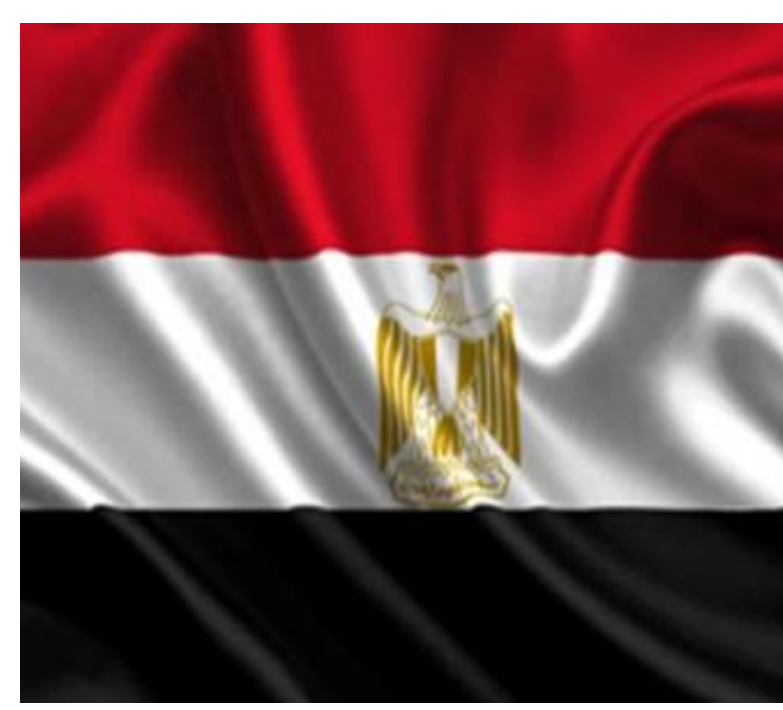
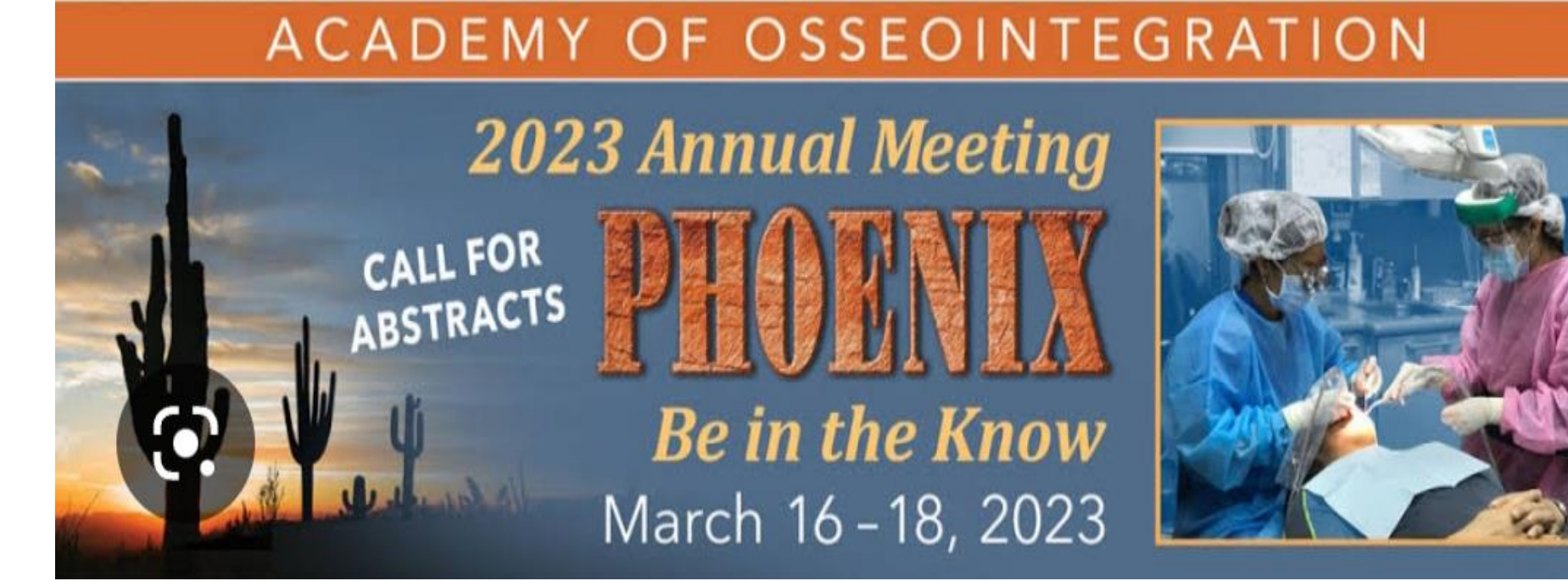




Computer Guided Cortical Shell Technique Using Patient Specific Interlocking Surgical Guides (PSIGs): A Novel Full Digital Protocol For 3D Bone Augmentation Of The Anterior Mandibular Alveolar Ridges.



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- Introduction:** The Autogenous cortical shell technique usually requires well trained operators, prolonged intraoperative time and had some technical drawbacks specially at the long span cases Such as lack of anatomical guidance during cortical shell fixation leading to an improperly positioned tilted or rotated autogenous shell, or even leaving an undesired distance between the shell and the deficient ridge .the aim of this study is to fully digitalize this protocol using 3 patient specific interlocking surgical guides to allow for accurate graft harvesting and buccal and lingual shell positioning.



Figures 1,2: severely atrophied anterior mandible

• **Methods:** 5 patients with deficient 3D (vertical and horizontal) anterior mandibular alveolar ridge received a full digital protocol for harvesting and positioning of autogenous cortical shells from the symphysis using 3 patient specific interlocking guides (PSIG) .the first guide used for safe and accurate harvesting of 2 cortical shells, then each shell was fixed to a second and third guides outside the patient’s mouth using micro screws. These guides were secured in placed and interlocked with the first guide at the surgical site for verification of the accuracy of the procedure. The second and third guides used for buccal and lingual shell fixation separately leaving the desired gap with the recipient site that was filled with a particulate mix of xeno and auto grafts 1:1 . Finally, the 3 guides were removed after fixation of the shells to the recipient site in a through and through manner at the proposed planed position.

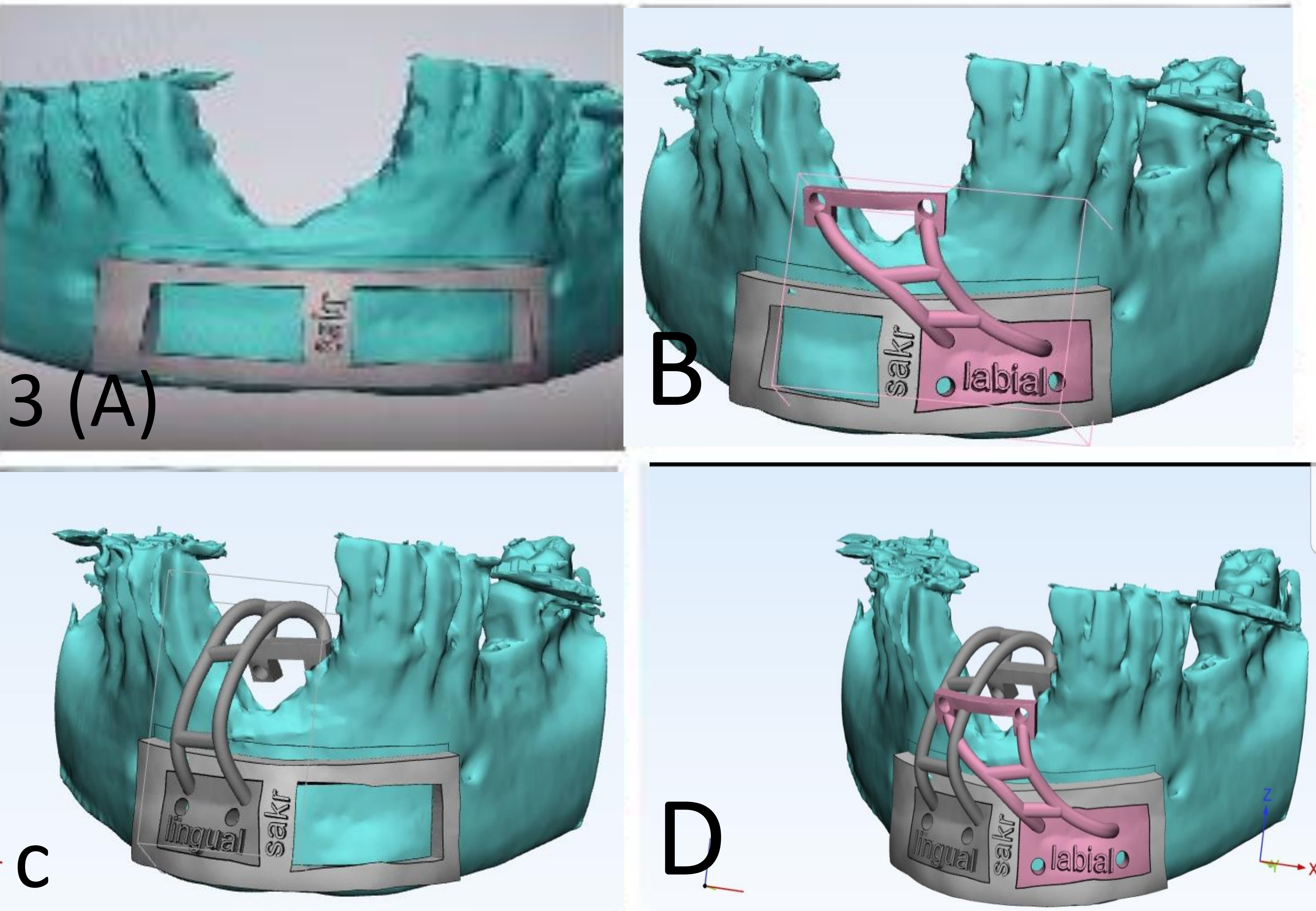


Fig 3 (A) :preoperative virtual design of the harvesting guide , (B,C,D) the first and second stackable guide for labial and lingual shell positioning .

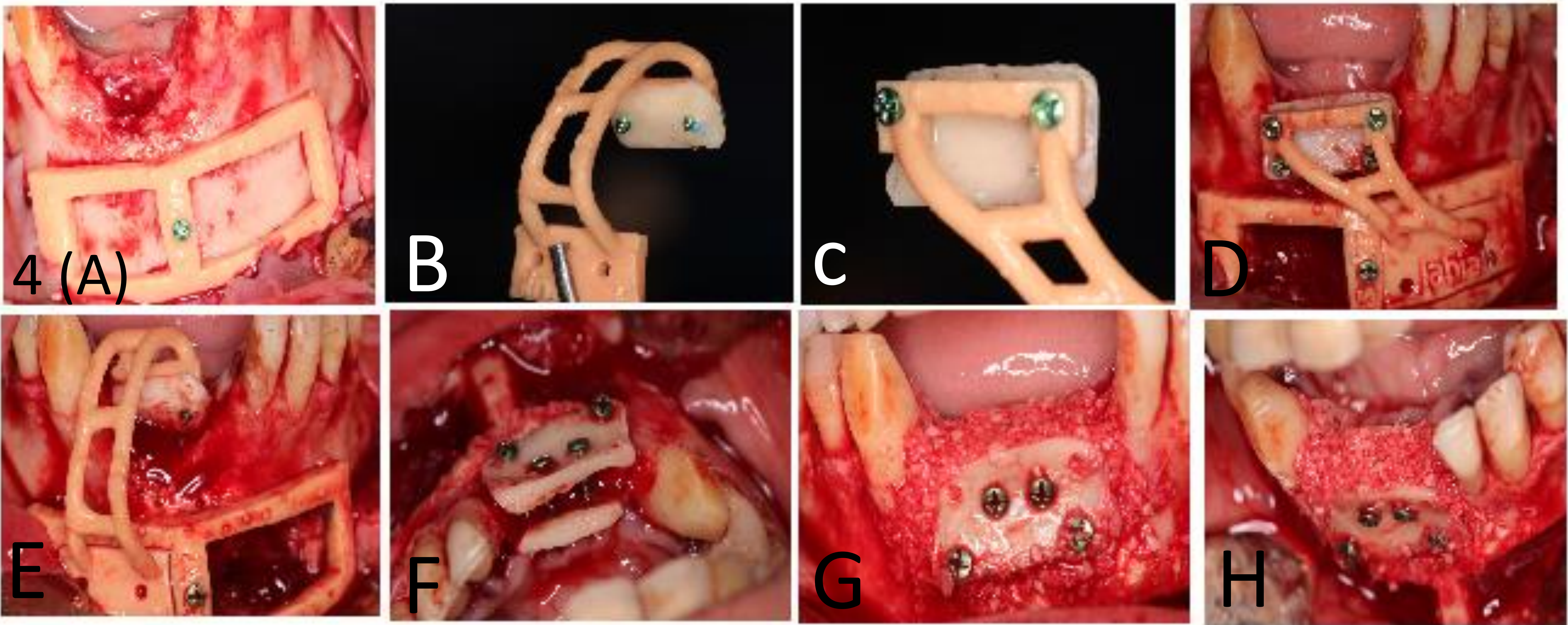


Fig 4: (A) full thickness flap reflection and fixation of the patient specific harvesting Guide in place . (B) Harvested cortical shells fixed to the positioning lingual and (C) labial guides with mini screws outside the patient’s mouth and interlocked with the first harvesting guide in place (D,E) .(F) fixation of the shell to the defective site with mini screws . (G,H) removal of both guides and application of particulate bone graft at the interpositional gap.

Results: all cases showed uneventful healing after 5 months of graft consolidation period, the final horizontal bone gain was 5 mm while the vertical was 3.5 mm from 4 months postoperative CBCT.

Conclusion: computer guided khoury Autogenous cortical shell technique allowed for more accurate and simple 3D graft fixation for the the anterior mandible specially for the inexperienced surgeons.

	Preoperative	4 months	Bone gain	Bone gain percentage (%)
horizontal gain	10.6±0.48	15±1.23	5±1.05	41.8±10.1 %
Vertical gain	10.7±0.72	14.6±0.55	3.5±0.65	36.9±8.2 %
P value	0.77	0.13	0.24	0.0001

Table: representing pre and postoperative vertical and horizontal dimensions of the alveolar ridge

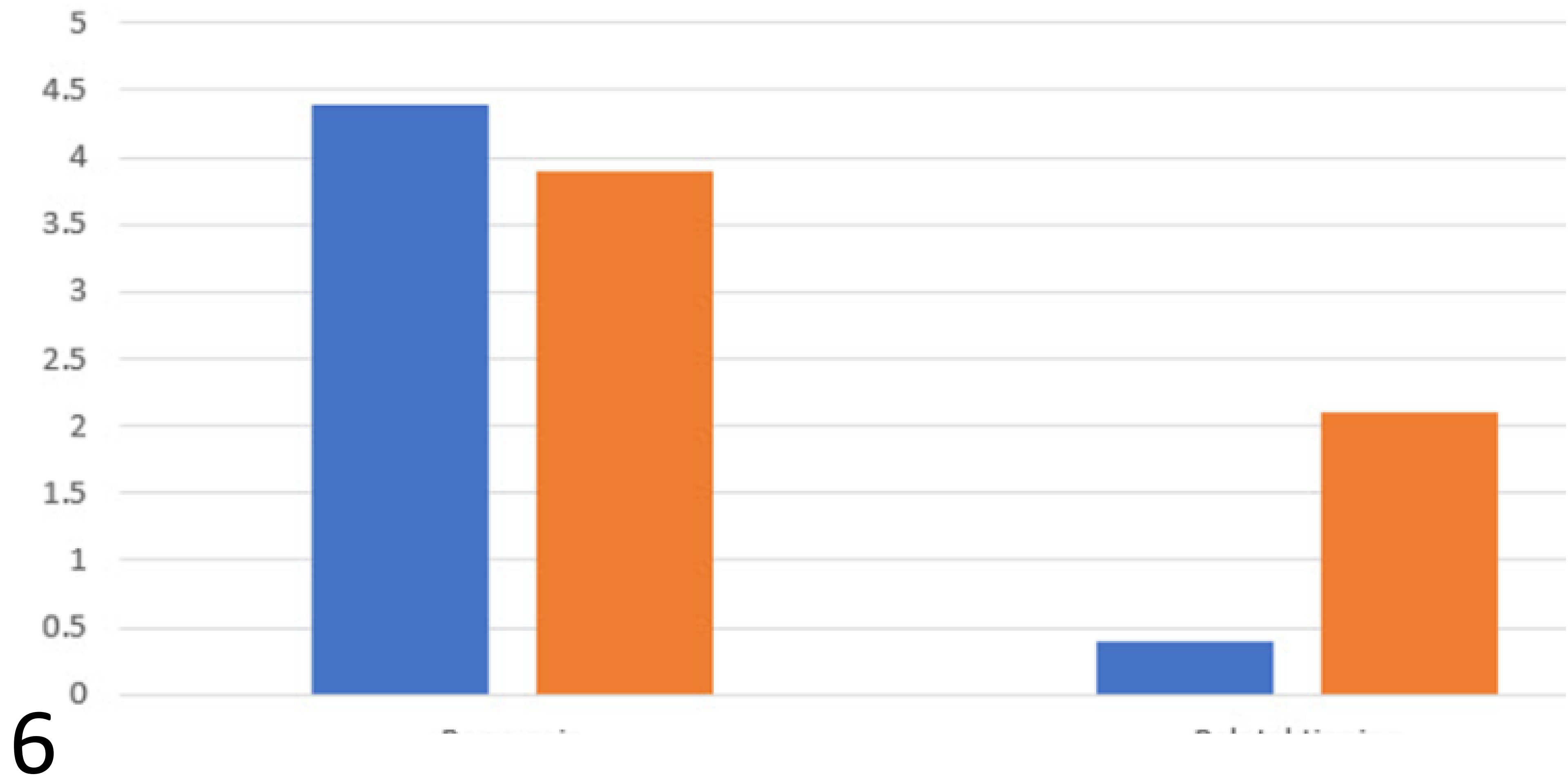


Fig 6 : Bar Chart representing pre and postoperative vertical and horizontal dimensions of the alveolar ridge

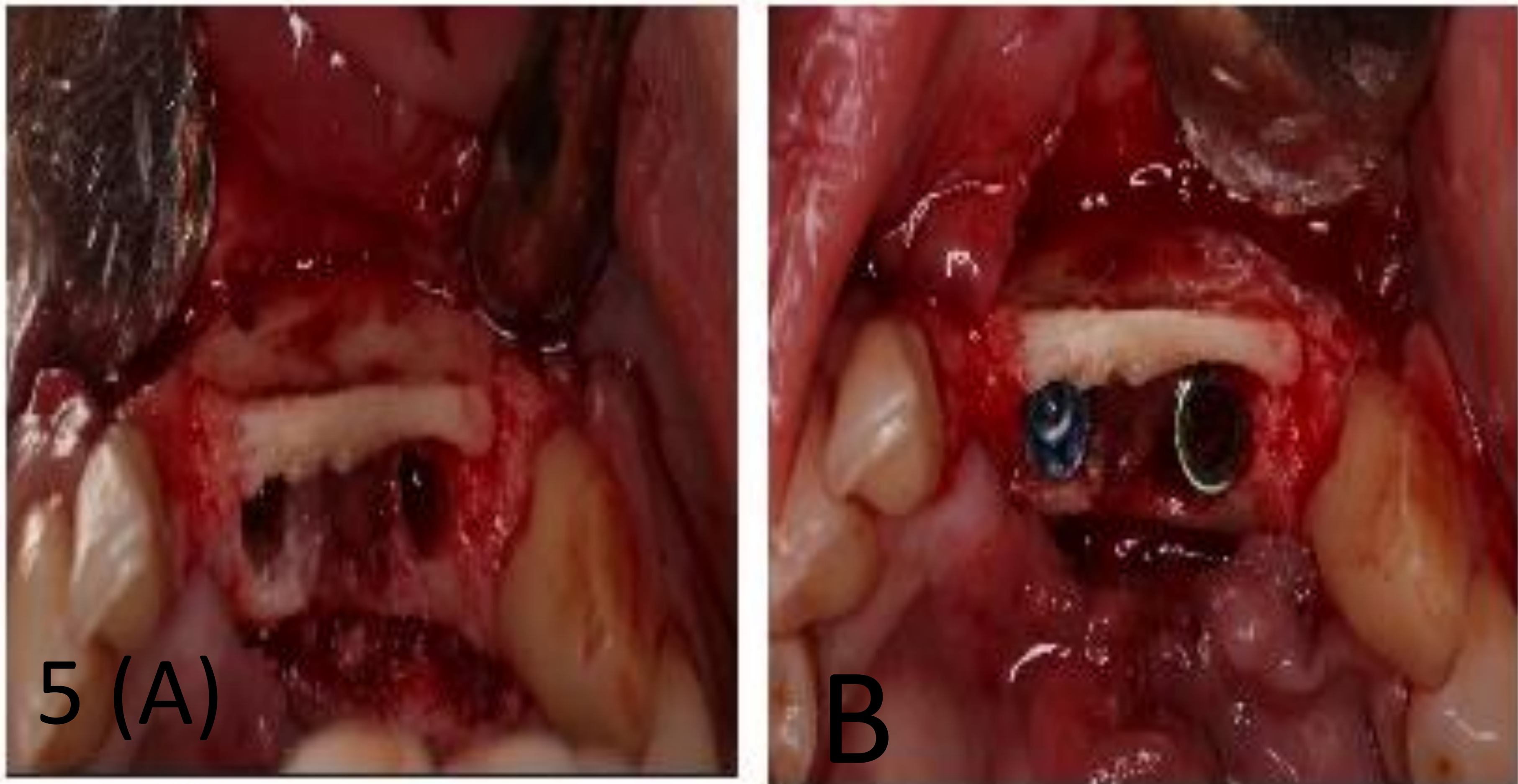


Fig 5 : second stage surgery (A) osteotomy site preparation, (B) dental implant placement

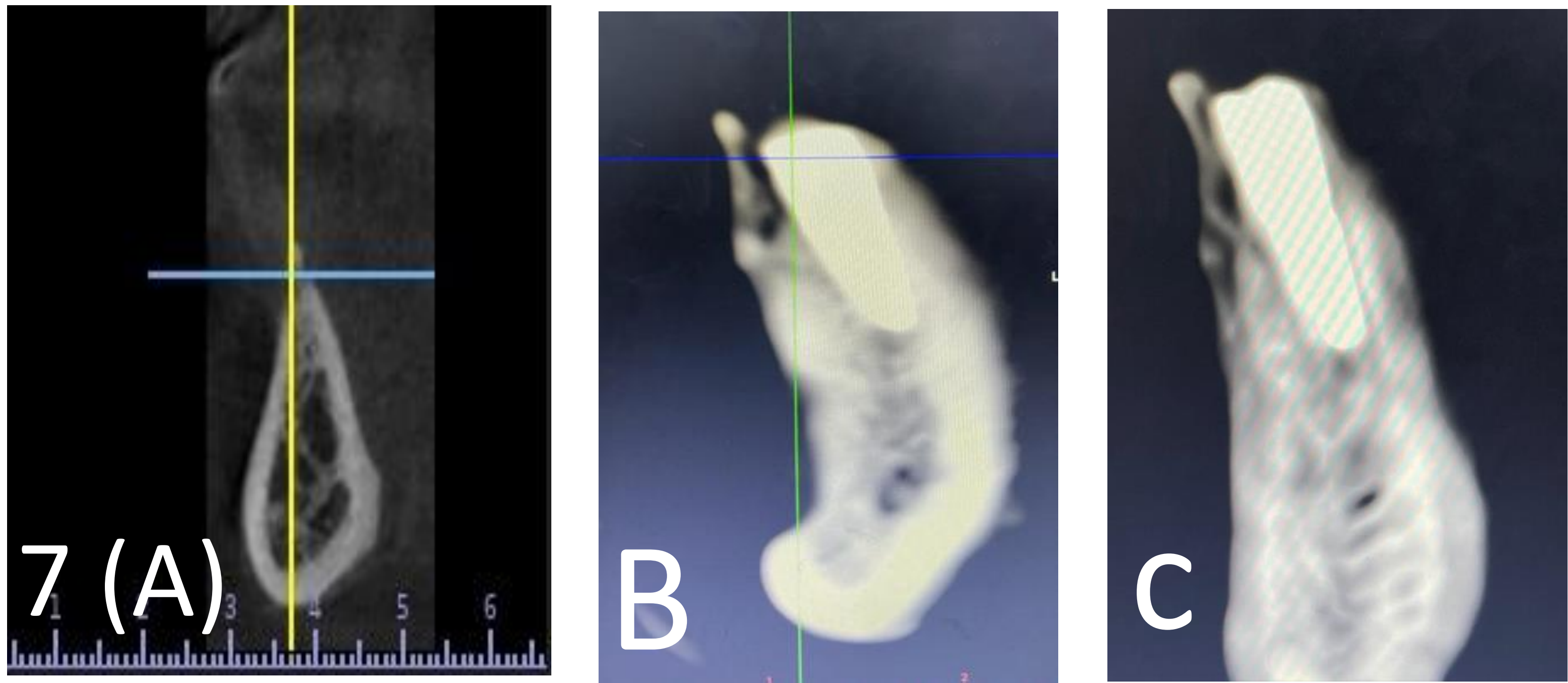


Fig 7 (A) :preoperative cross sectional cut, (B,C) postoperative cross sectional view showing implants in place with adequate 3d dimensions of the alveolar ridge