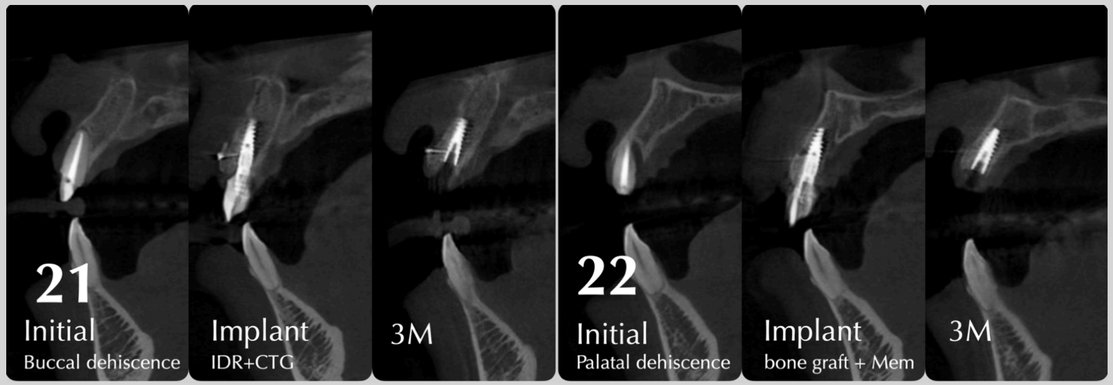

Figure 8.
CBCT images of #21 and #22 at baseline, immediate postoperative, and 3 months.

Figure 7. CTGs stabilized with supra-crestal sling (SCS) sutures to augment buccal and interdental tissue volume.

Figure 9. Clinical views of wound healing and 8-month follow-up, showing stable peri-implant tissues.