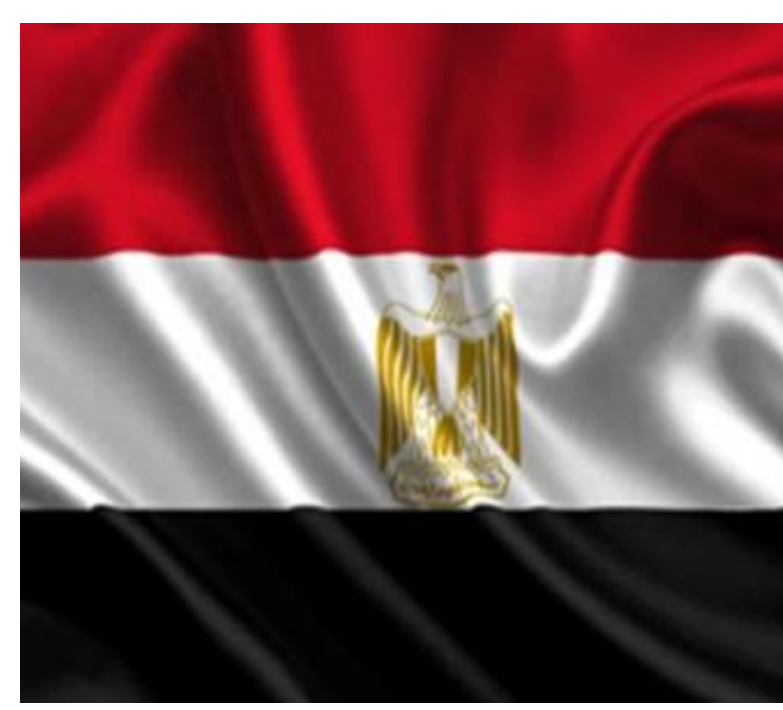
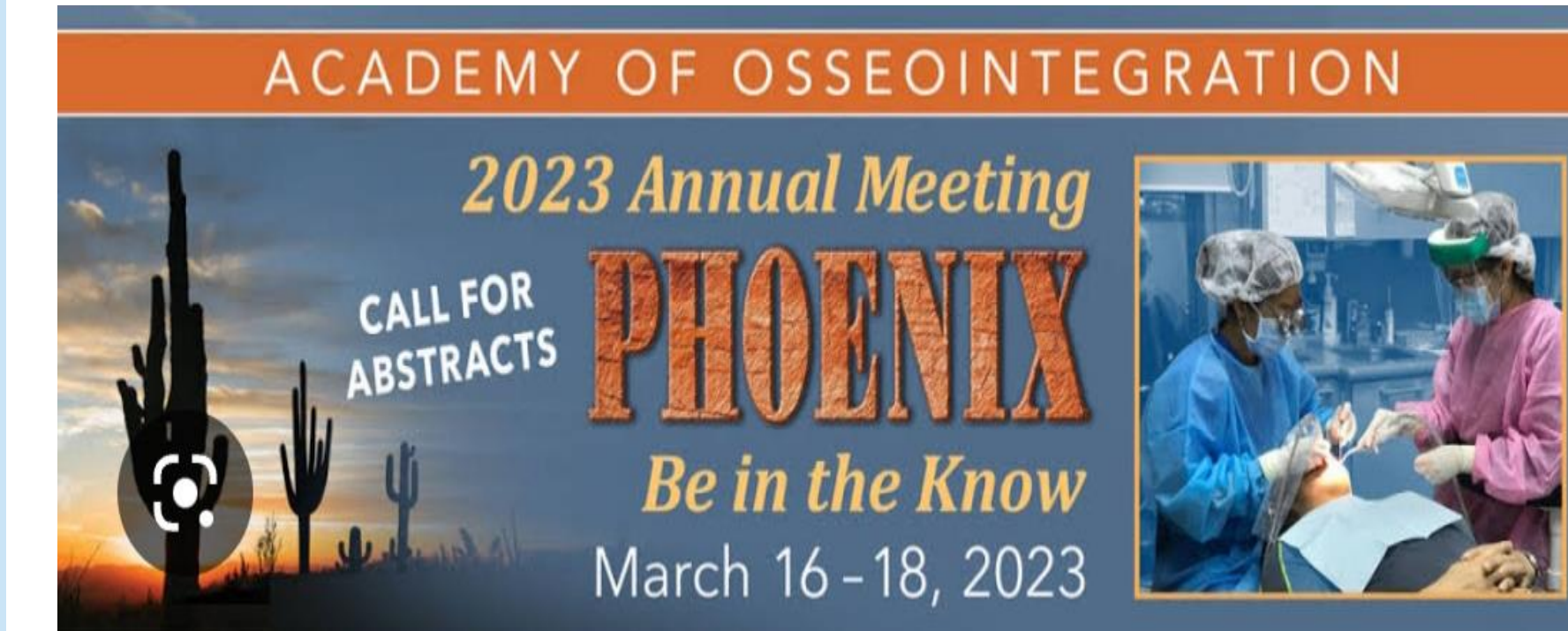


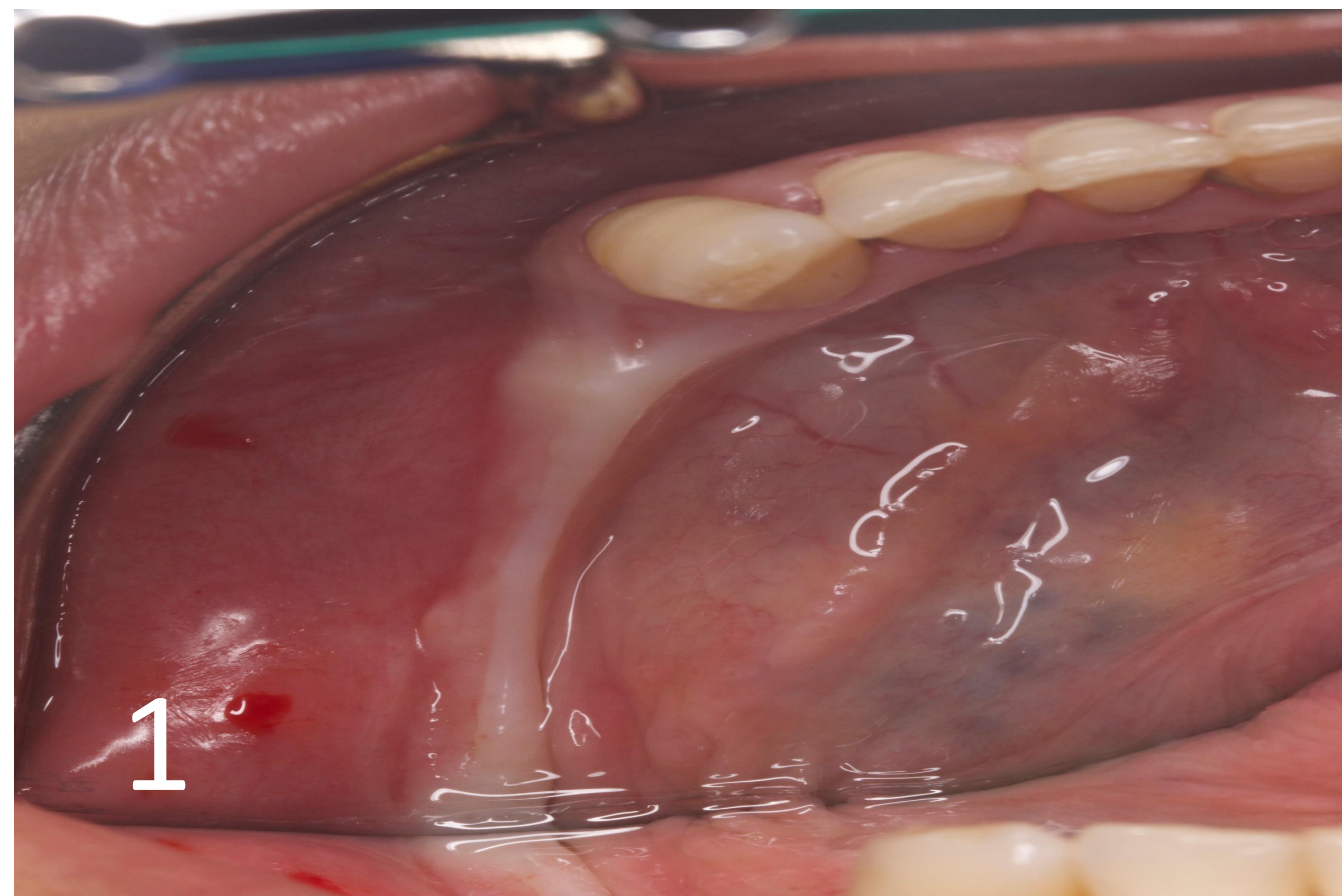


Assessment of Vertical Ridge Augmentation And Neurosensory Affection Using Sandwich Osteotomy Technique For The posterior Mandible Using Free Hand Versus Computer Guided Protocol. A split Mouth Study



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- Introduction:** vertical Bone Augmentation of the posterior mandible is a very challenging procedure due to impaired blood supply, difficult accessibility, bad quality of bone and lack of keratinized soft tissue coverage . despite being reliable; sandwich osteotomy technique usually requires special surgical skills, prolonged intraoperative time , lack of anatomical guidance during separation of the transport segment specially for the long span cases leading to an improperly positioned tilted or rotated mobilized segment or leaving an undesired distance between the segment and the basal part of the deficient mandible .The aim of this study is to maximize the benefit of such technique using 2 patient specific surgical guides to allow for accurate separation and positioning of the mobilized segment at the posterior mandible .



Figures 1,2: severely atrophied posterior mandible

• **Methods:** : 7 patients with bilateral vertically deficient posterior mandible were included in this split mouth study . full thickness buccal flaps were done for both sides. free hand osteotomy placement was performed followed by segment separation and free hand vertical mobilization and fixation at one side (control group) ,then; the other side (study group) received computer guided protocol using 2 patient specific surgical guides (PSGs) one for accurate osteotomy placement (2 vertical and one horizontal cut)above the inferior alveolar nerve while the other guide for segment fixation at the final vertical position leaving the desired gap with the basal part of the ridge that was filled with particulate xenografts. the segment in both sides fixed using mini-plates.

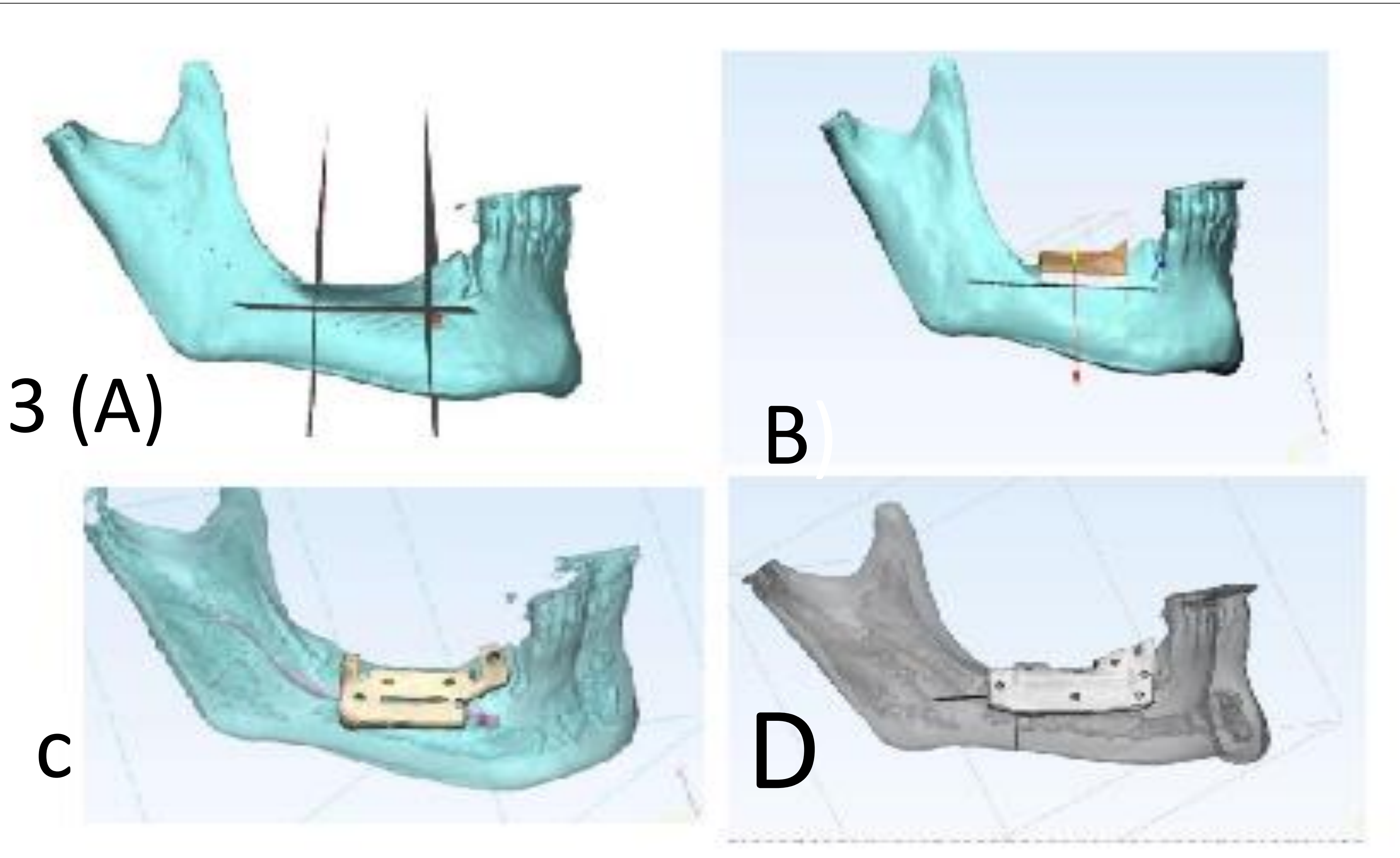


FIG 3: Case 1 (guided group) preoperative virtual design of the 2 guides

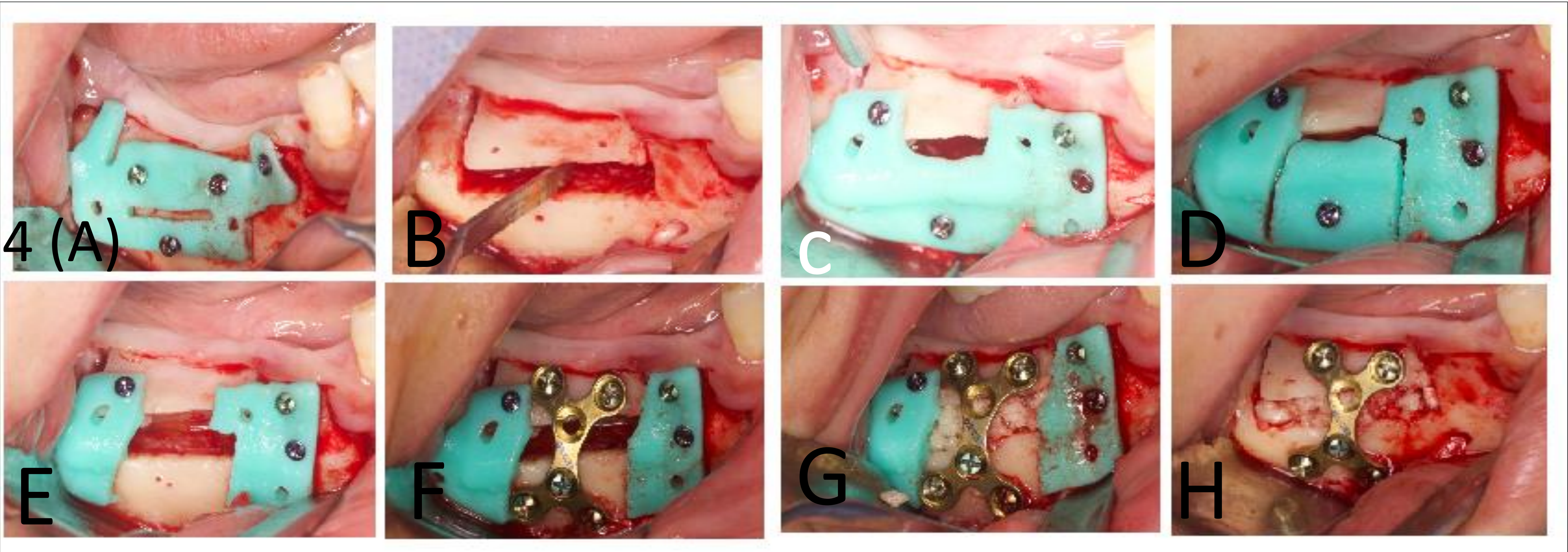
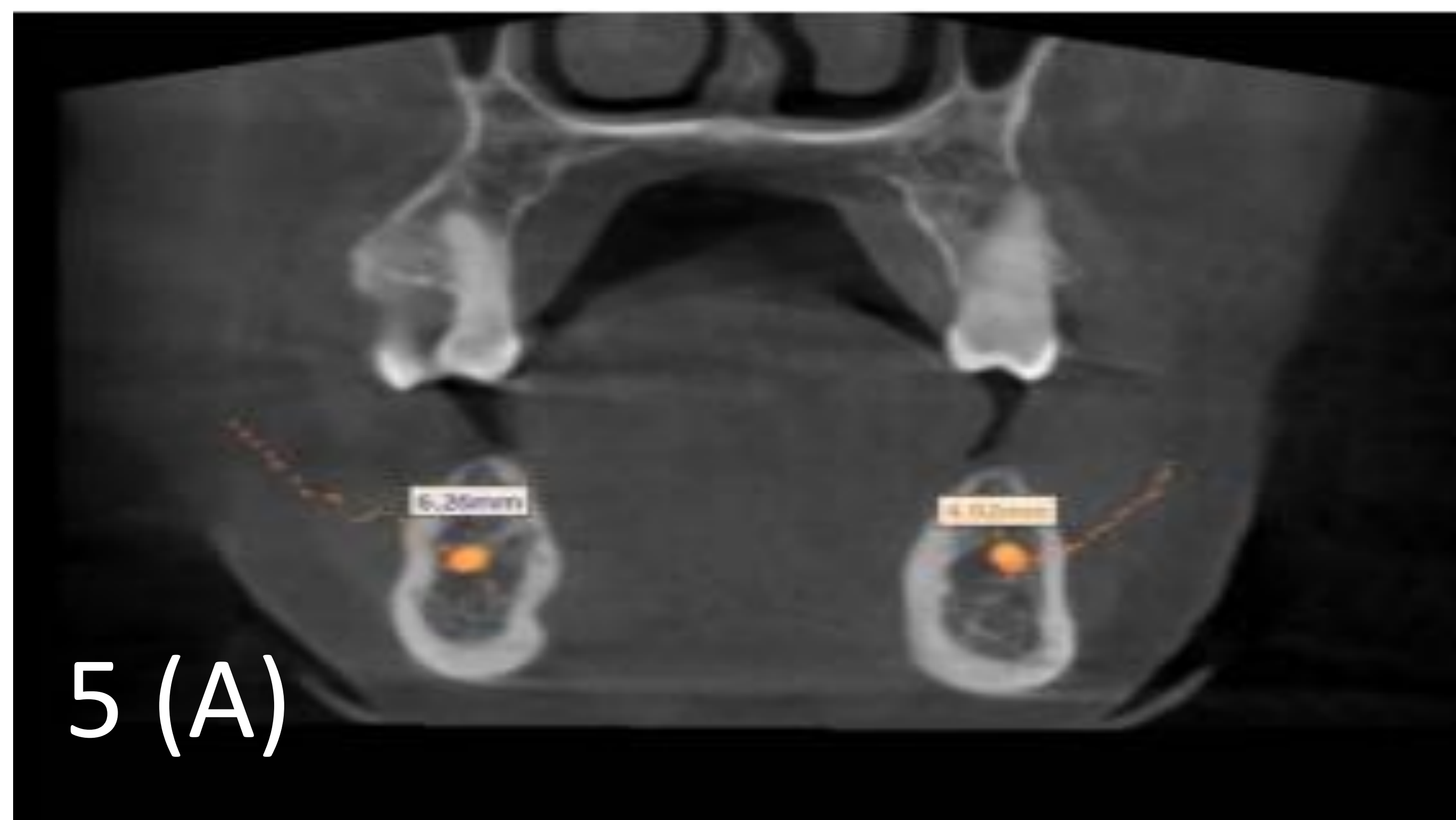
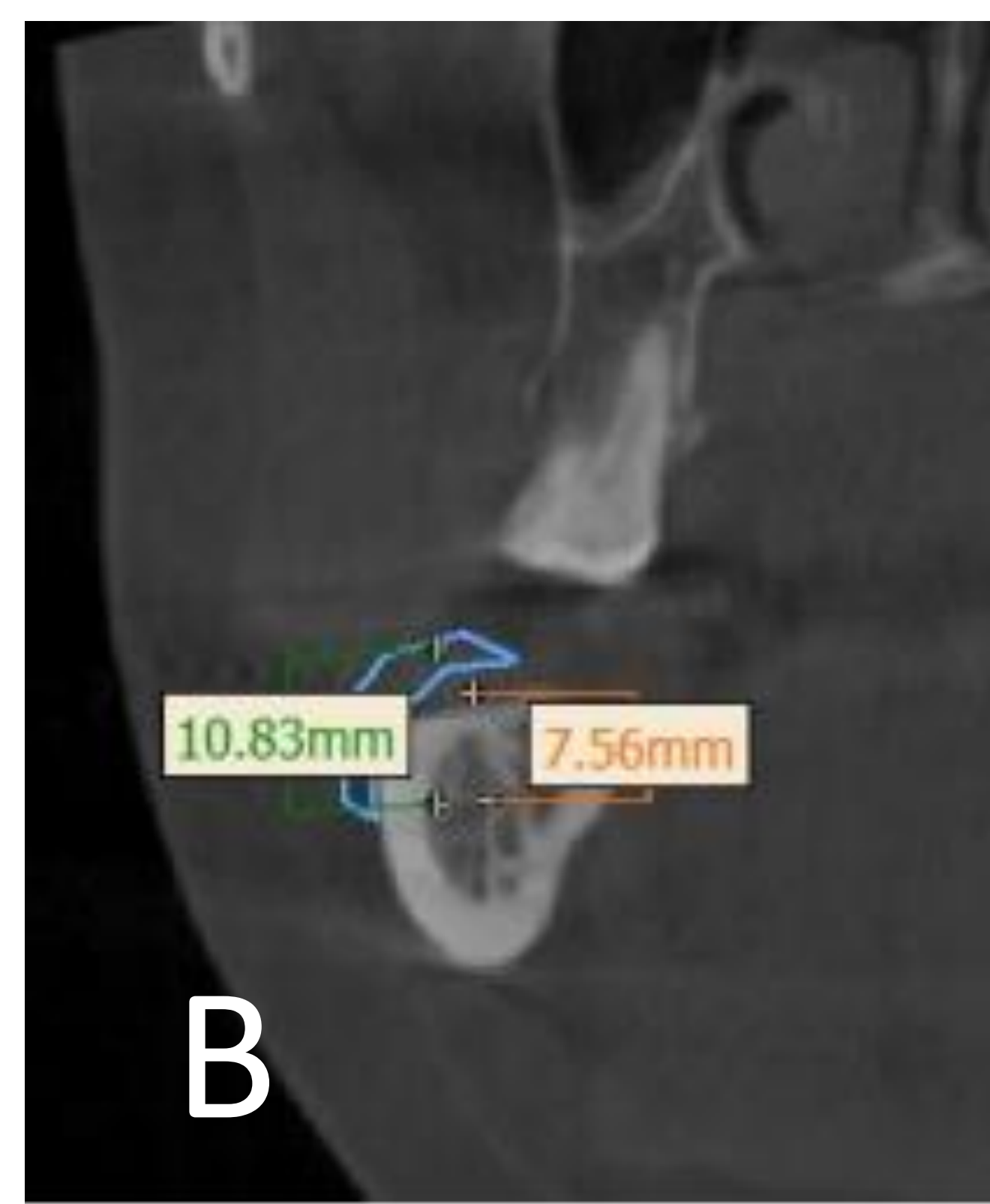


Fig 4: Case 1: (A) full thickness flap reflection and fixation of the patient specific cutting Guide in place using monocortical mini screws . (B) crestal mobilization of the fractured segment .(c) fixation of the positioning guide in place to fix the segment in its final preplanned position . (D) removal of the inter connecting part of the second guide for non obscured plate and graft insertion . (F,G) Insertion of mini plate and particulate graft. (H) positioning guide removal

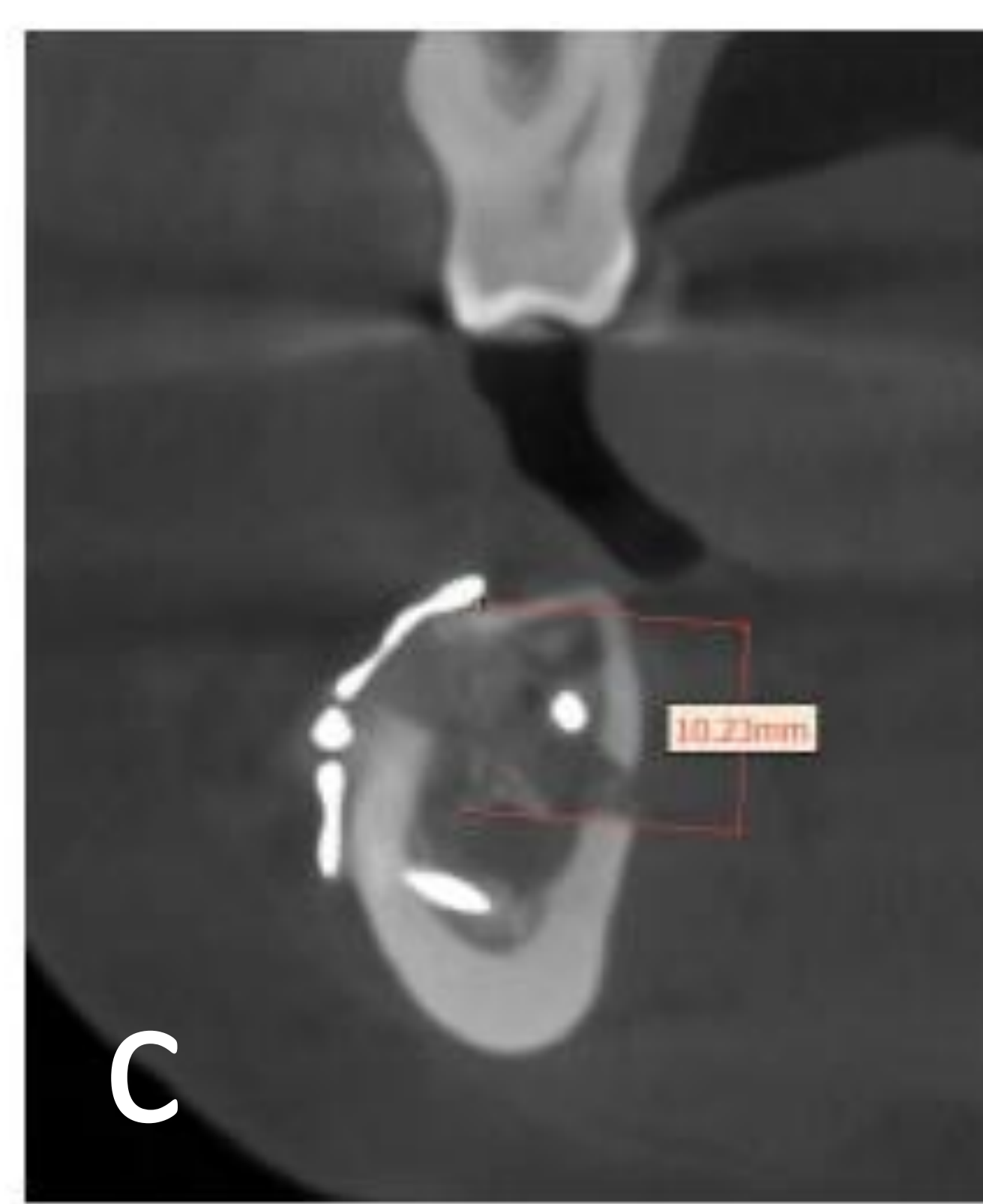


5 (A)

Fig 5: **case 1** Preoperative cross sectional cuts of bilateral posterior mandible showing vertical deficiency.



B



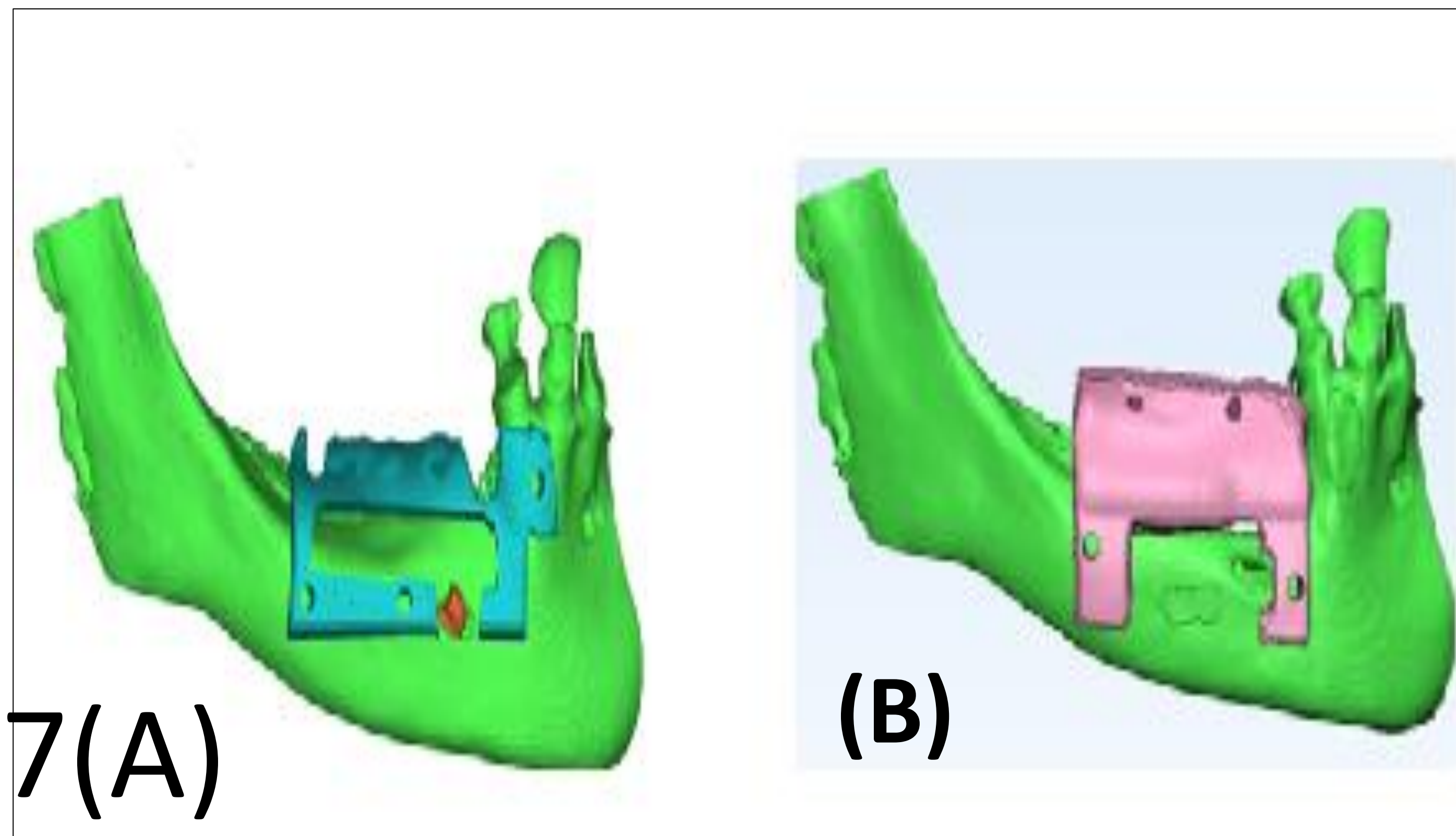
C

B,C : **case 1** Cross sections of the preoperative planned and the actual postoperative amount of vertical augmentation



6

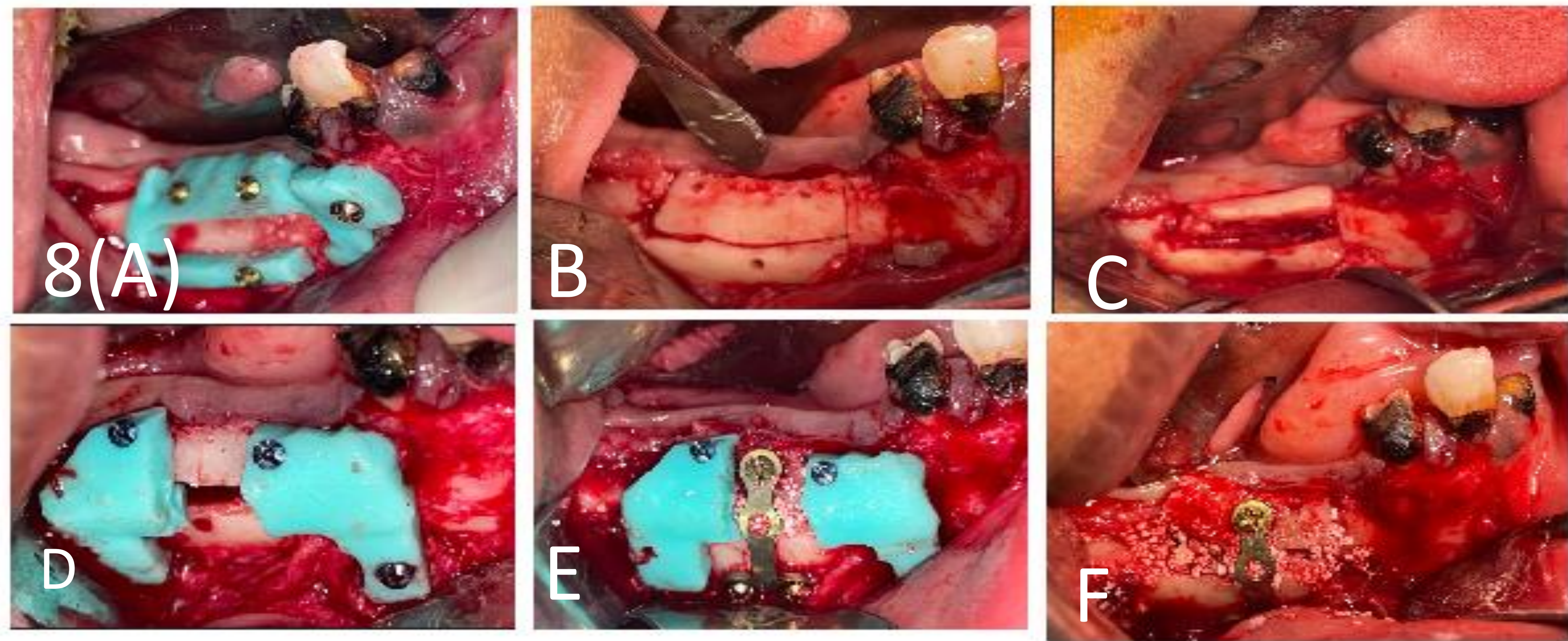
Fig 6: **case 1**: Re entry surgery 4 months postoperative after plate removal



7(A)

(B)

FIG 7 (A,B): **case 2 (guided group)** preoperative virtual design of the 2 guides



8(A)

B

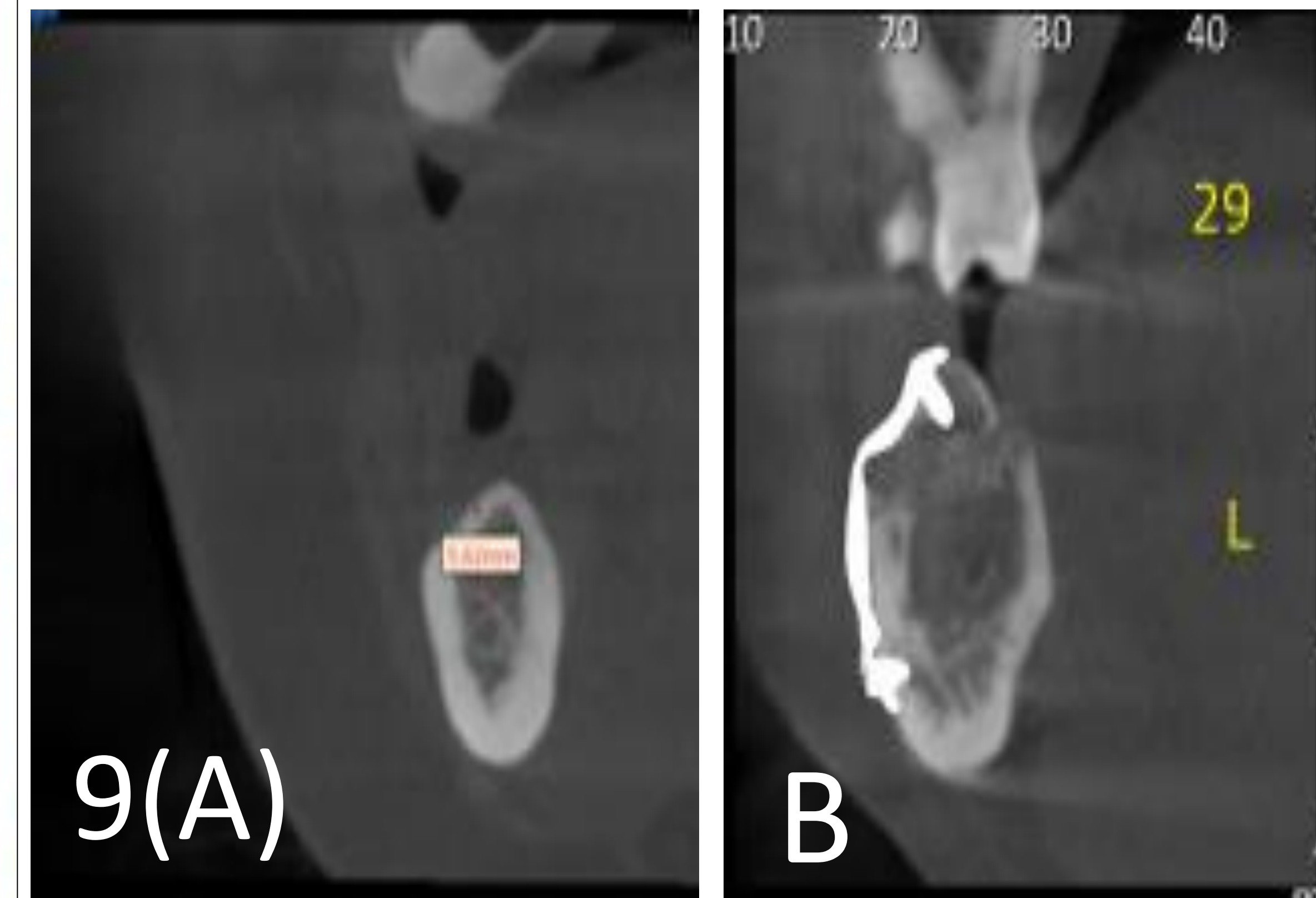
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D

E

F

Fig 8: **case 2** (A) full thickness flap reflection and fixation of the patient specific cutting Guide in place using monocortical mini screws . (B,C) crestal mobilization of the fractured segment . fixation of the positioning guide in place to fix the segment in its final preplanned position.) (E)removal of the inter connecting part of the second guide for non obscured plate and graft insertion . (F,G) Insertion of mini plate and particulate graft. (F) positioning guide removal



9(A)

B

FIG 9: Cross sections of the preoperative and the postoperative amount of vertical augmentation

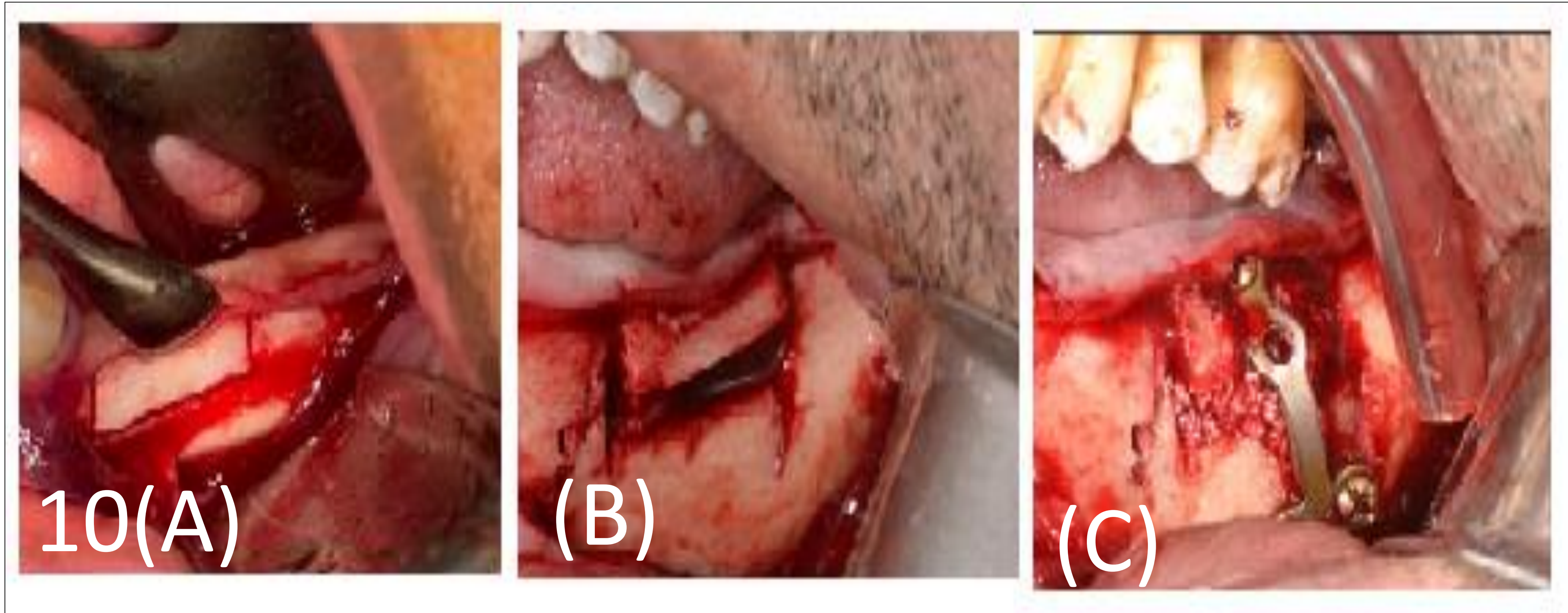


FIG 10 : Intra operative procedure of the control group

Results: all cases showed uneventful healing after 4 months of graft consolidation period, one case showed wound break down and plate exposure at the free hand side that did not affect the final outcome. there was statistical significant difference between both groups where the final vertical l gain was 2.7 mm in the control. group while 4.3 mm in the study group. 2 point discrimination test showed 2 cases of neurodeficits for the non guided group at 1 week follow-up appointment which resolved within 1 month.

Conclusion: computer guided sandwich osteotomy technique allowed for more accurate and simple procedure for vertical augmentation of the posterior mandible specially for the inexperienced surgeons.

Table 1 and Bar chart: showing the difference between both sides for regaining the complete neurosensory function

Group	Minimum	Maximum	Mean	SD	Mean difference	t value	p-value
Study	9.25	7.25	8.2	0.94	2.867	4.35	0.002 s
Control	3.25	7	5.33	1.24			

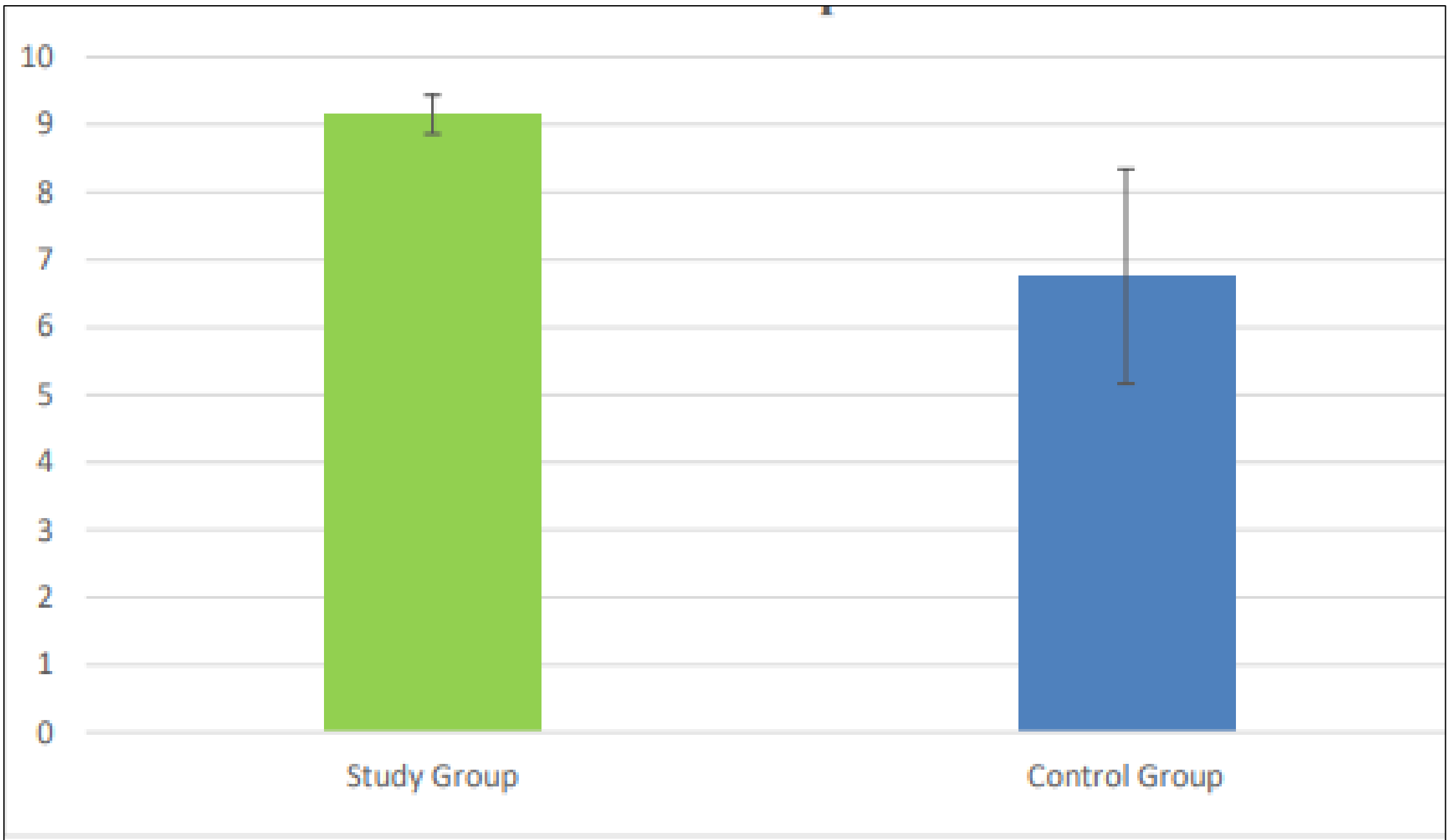


Table 2 and Bar chart: showing the difference between both sides for vertical bone gain

Group	Minimum	Maximum	Mean	SD	Mean difference	t value	p-value
Study	0.58	3.65	2.6	1.03	0.616	0.96	0.357 ns
Control	-0.98	2.81	1.98	1.35			

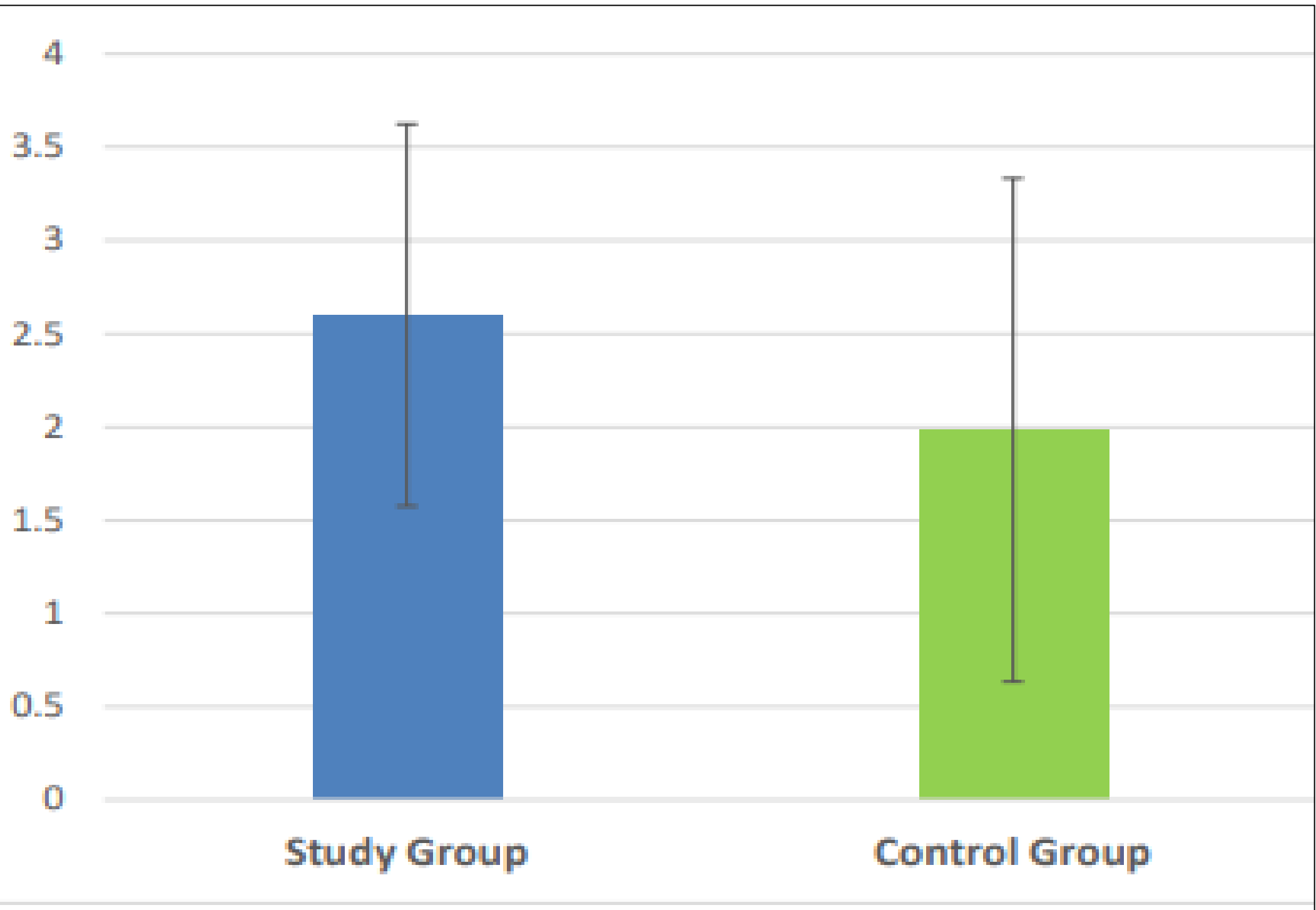
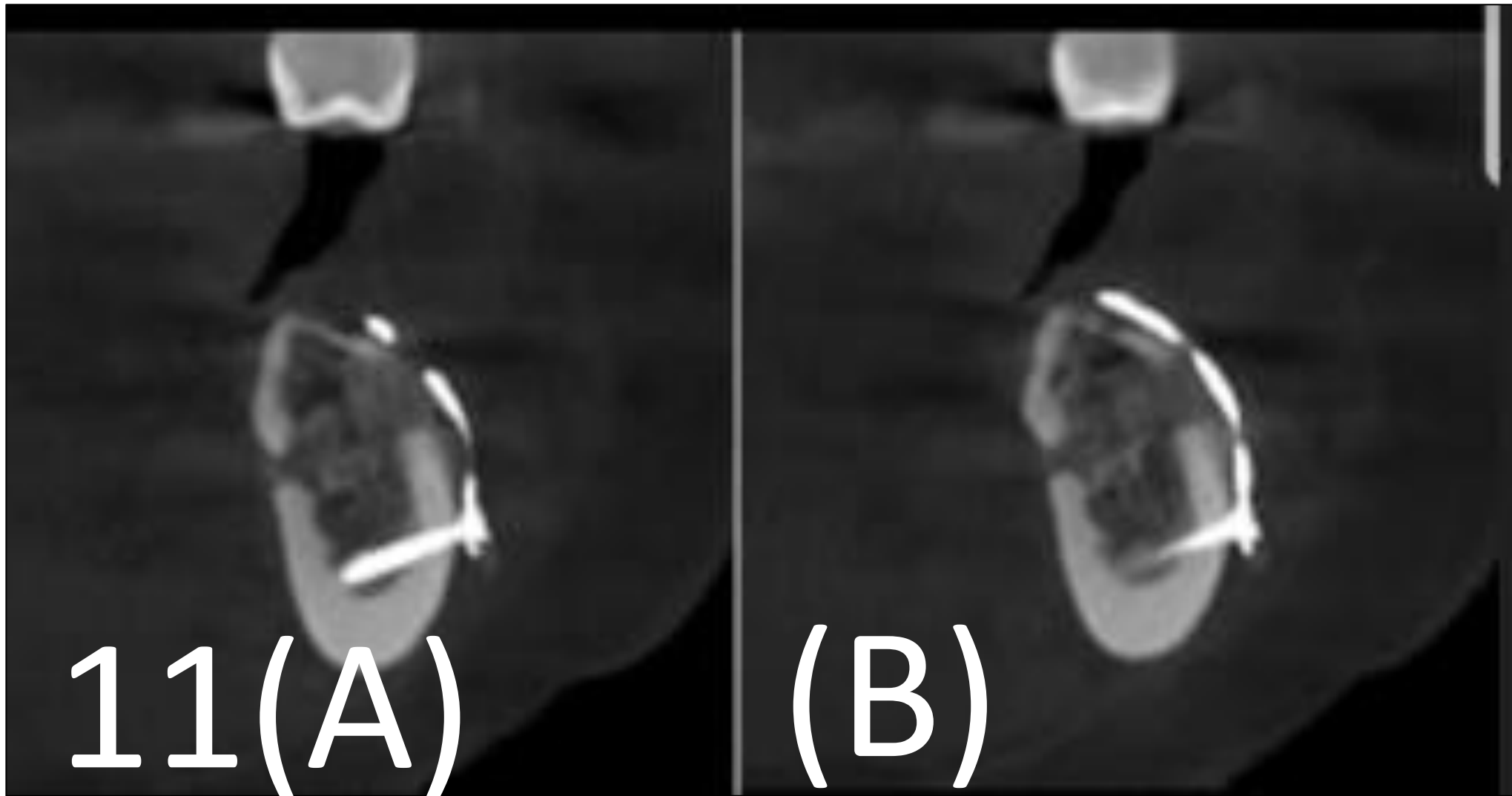


Fig 11 (A,B) : postoperative cross sectional views of the control group

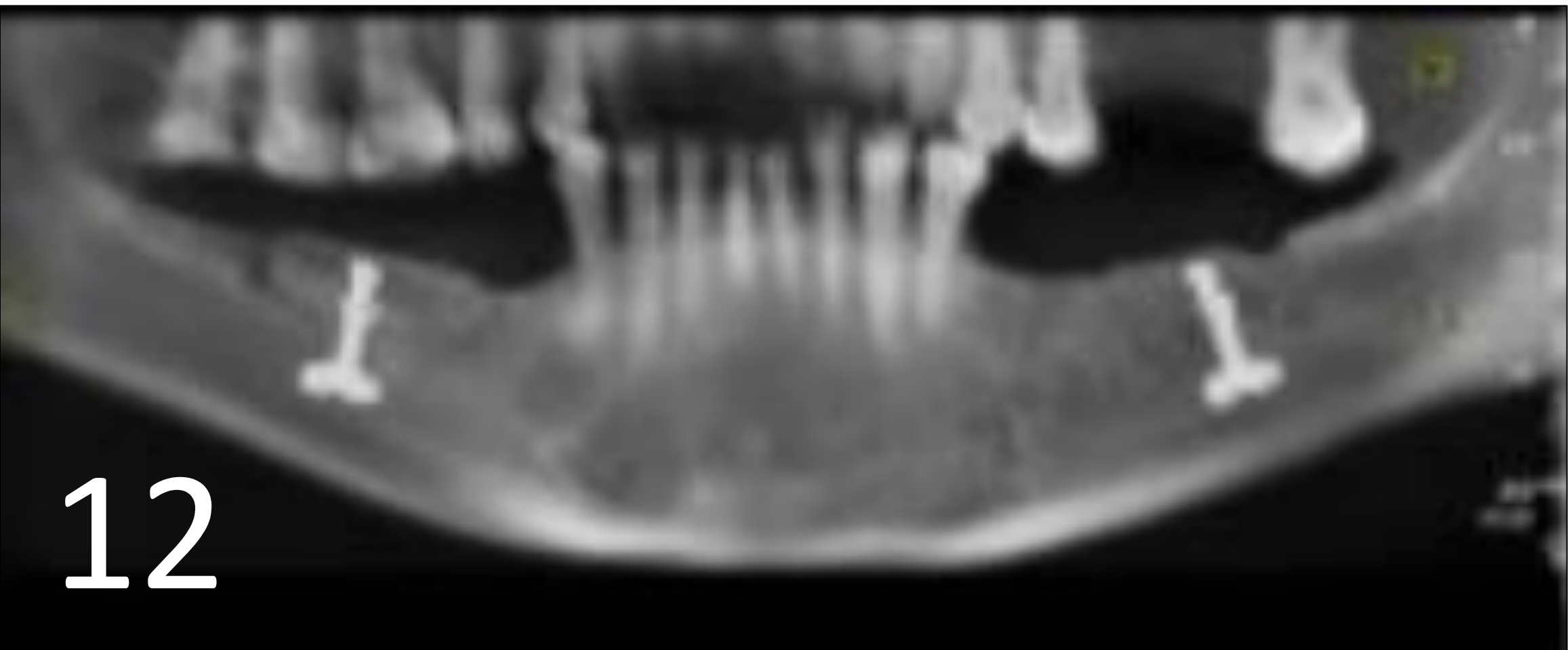


Fig 11 (A,B) : postoperative panoramic views of the control group