



Tehran University of
Medical Sciences

Clinical Innovation in Ridge Reconstruction: 3D Ring Augmentation for Complex Bony Defects

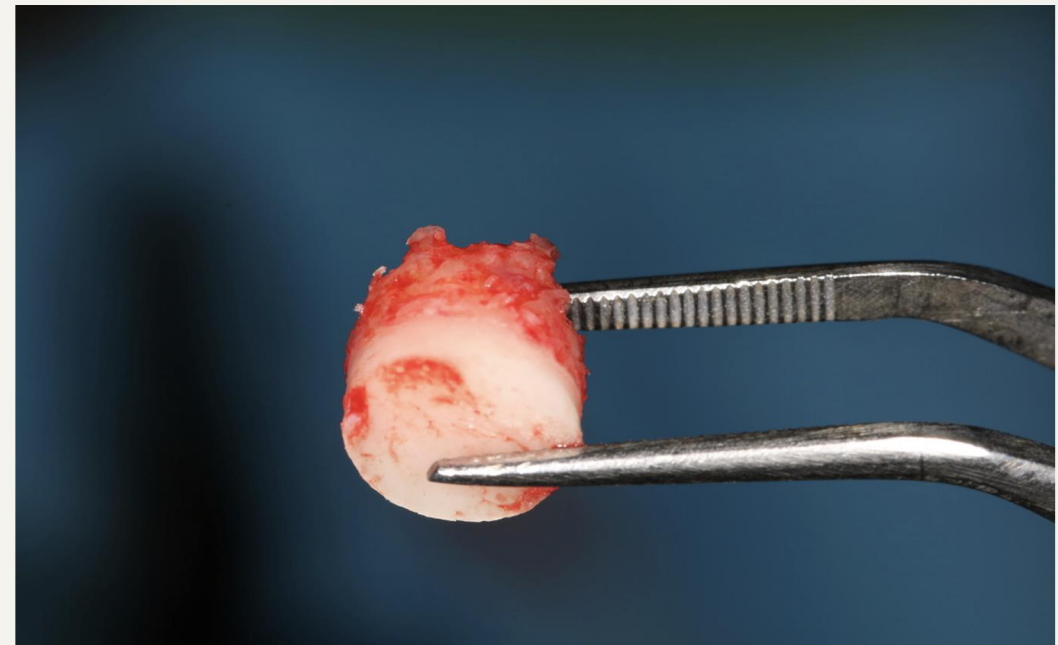
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Introduction: Autogenous bone remains the gold standard in ridge augmentation. However, conventional block designs often fail to adapt to complex ridge morphology, require technique-sensitive harvesting, and limit recreation of natural bony contours. To overcome these challenges, we introduce a simplified three-dimensional ring-shaped augmentation concept for complex bony defects.

Classification of Ring-shaped bone by trephine bur

- ✓ 1. Regular shape
- 2. Semilunar shape
- 3. Intra lock shape
- 4. 8- shape
- 5. Ring bed shape (half lap shape)height & diameter
- 6. Olympic shape

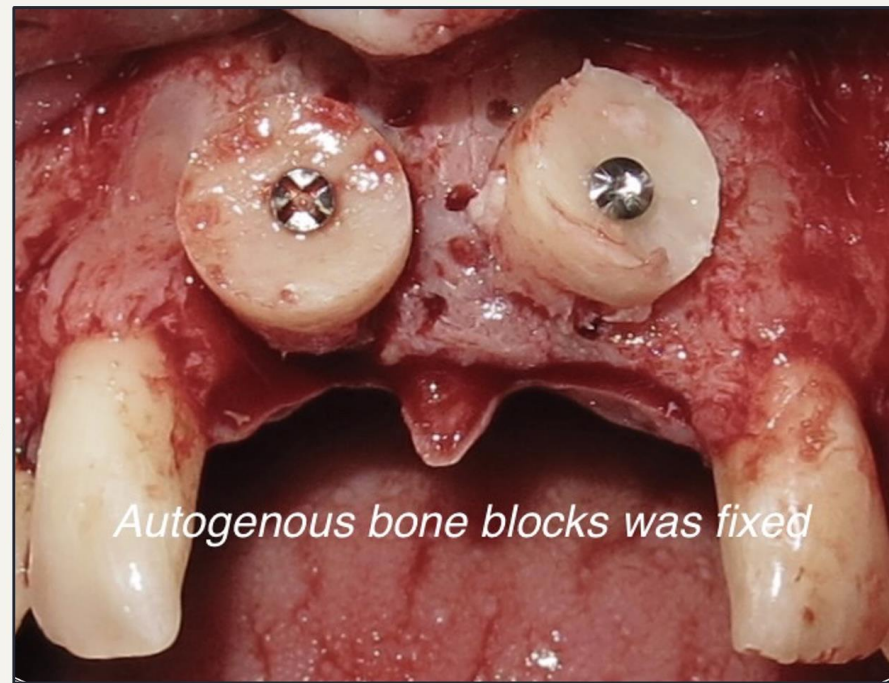


Multiple regular Rings as Cortical Tents

Sites with minor tissue deficiencies (Simple)

✓ Sites with extended tissue deficiencies (Advance)

Sites with severe tissue deficiencies (Complex)

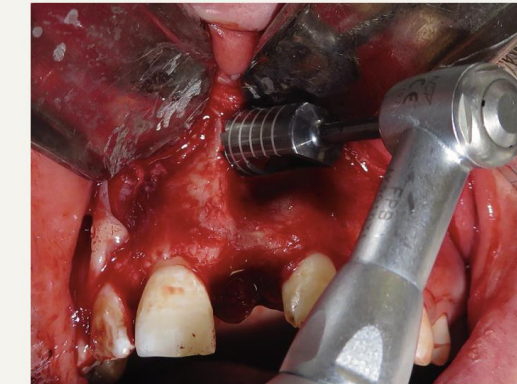


Regular shape

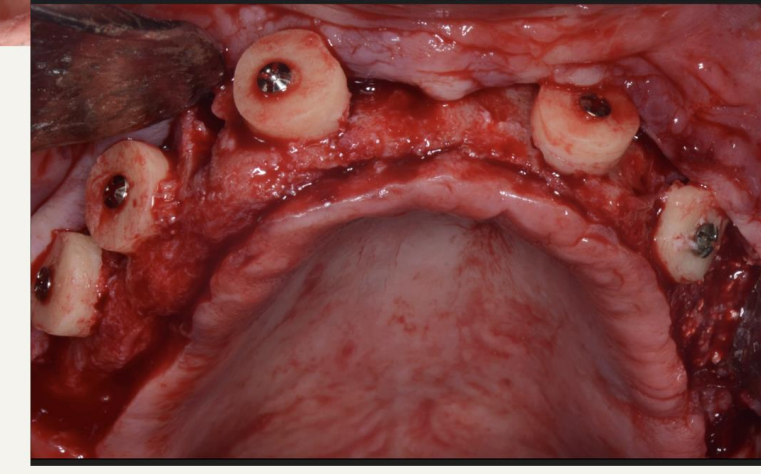
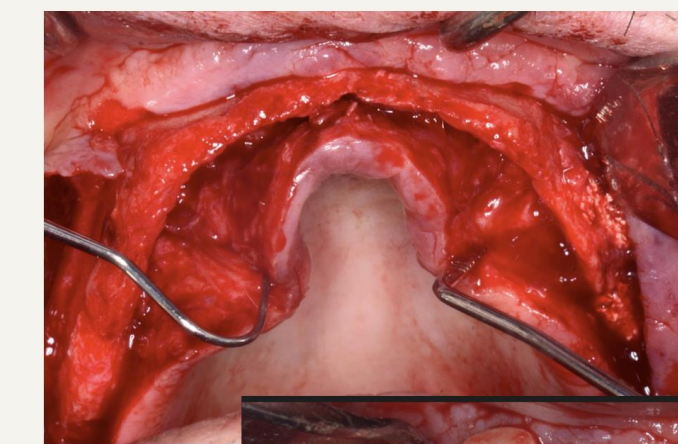
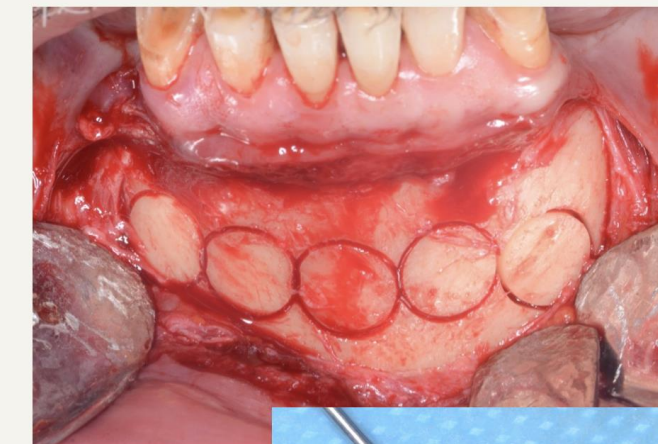
A smart move – one action, double gain

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Multiple regular rings as cortical tents

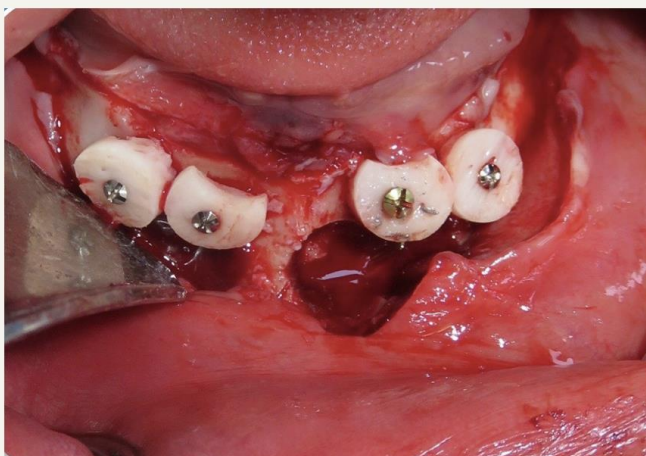
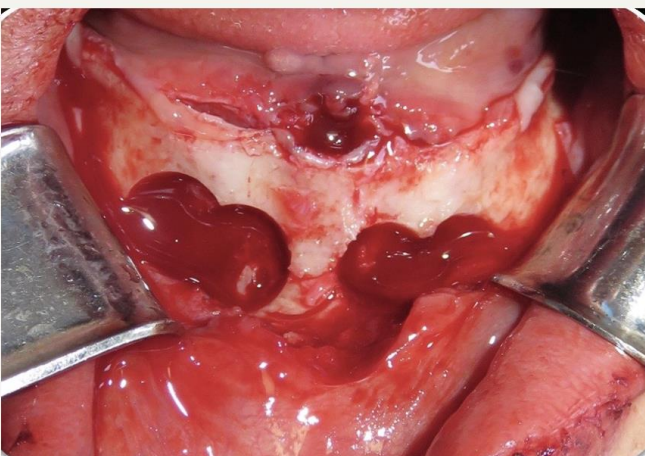


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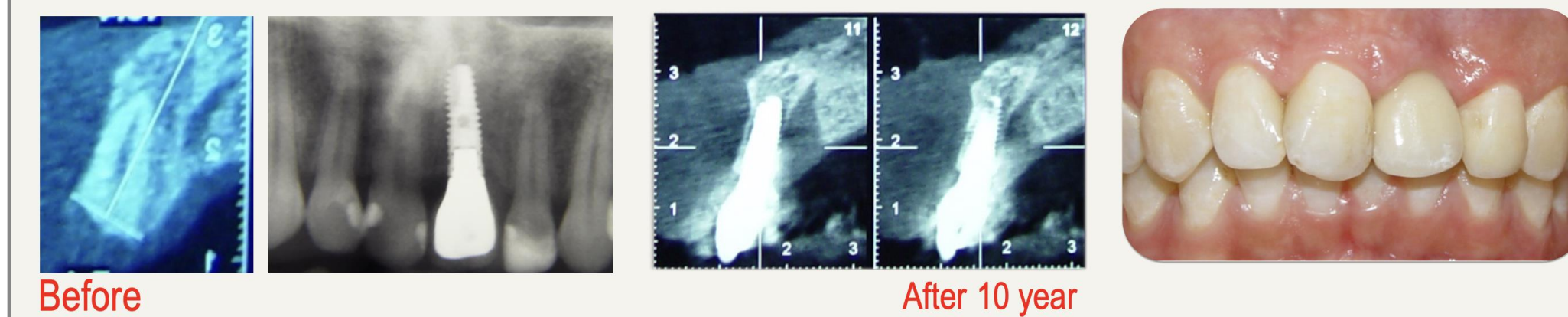
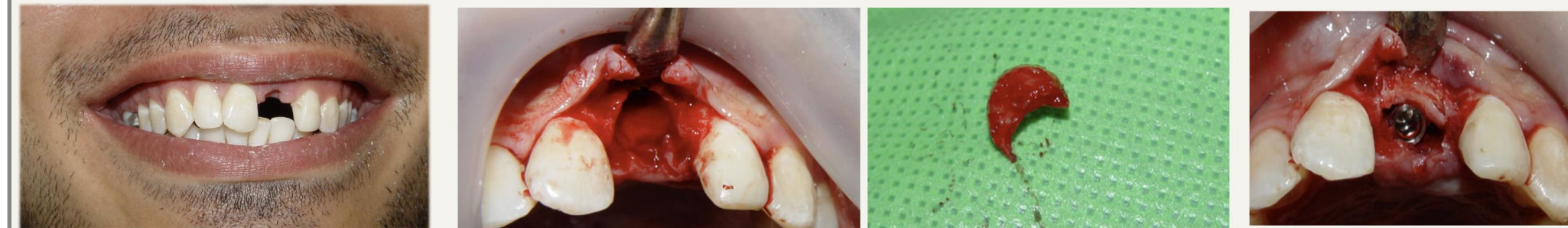


Classification of Ring-shaped Bone by trephine bur

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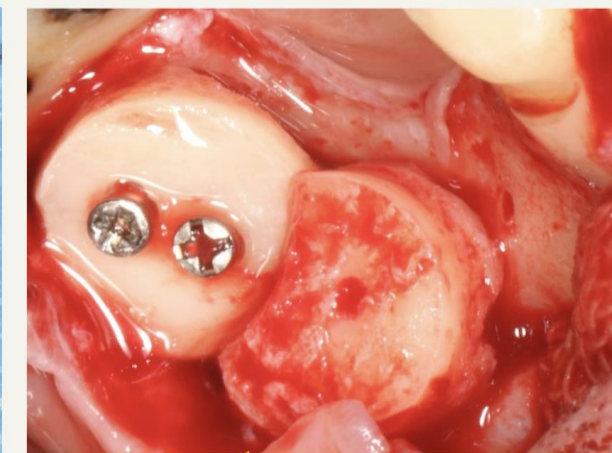
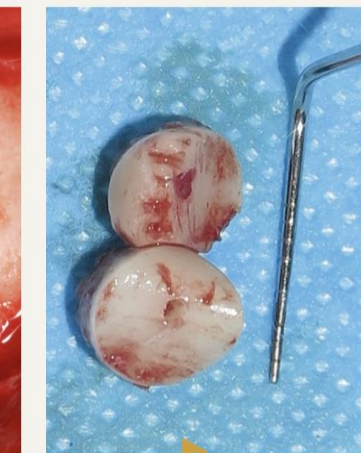


Re-Establish of Implant's Buccal Convexity in Severe Bone Deficiency via Modified Autogenous Bone Block Graft (Semilunar shape) with Free connective tissue graft



CLASSIFICATION OF RING-SHAPED BONE

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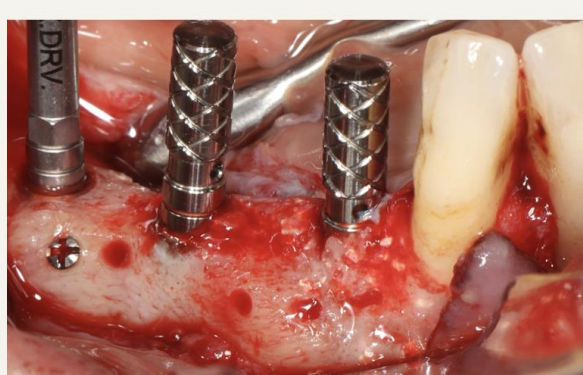
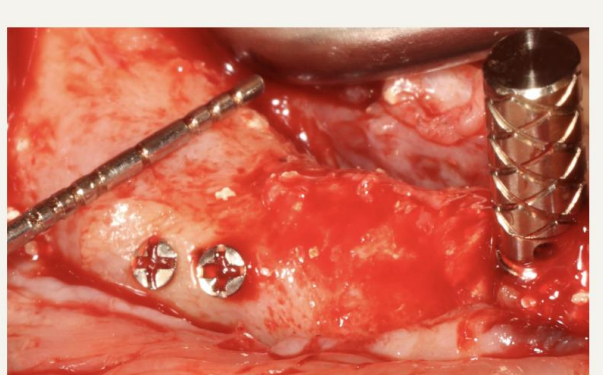
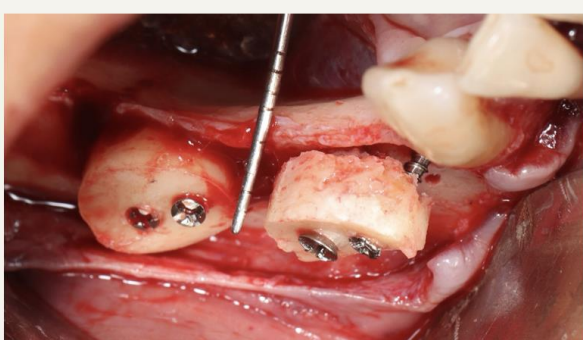
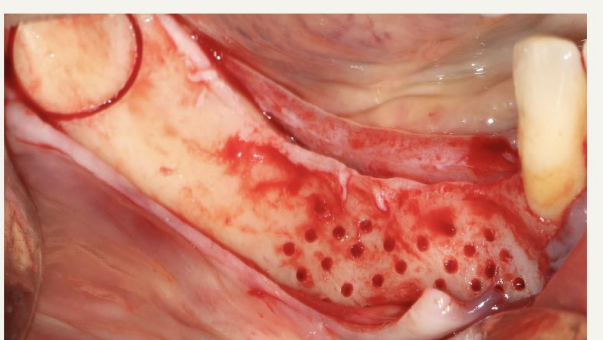
In case of multiple rings, they could be placed in *apico-coronal* , *mesiodistal* or *oblique* direction to adapt optimally with the defect.

Multiple regular rings as cortical tents

• Sites with minor tissue deficiencies (Simple)

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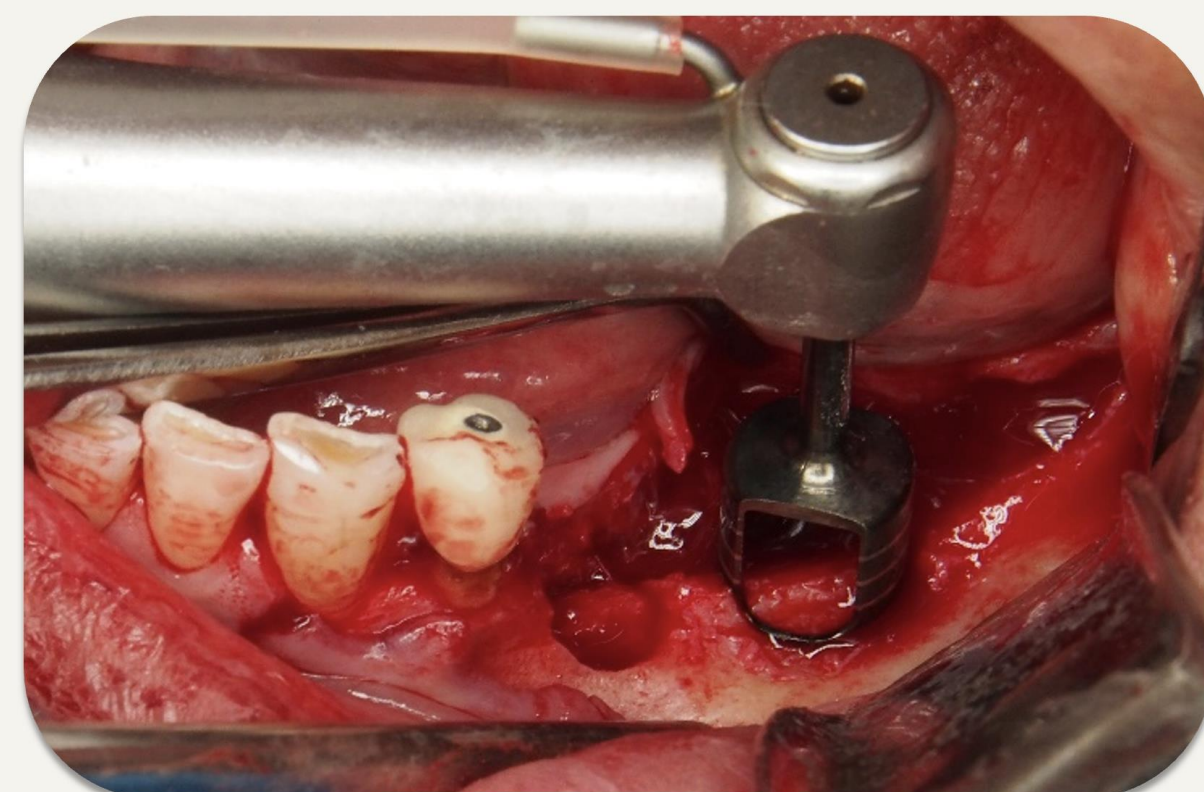
• Sites with severe tissue deficiencies (Complex)



Classification of Ring-shaped bone

These bone peaks may act as tents which bring vessels, nutrients and stem cell to the area of GBR.

- 1. Regular shape
- 2. Semilunar shape
- 3. Intralock shape
- 4. 8- shape
- ✓ 5. Ring bed shape (circle half lap shape)
- 6. Olympic shape

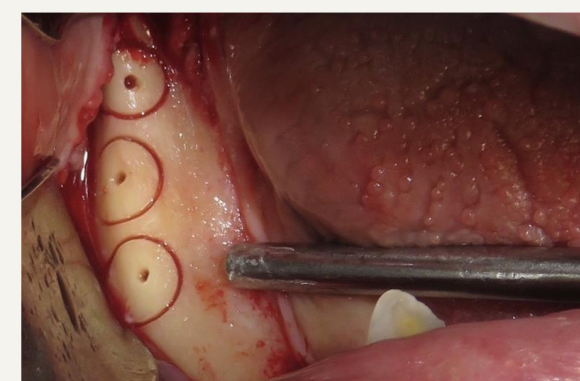


Ring bed shape (Creating Bony Peaks)

Sites with minor tissue deficiencies (Simple)

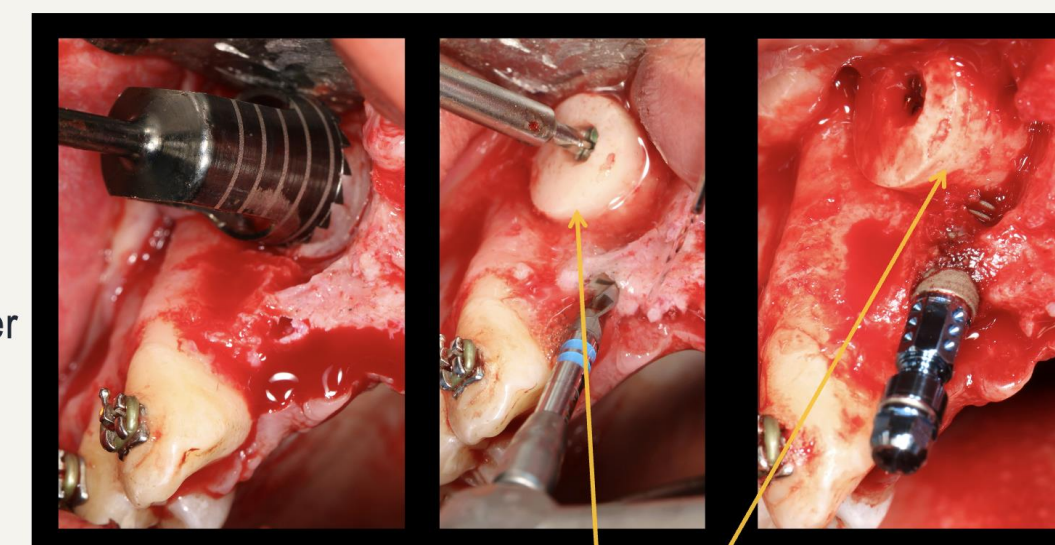
Sites with extended tissue deficiencies (Advance)

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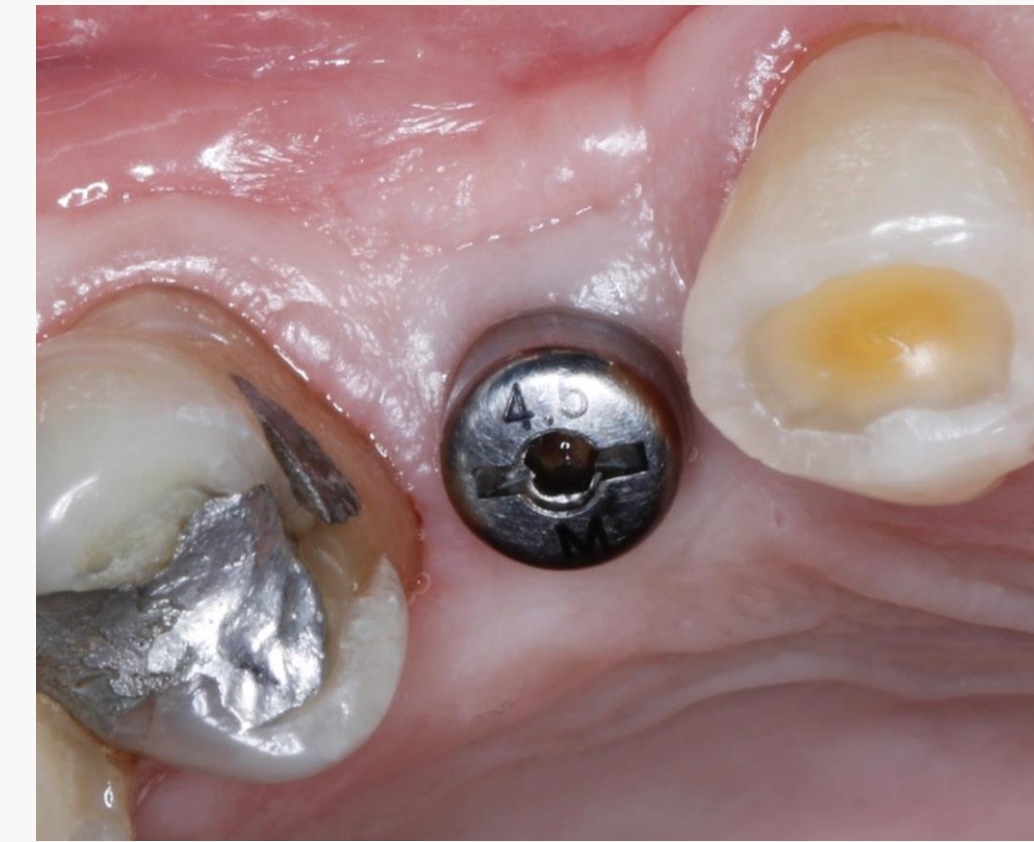
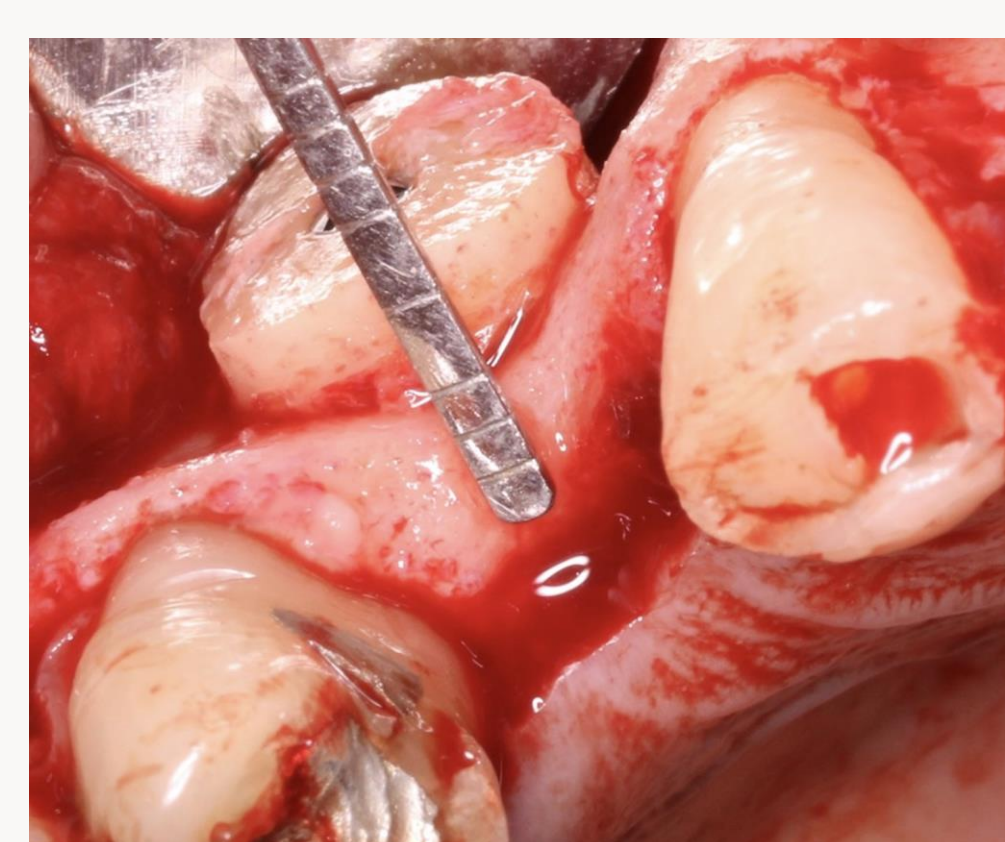


ring blocks could serve as a part of implant osteotomy to provide optimum primary stability and sufficient bone surrounding the implants.

Method

Bone rings were harvested intra-orally using trephine drills from donor sites including the mandibular ramus, symphysis, and alveolar ridges. The harvested rings were classified into six distinct morphologies: regular, semilunar, intra-lock, 8-shape, half-lap, and Olympic. Following classification, the rings were positioned and stabilized within deficient alveolar ridges to reconstruct complex defects. Guided bone regeneration (GBR) was performed using particulate grafts to fill residual gaps, complemented with resorbable membranes. Finally, primary tension-free closure was achieved to ensure optimal wound healing and graft protection

Case 1 – Regular Ring Buccal Convexity Reconstruction



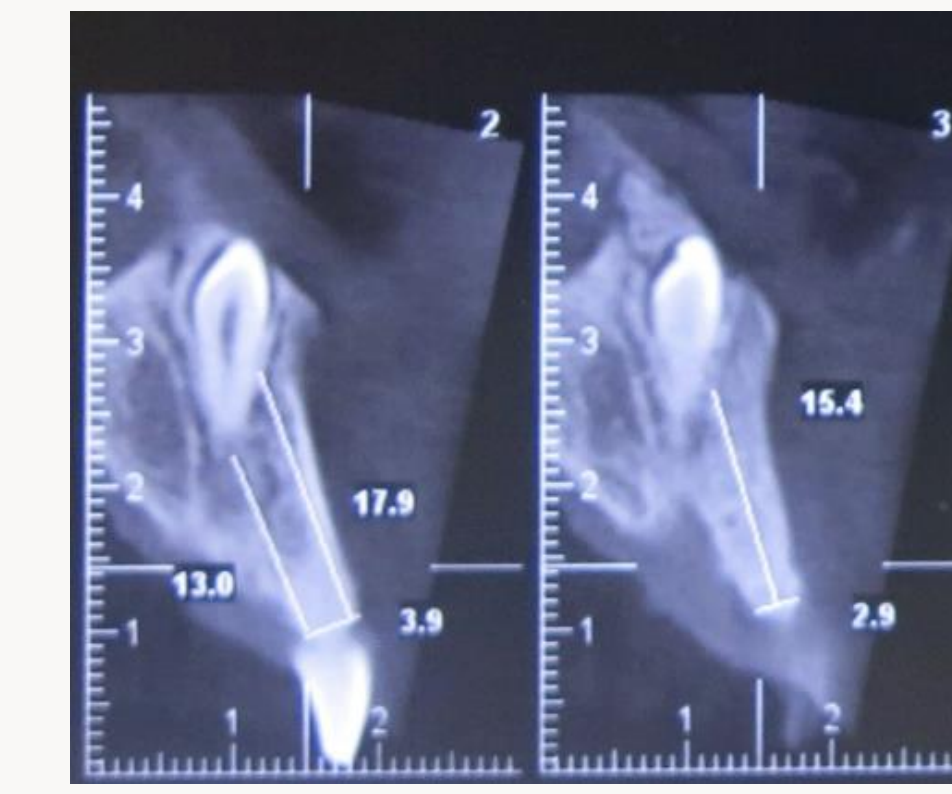
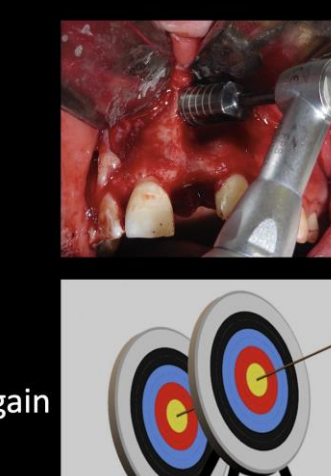
Case 2 – Mesiodens site as Ring Graft Donor

Clinical concepts for a single missing tooth

Regular shape

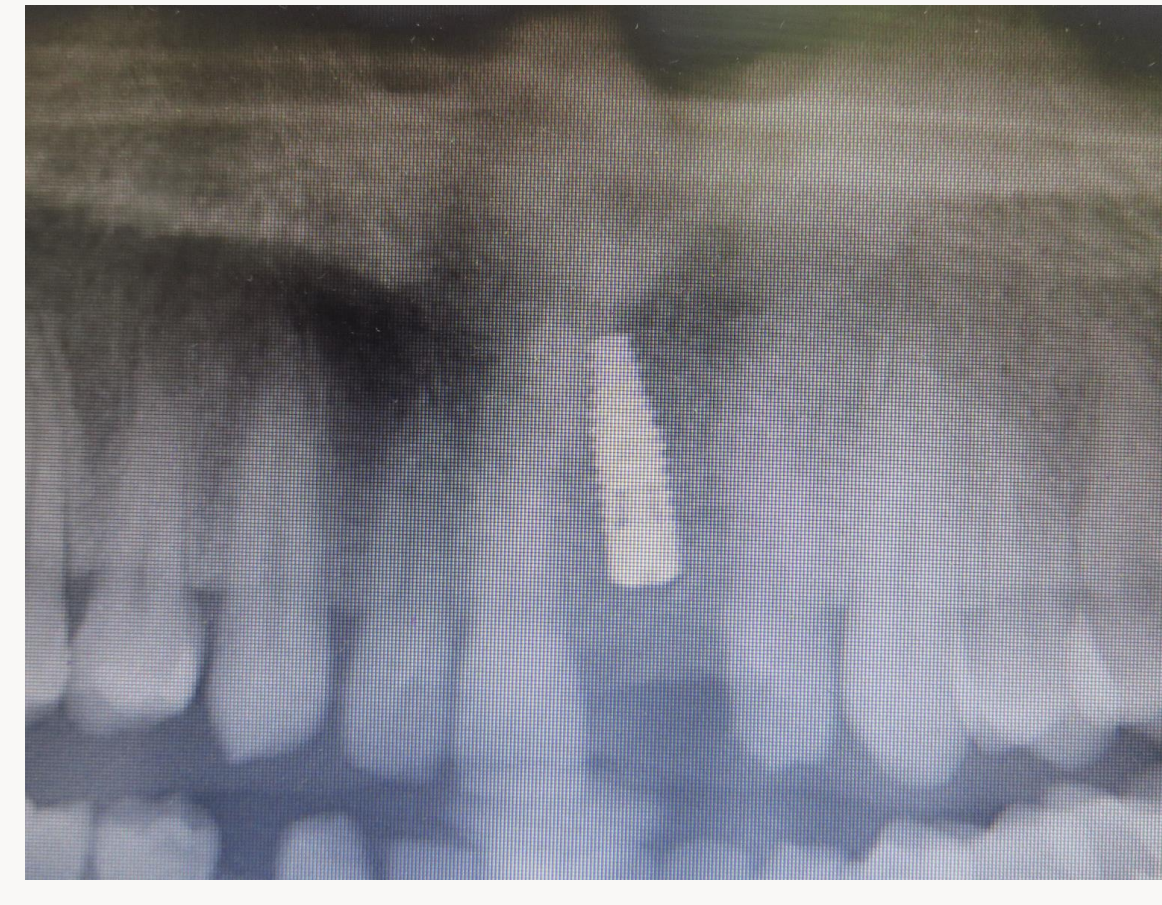
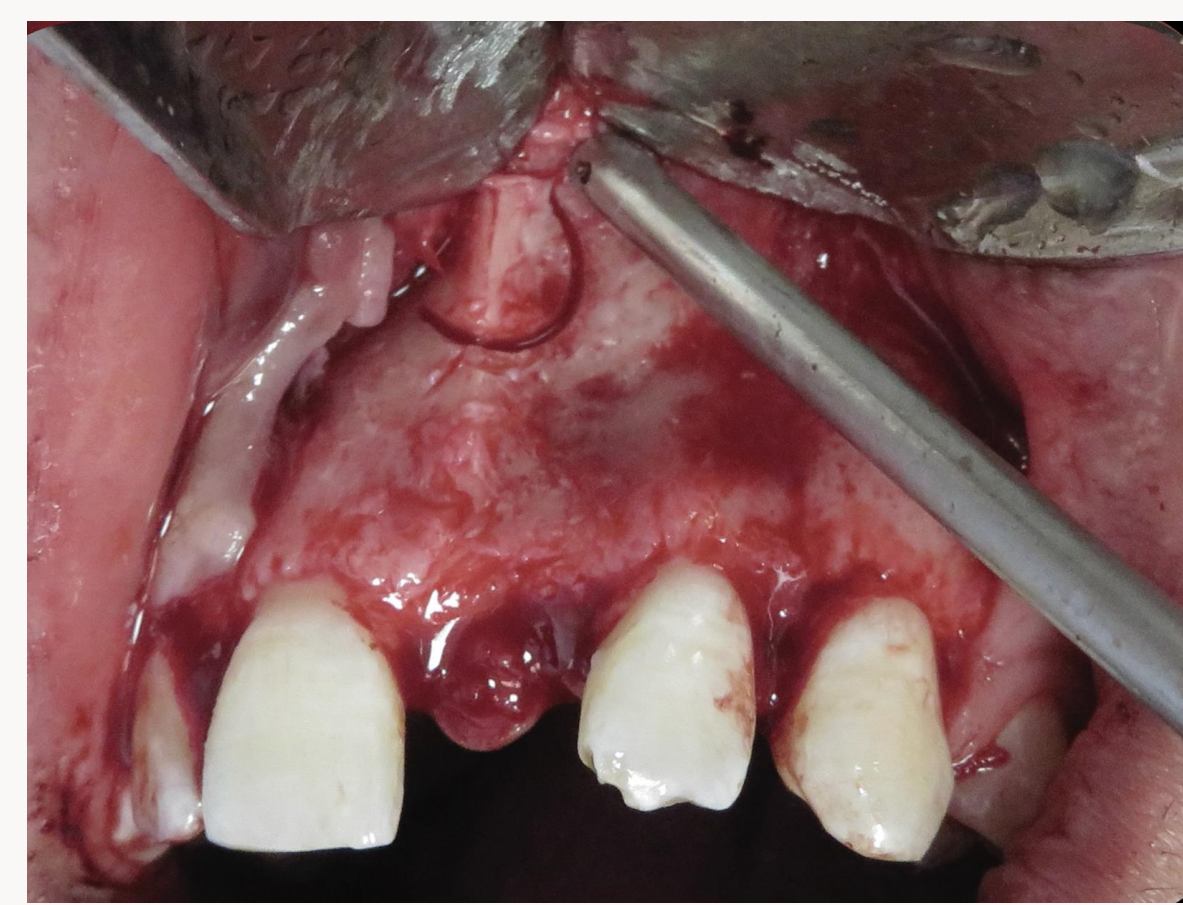
- ✓ Sites with minor tissue deficiencies (Simple)
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A smart move – one action, double gain



Re-Establish of Implant's Buccal Convexity in Severe Bone Deficiency via ring graft and supportive guided bone regeneration

One-site harvesting and reconstruction (two goals, one approach)



Case 3 Ring as Cortical Tent Congenital Missing Incisors

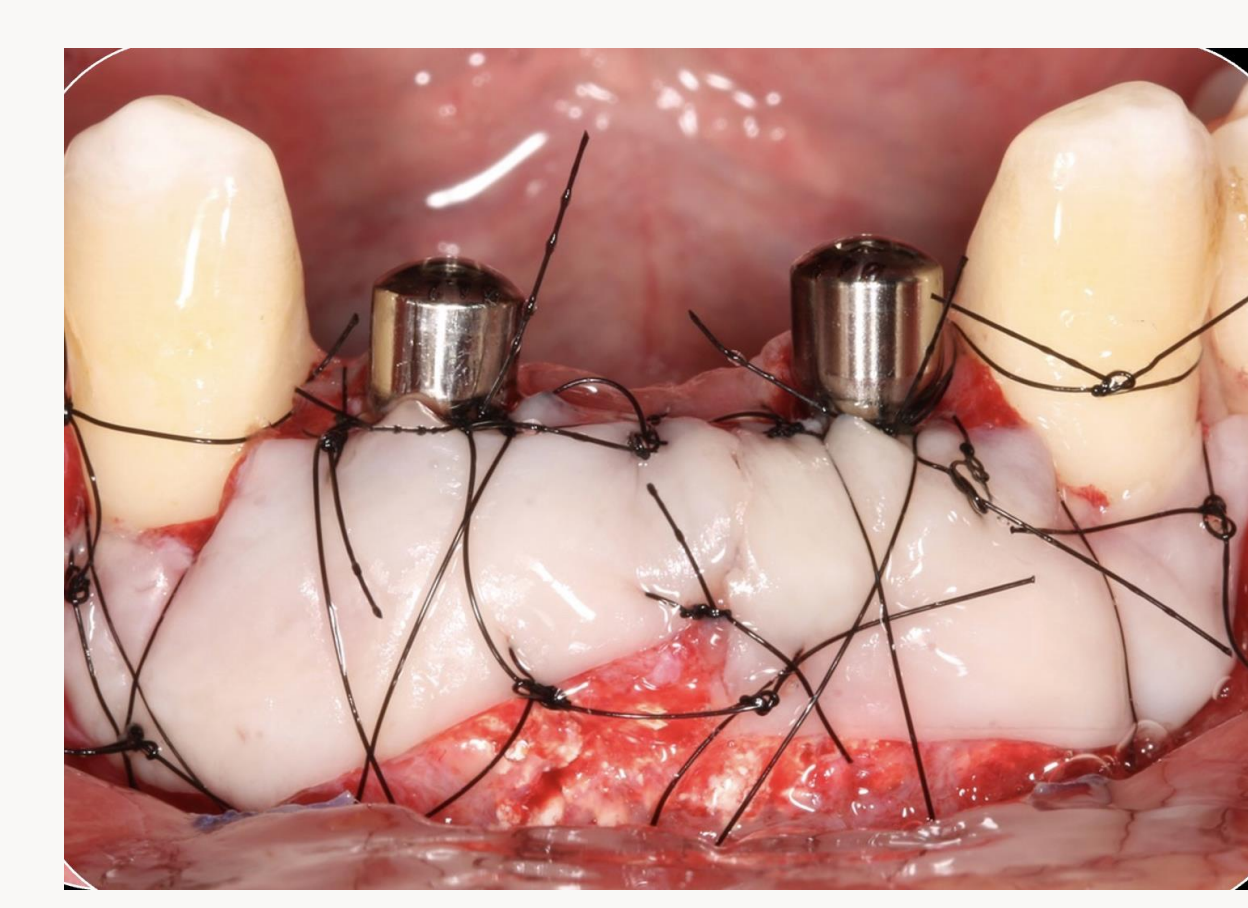
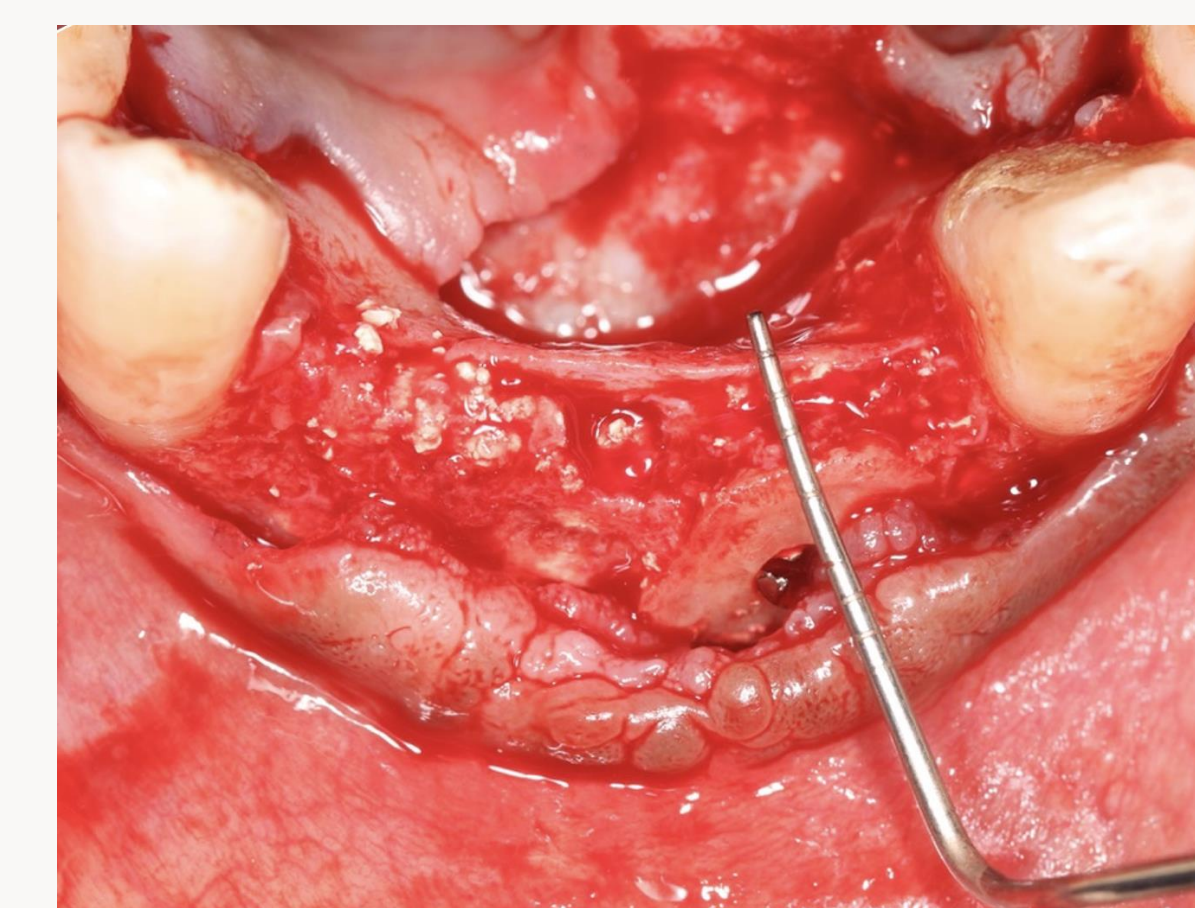
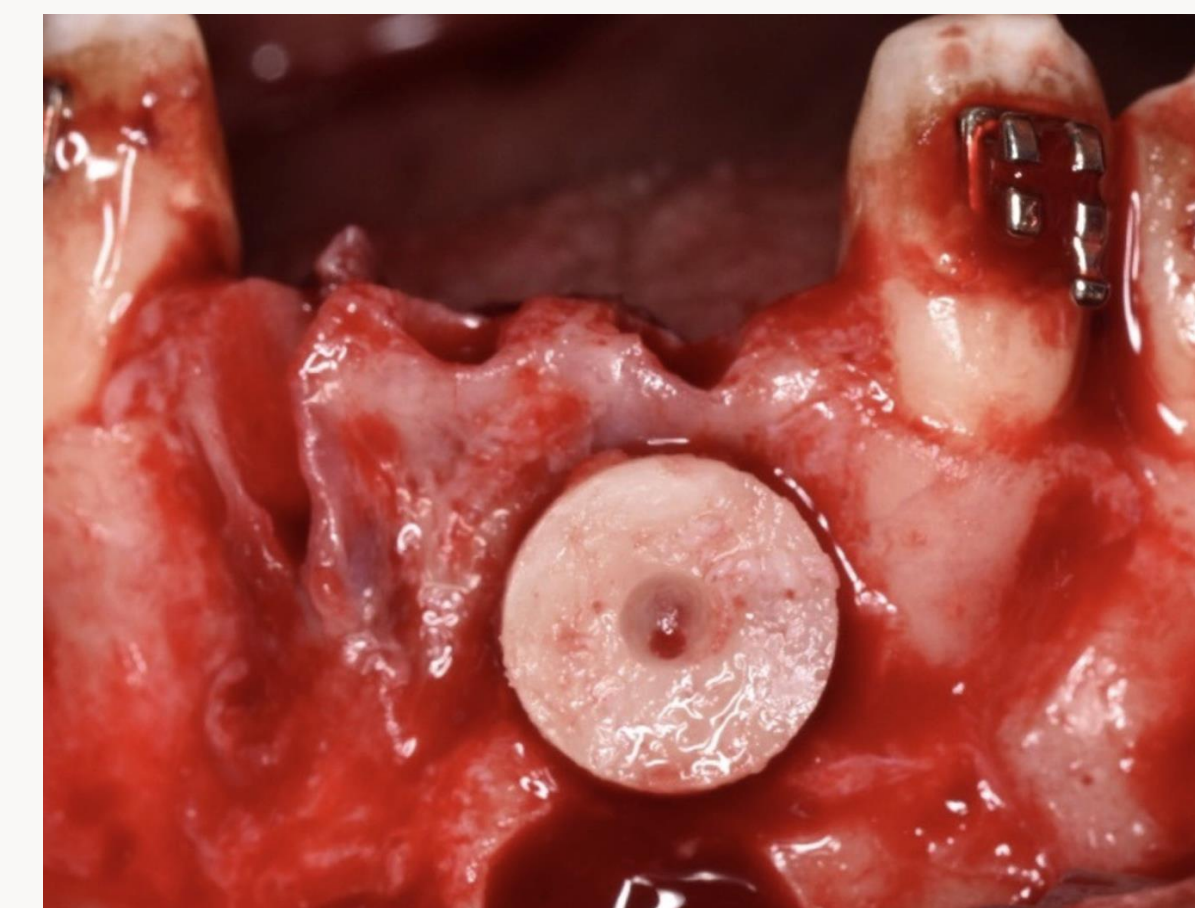
Clinical concepts for multiple missing teeth ring as a cortical tent

- Sites with minor tissue deficiencies (Simple)
- ✓ Sites with extended tissue deficiencies (Advance)
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Mesiodense Removal with Simultaneous Horizontal Bone Augmentation for Implant Placement- A Case Report in Easthetic Zone

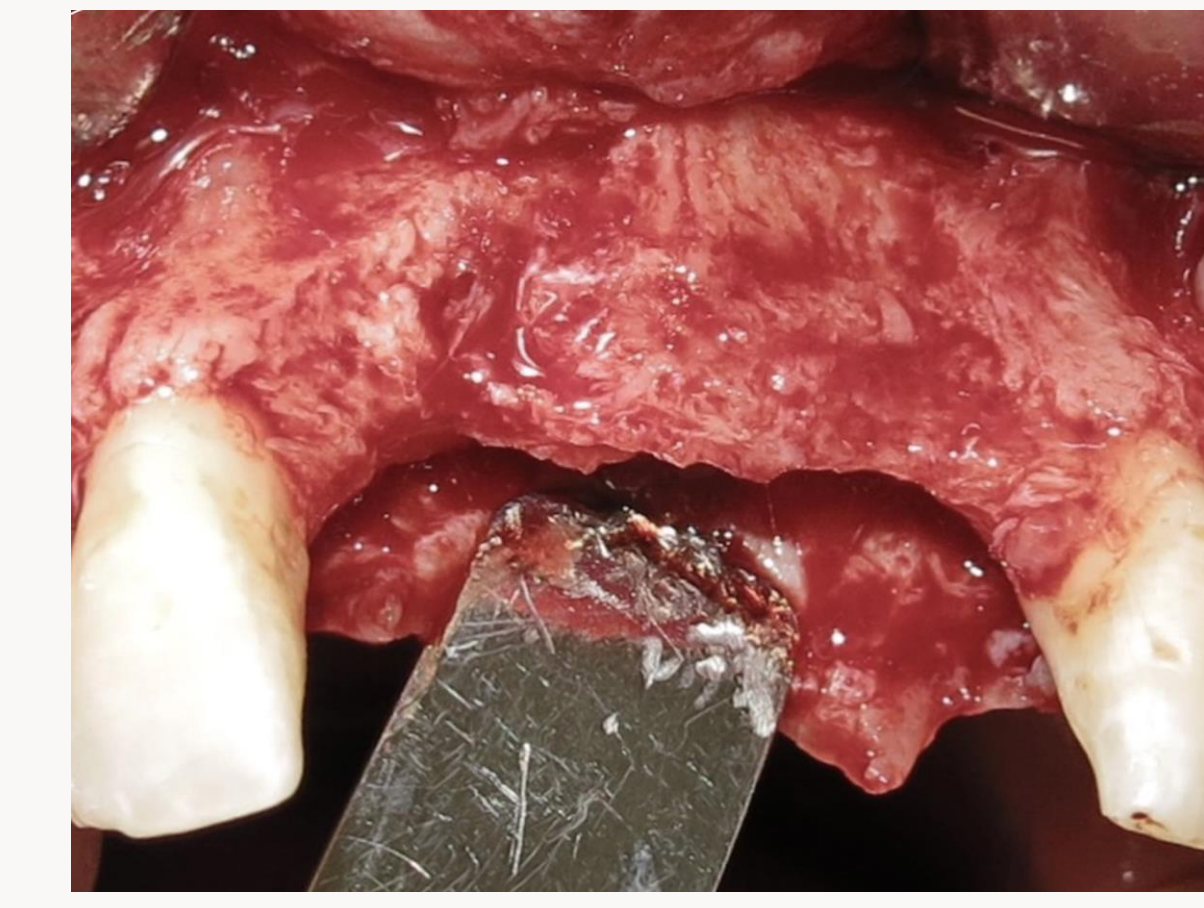
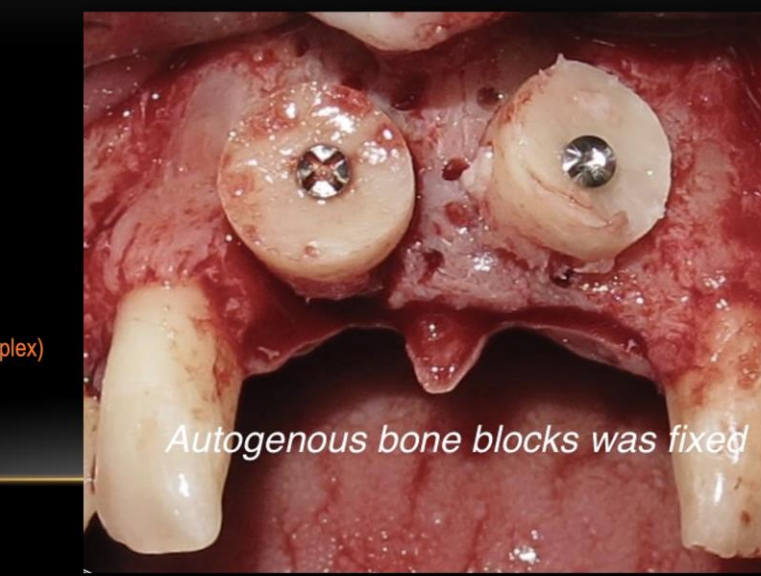
Case 3: Re-Establish of Implant's Buccal Convexity in Severe Bone(A 25-year-old male patient)



Case 4 Multiple Rings Severe Atrophic Ridge

CLINICAL CONCEPTS FOR MULTIPLE MISSING TEETH Multiple regular rings as cortical tents

- Sites with minor tissue deficiencies (Simple)
- ✓ Sites with extended tissue deficiencies (Advance)
- Sites with severe tissue deficiencies (Complex)

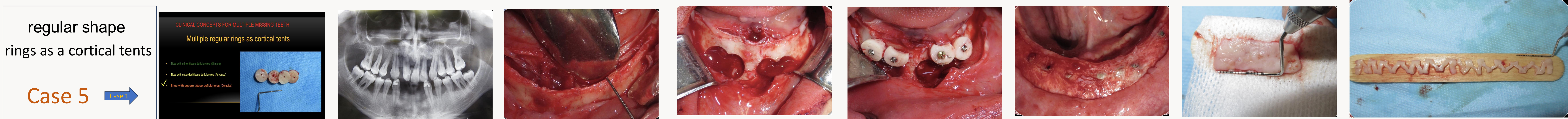


congenitally missing three mandibular incisors) Deficiency using a ring graft (as a cortical tenting) and supportive guided bone regeneration ,and subsequent free gingival graft

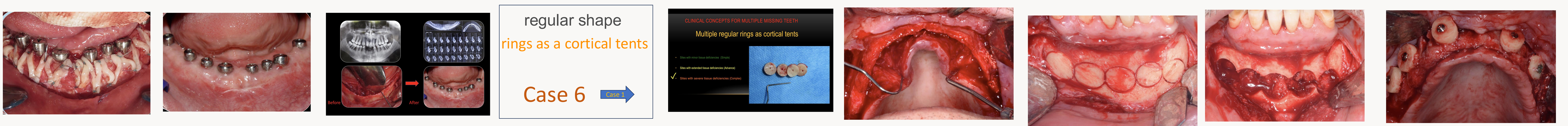
Severe atrophic ridge



Re-Establish of Implant's Buccal Convexity in Severe Bone Deficiency via chin graft and supportive guided bone regeneration with Free Gingival Graft . "Accordion Technique"



Re-Establish of Implant's Buccal Convexity in Severe Bone Deficiency via chin graft (cortical tenting) and supportive guided bone regeneration with Free Gingival Graft . "Accordion Technique"



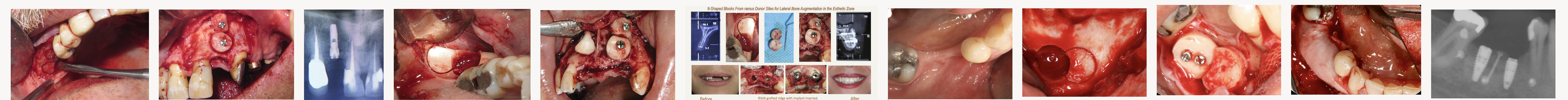
Atrophic maxillary alveolar ridge augmented by five circular bone blocks harvested from the chin by trephine drill



Case 7

Composite bone graft placement

8-Shaped Blocks from Different Donor Sites for Lateral Bone Augmentation in the Esthetic zone

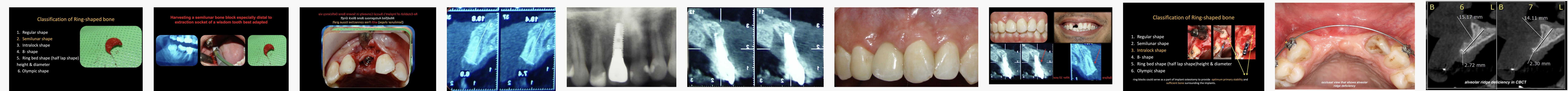


Case 8 : Alveolar Ridge as Donor site

8-Shaped Blocks From Different Donor Sites for Lateral Bone Augmentation in the Esthetic Zone

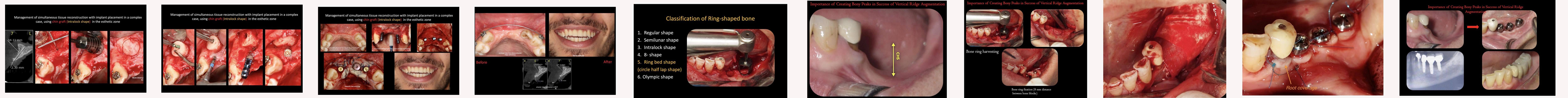
Case 9: Ramus as Donor site

Case 10: Vertical and horizontal bone augmentation with Ring bone shield technique



Case 11: A semilunar ring harvested from the area of third molar inserted inside the socket of the missing central incisor prior to drilling for implant insertion, covered with a SCTG preserved the peri-implant bone and soft tissue.

Case 12: A ring harvested from the alveolar bone adjacent to the edentulous ridge was inserted in a recipient area prepared-

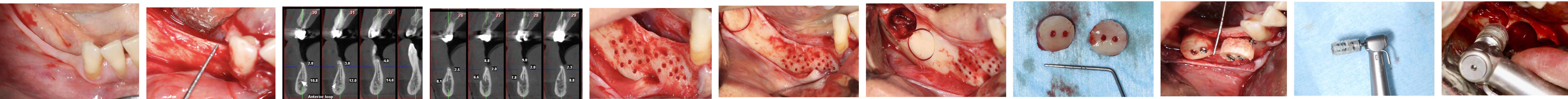


using a trephine drill a little bit larger than the ring in an Intralock model, then drilling was performed with the ring serving as the part of the osteotomy wall

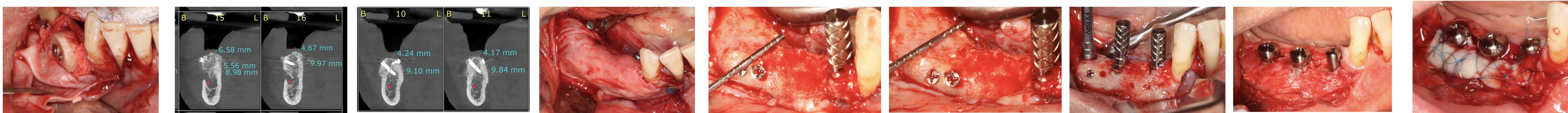
Case 13: In a severe vertical defect, two ring blocks harvested from the ridge, were placed obliquely. After 6 months two bony peaks were created in vertical dimension which supported the vertical ridge augmentation. The recession on second premolar was covered.



Case 14: In a severe vertical defect, three rings were harvested from the adjacent external oblique ridge and placed obliquely overlaying the ridge supporting the GBR. After 6 months, two 10 mm implants were inserted. The periapical radiograph shows the 5-year results.



Case 15 : Two autogenous bone rings and autogenous particulate bone were harvested from the mandibular ramus using a trephine bur and bone collector. Simultaneous horizontal and vertical



augmentation was performed in the anterior region. After 6 months, three implants were placed, followed by a free gingival graft (FGG).

Results: Clinical application of the 3D ring augmentation technique showed stable graft integration and significant bone volume gain in complex ridge defects. The method minimized surgical complications such as graft mobility and soft tissue dehiscence, while enhancing predictability of outcomes. Radiographic and clinical assessments confirmed successful defect reconstruction and favorable conditions for subsequent implant placement. Overall, the technique demonstrated high reliability and reproducibility in challenging reconstructive scenarios.

Conclusion: 3D ring augmentation represents a clinically innovative alternative to conventional block grafting. Its morphological versatility, intraoral accessibility, and ability to regenerate natural bony contours offer predictable, efficient, and esthetically favorable outcomes for complex ridge augmentation.

Reference:

1. Giraddi, G. B., & Saifi, A. M. (2017). Bone ring augmentation around immediate implants: A clinical and radiographic study. *Annals of Maxillofacial Surgery*, 7(1), 92–97. https://doi.org/10.4103/ams.ams_58_17
2. Lei, K., Zhang, X., & Peng, L. (2025). Modified bone ring tenting technique for alveolar ridge augmentation and simultaneous implant placement: A technical note. *Journal of Oral and Maxillofacial Surgery*. Advance online publication. <https://doi.org/10.1016/j.joms.2025.11.001>
3. Chen, X., Tang, C., Zhang, X., Chen, Y., Huang, P., Chen, Z., Gao, Y., & Peng, L. (2023). Autogenous bone ring augmentation around single tooth implantation in the esthetic zone: A retrospective case series study with 2–3 years of follow-up. *Journal of Dental Sciences*, 18(4), 1517–1526. <https://doi.org/10.1016/j.jds.2023.03.006>