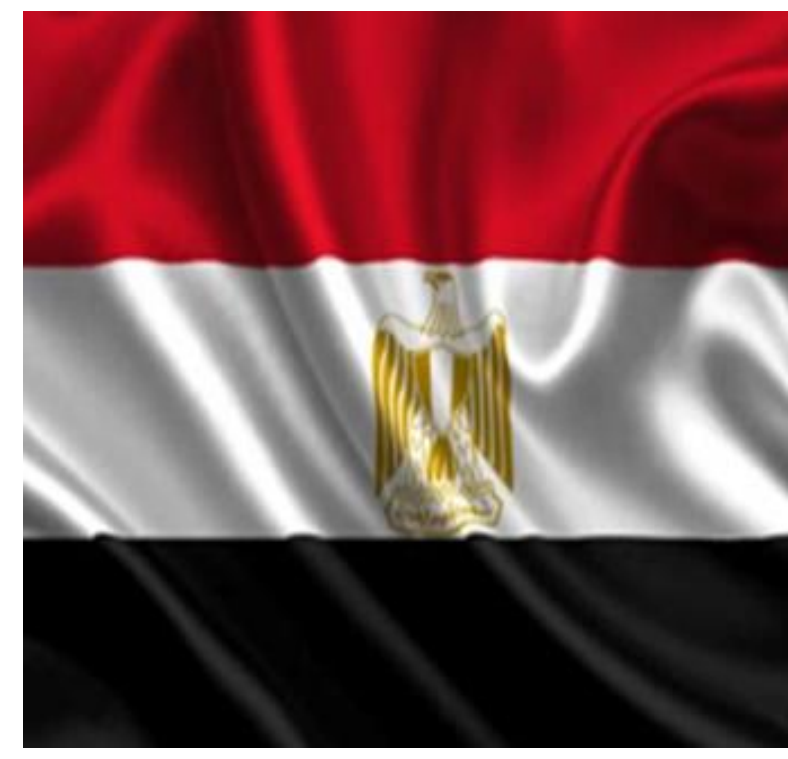




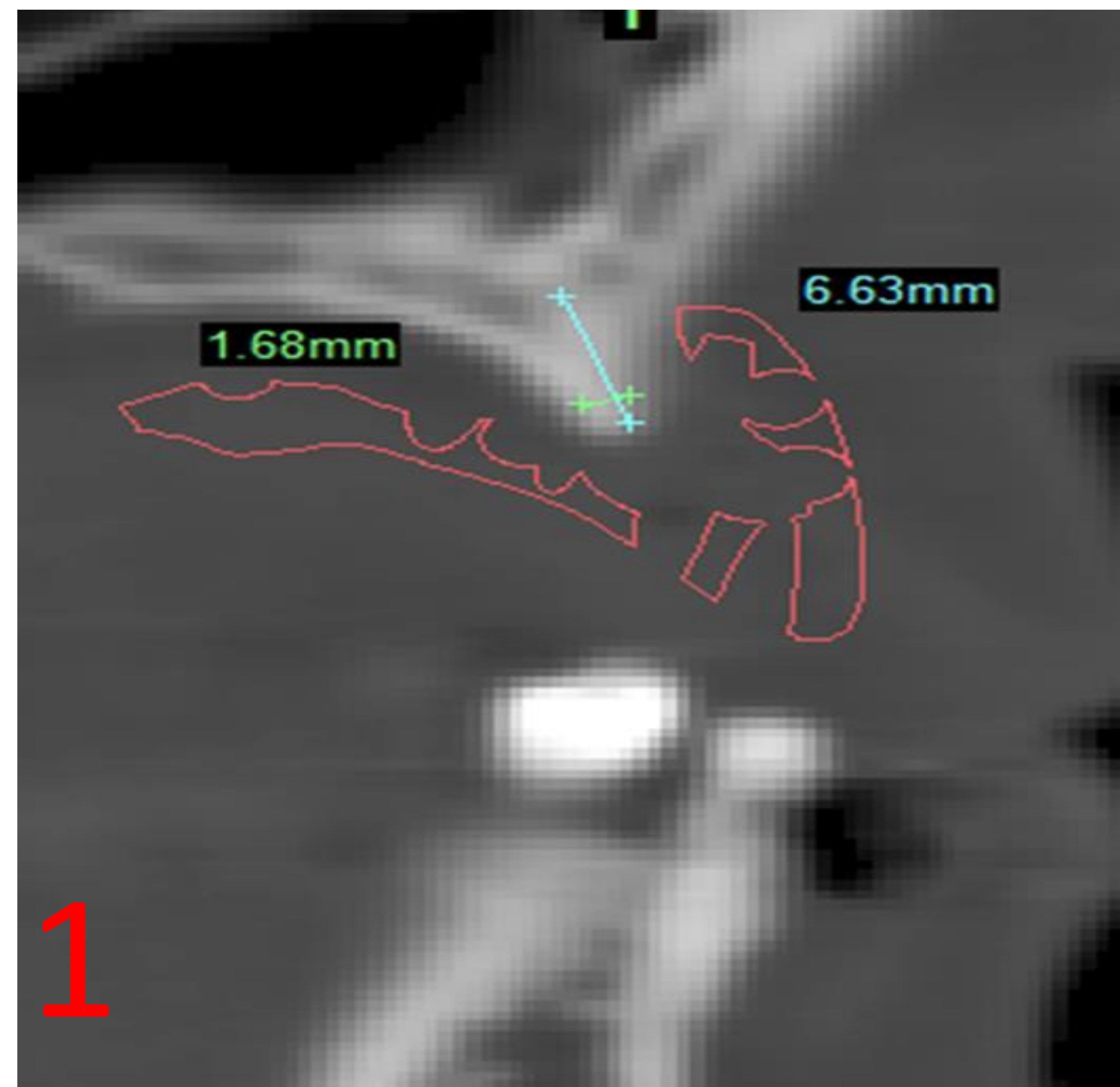
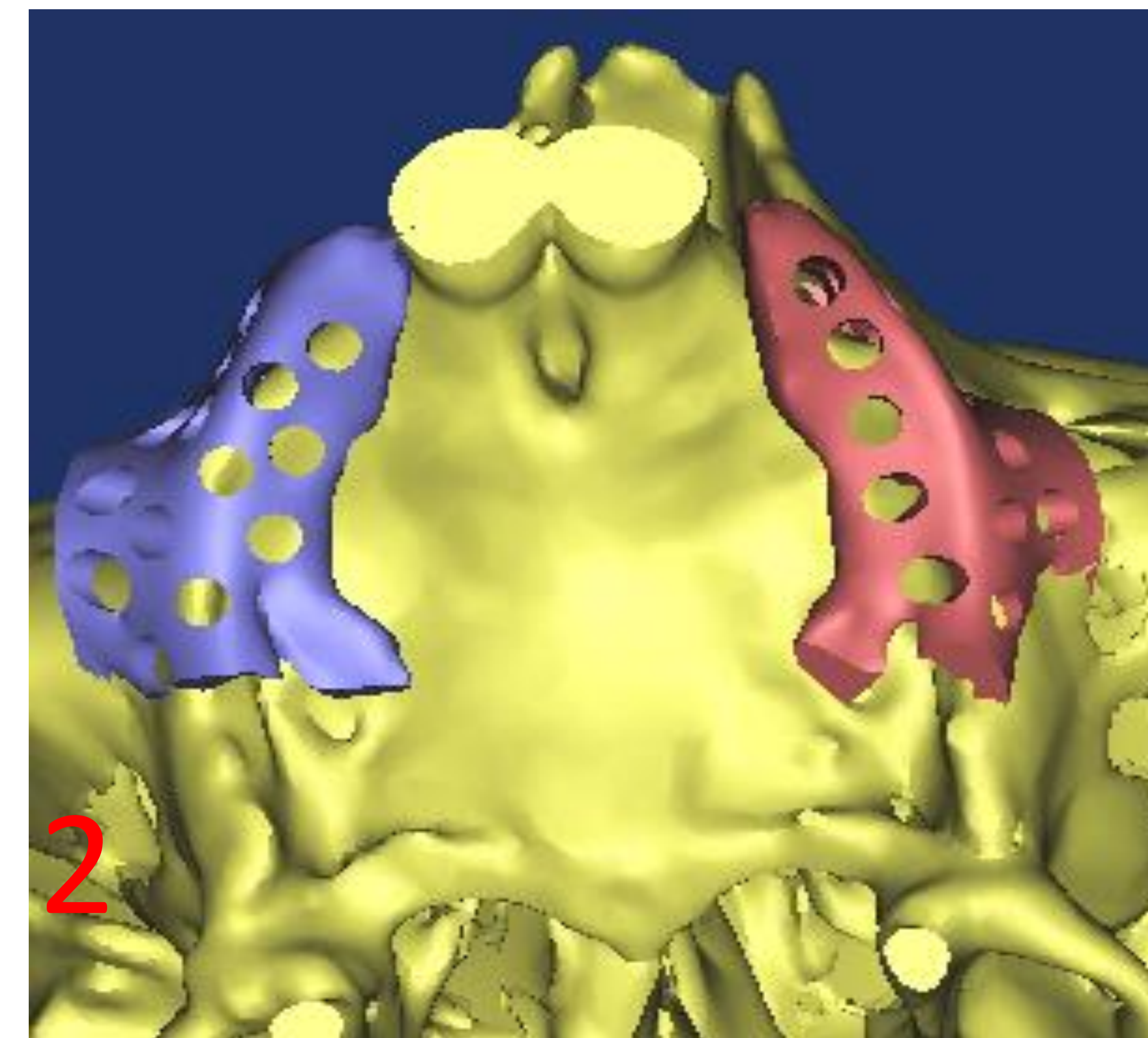
Assessment Of Three Dimensional Bone Augmentation Of Severely Atrophied Maxillary Alveolar Ridges Using Patient Specific Titanium VS Poly-Ether-Ether-Ketone (PEEK) Mesh: A Randomized Clinical Trial

Mohamed Shawky, Mohamed Mounir, Mohammed Atef



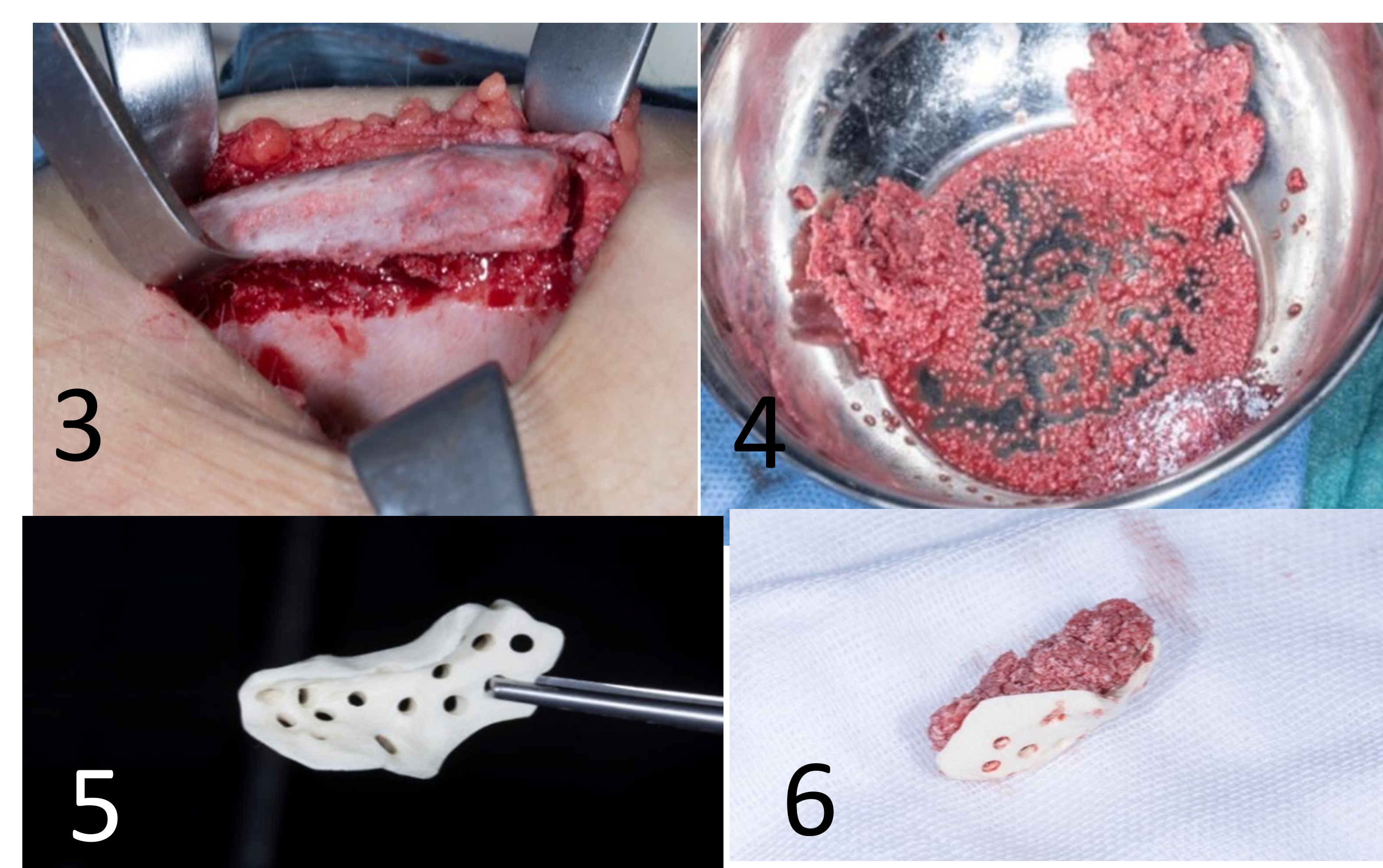
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- Introduction:** Restoration of ideal alveolar ridge contour using 3 dimensional bone augmentation techniques in the maxillary aesthetic zone is a very challenging procedure that always requires multiple surgeries, long follow up period, donor site morbidity and possibility of bone graft failure so; the aim of this study is to present 2 different CAD-CAM protocols using customized Meshes fabricated from 2 different biomaterials while the second group fabricated using tissue biocompatible POLYMER, poly Ether-Ether Ketone (PEEK)



Figures 1,2: preoperative virtual Design of the customized PEEK meshes

Methods: 6 patients with severely atrophied maxillary alveolar ridges divided into 2 groups 3 patients in each, the first group was reconstructed using patient specific titanium mesh while the second group was rehabilitated using customized PEEK meshes, both were used as a containment systems with particulate mix of autogenous and xenografts and fixed in their final positions using cortical mini screws.



Case 1: fig3-6 trap door iliac crest bone harvesting then bone mixed with xenograft and loaded into the 3d milled custom peek mesh



Fig 7-9 peek meshes were fixed in place by mini screws then covered by collagen membrane and flap closure



Fig 10-12: immediate postoperative cbct showing ideal ridge dimensions

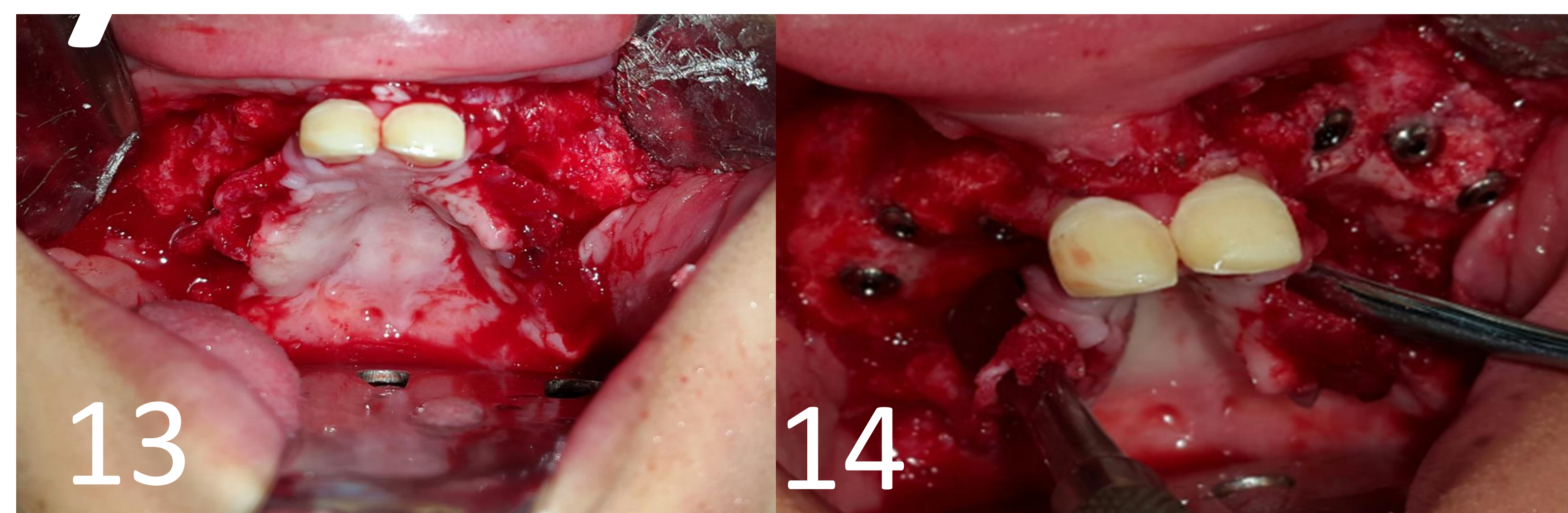


Fig 13, 14 second stage surgery 4 months postop. And implant placement



Fig 15-17: Screw retained prosthesis and facial profile photos (pre and postop)

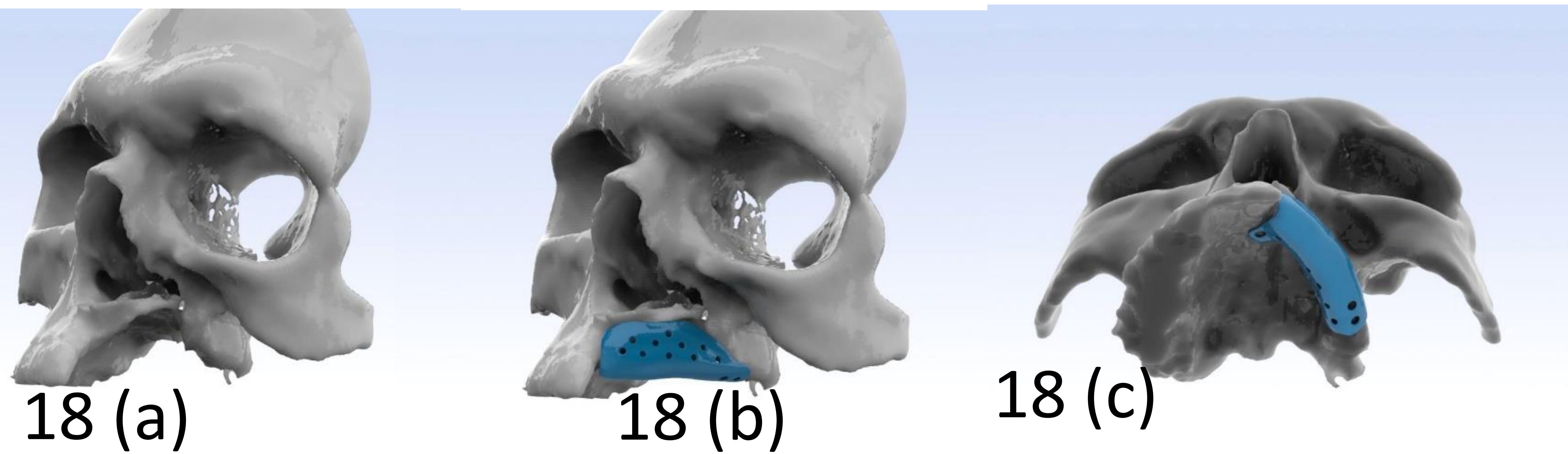


Fig 18 (a,b,c) **Case 2**; Preop. C.t showing the post Resection defect and the customized mesh in place , lateral and occlusal views

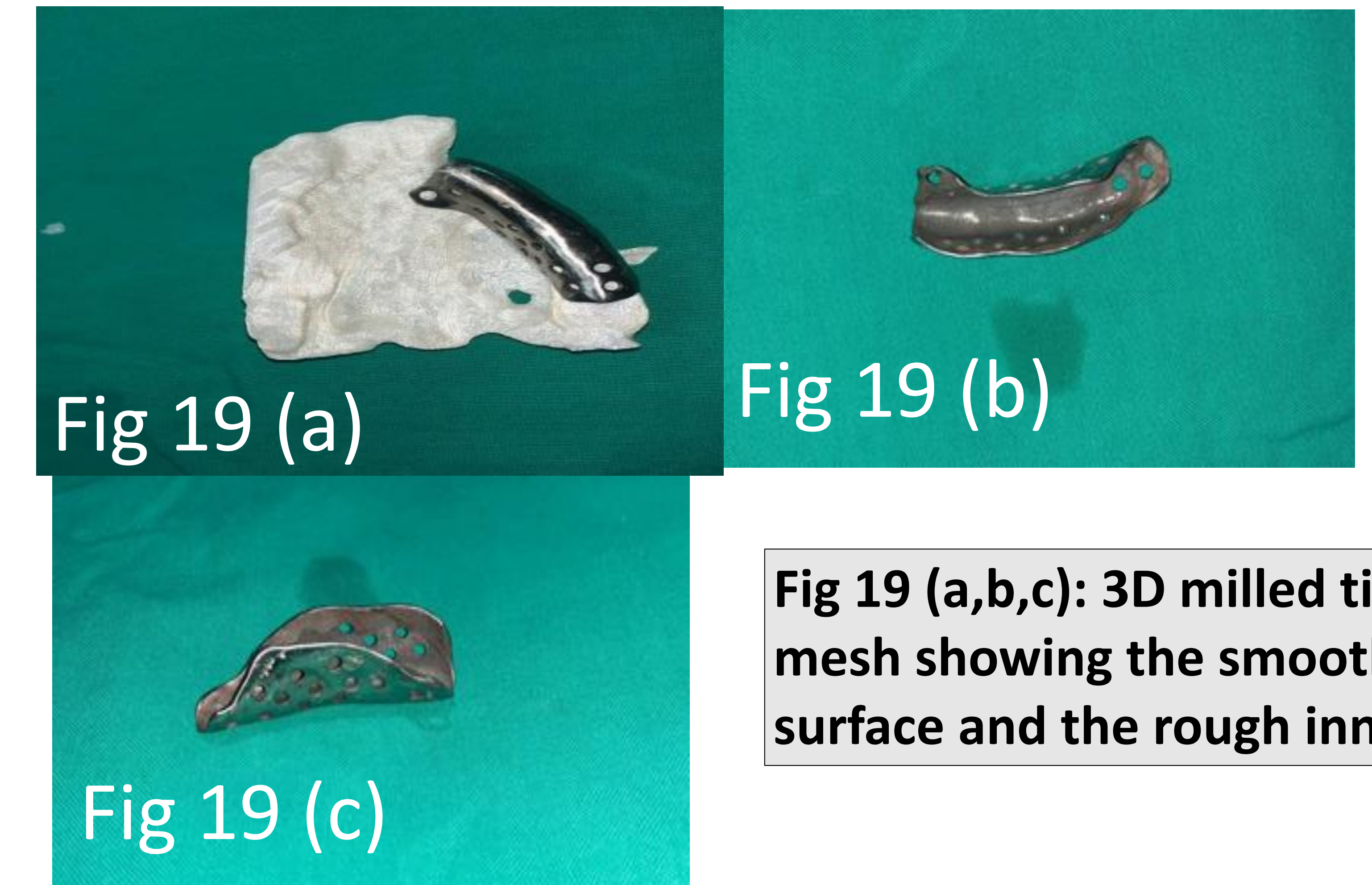
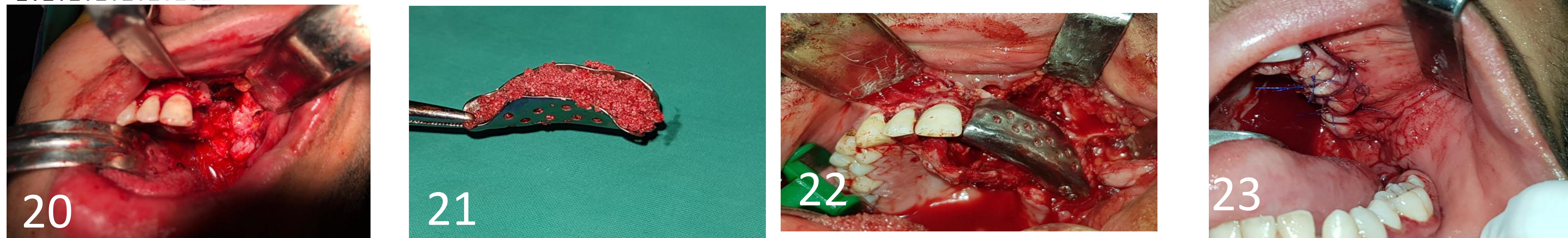
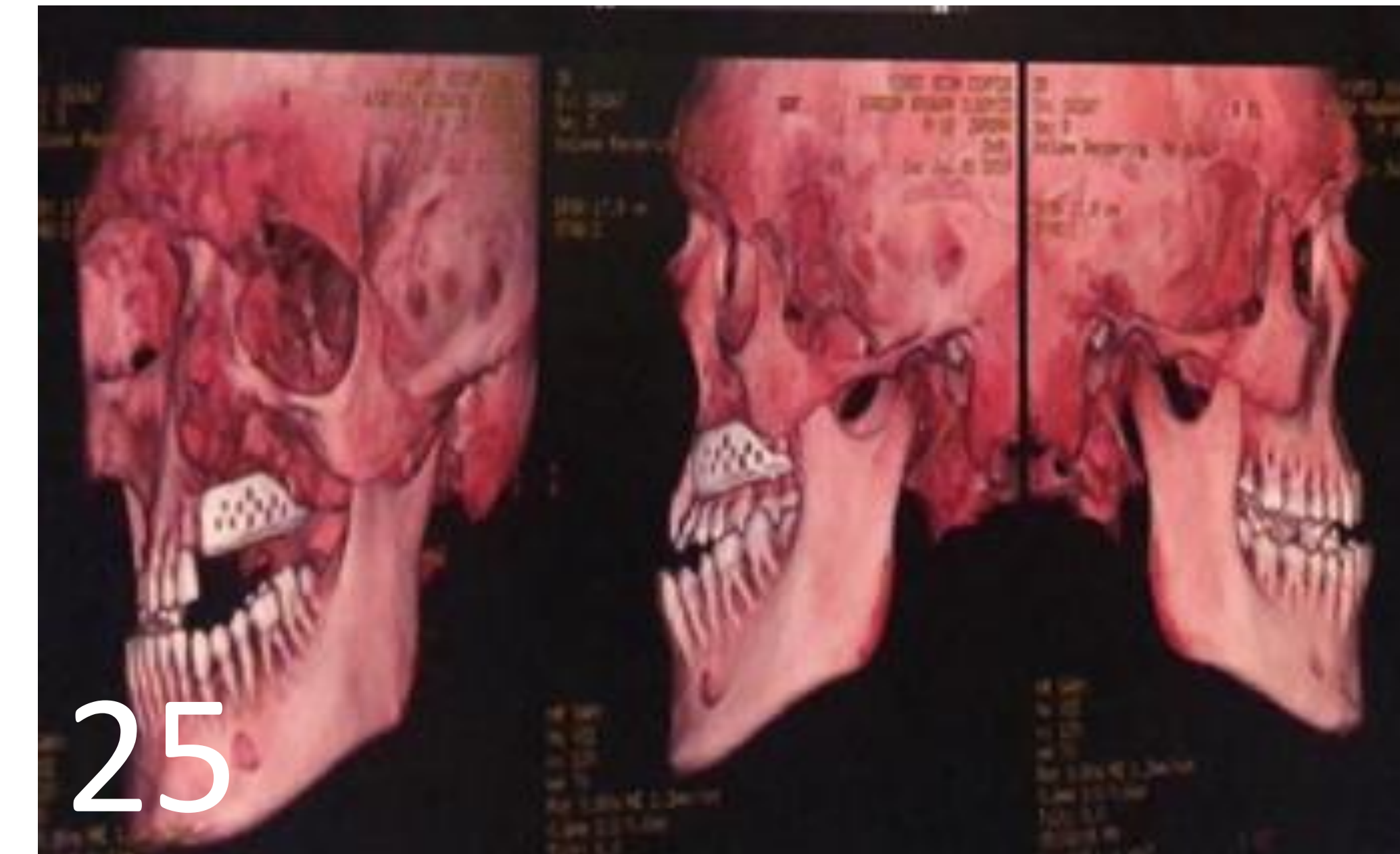


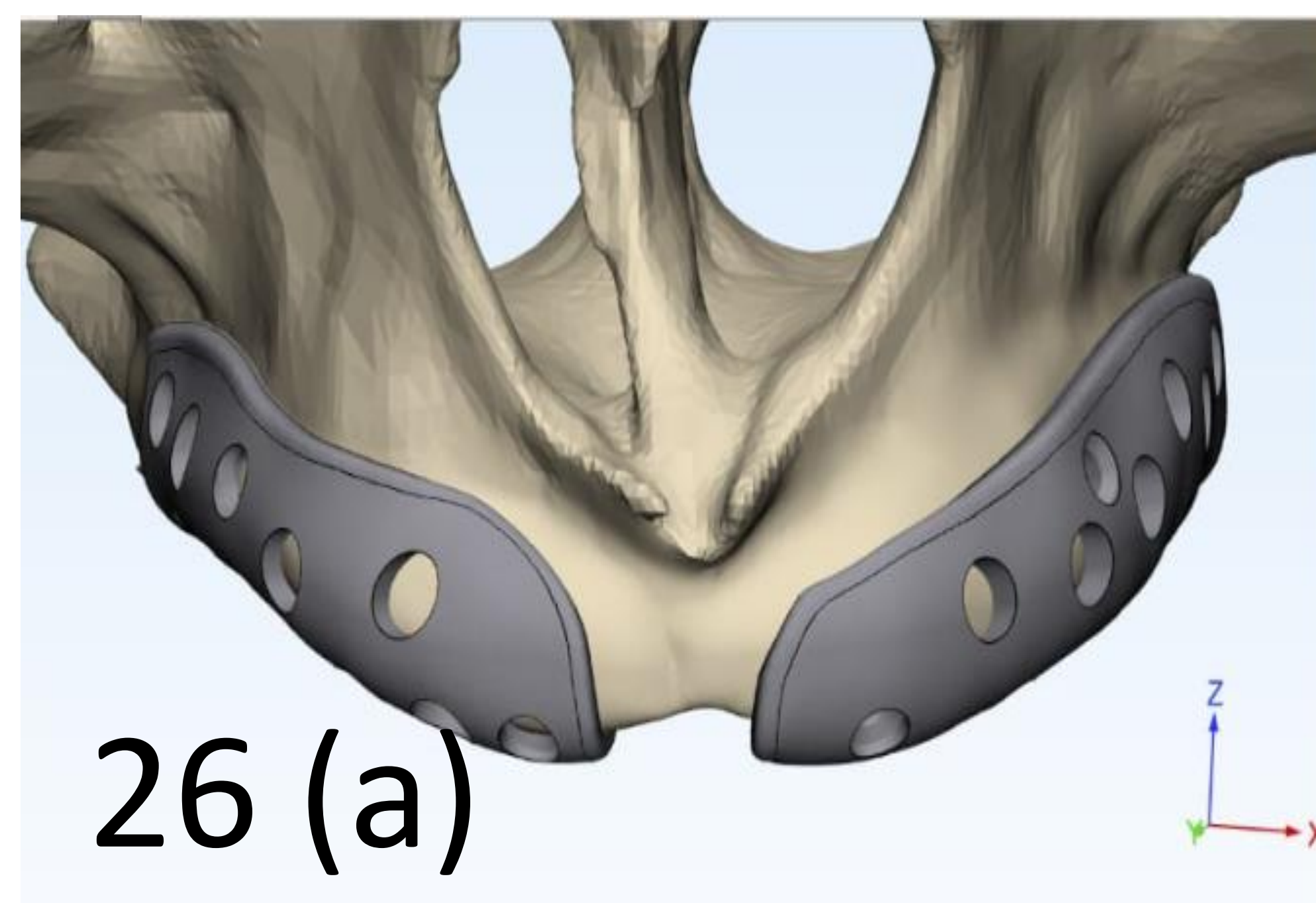
Fig 19 (a,b,c): 3D milled titanium mesh showing the smooth outer surface and the rough inner surface



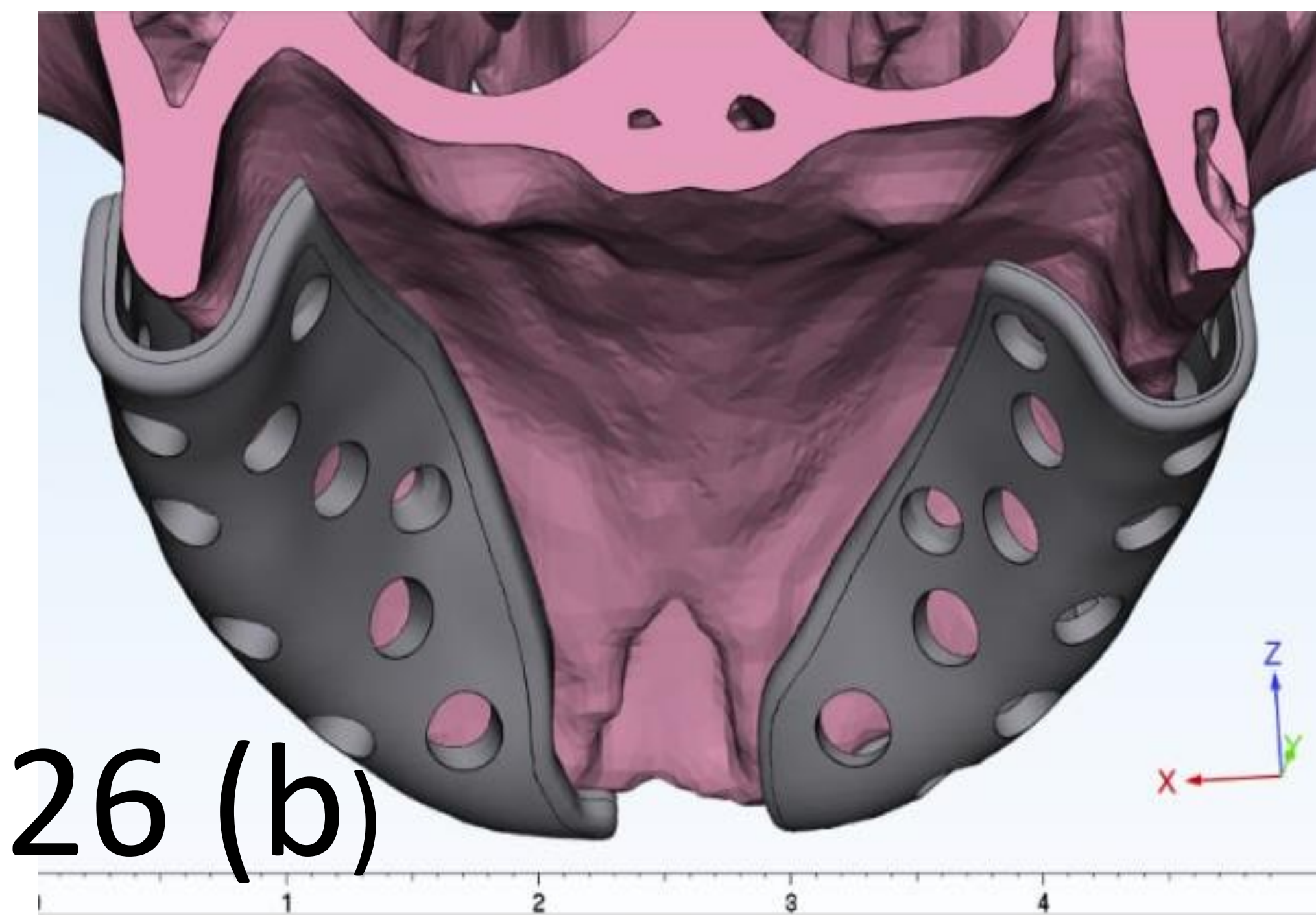
Figs 20-23: exposure of the massive defect followed by application of the customized titanium mesh loaded with the particulate graft and fixed with mini screws then tension free closure of the flap



Figs 24,25: postop. Cbct



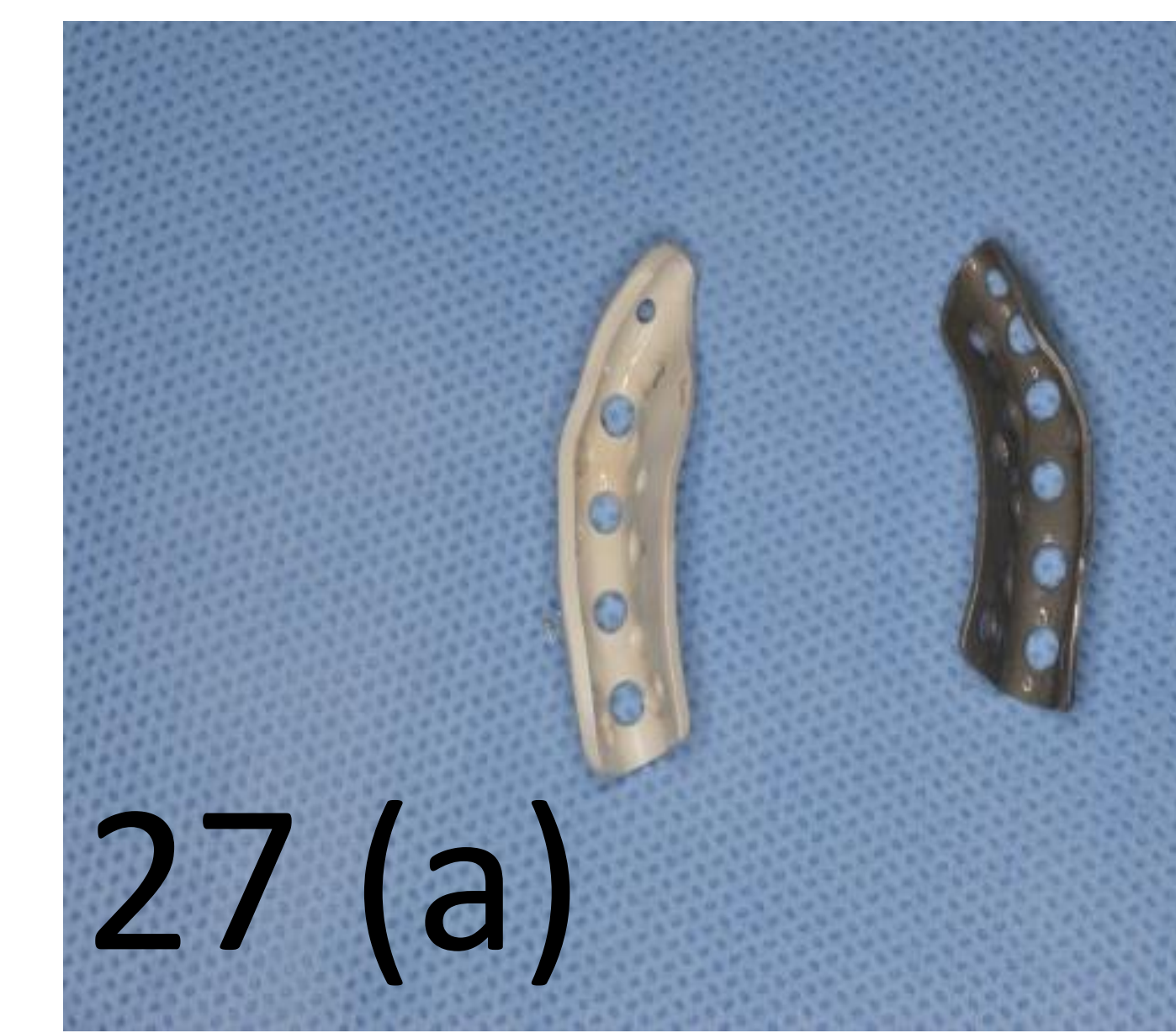
26 (a)



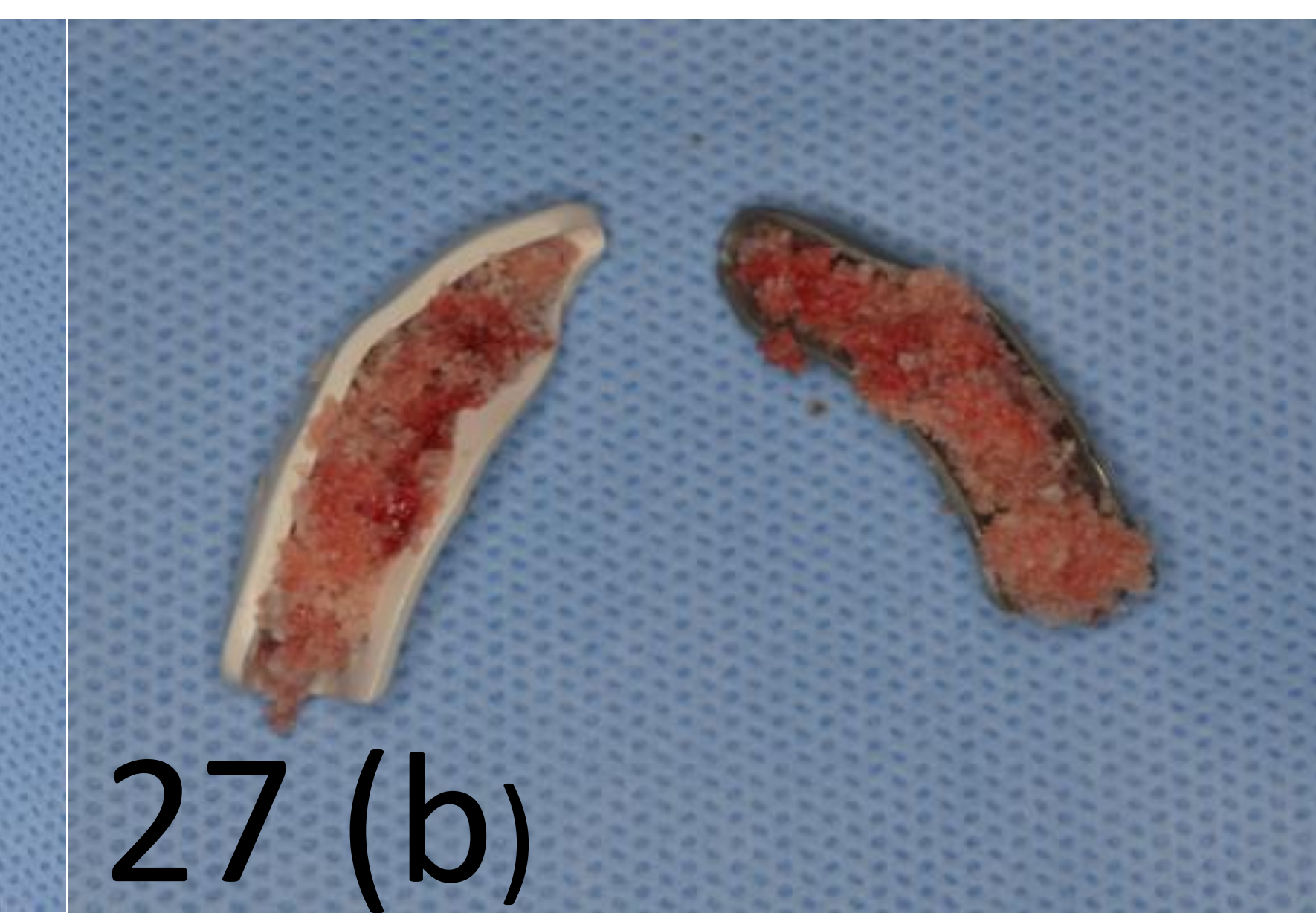
26 (b)

case 3: Figs 26(a,b)
preop. Virtual
design of the
customized mesh

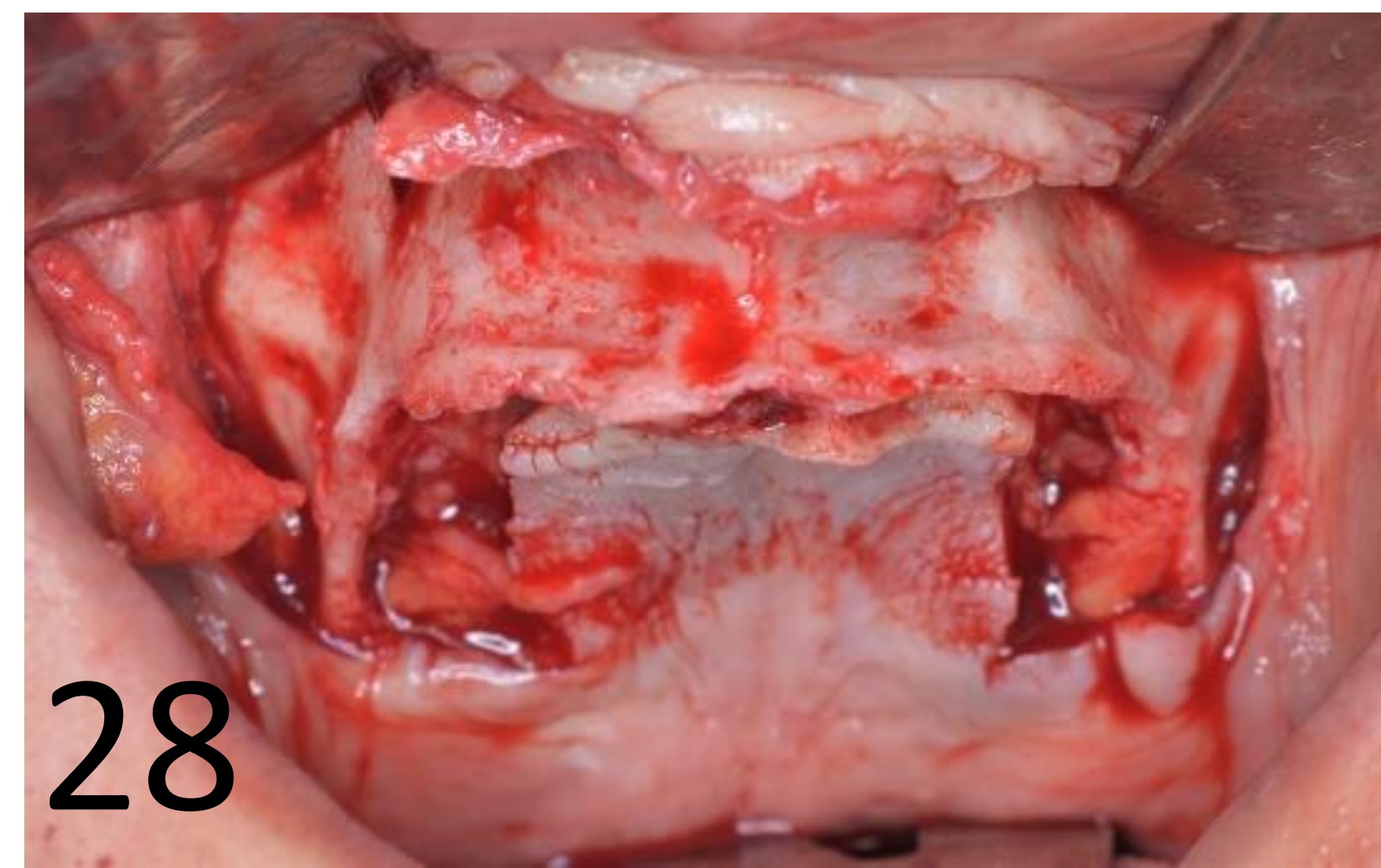
Figs 27 (a,b)
customized
peek and
titanium
meshes
loaded with
the particulate
graft



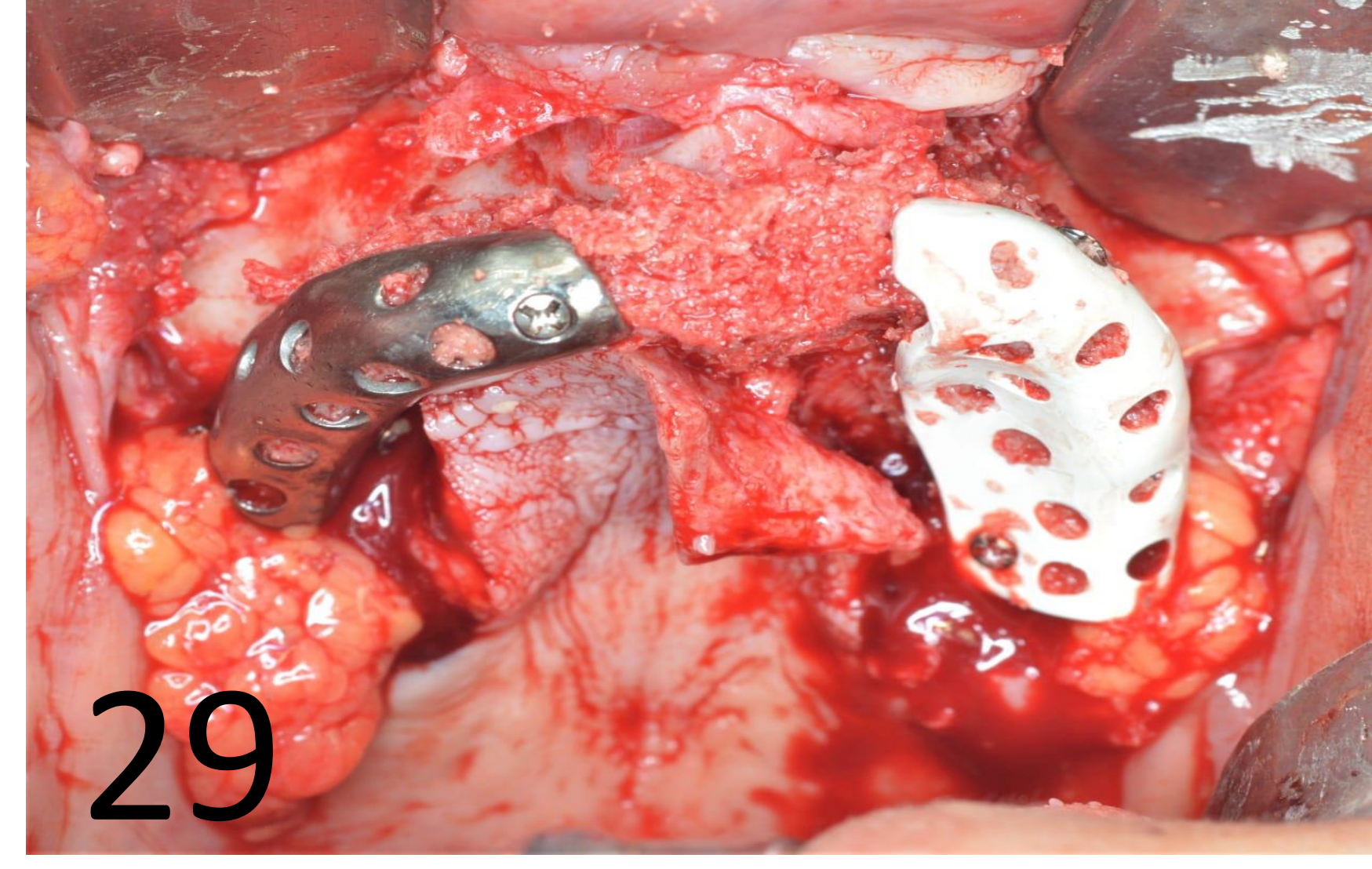
27 (a)



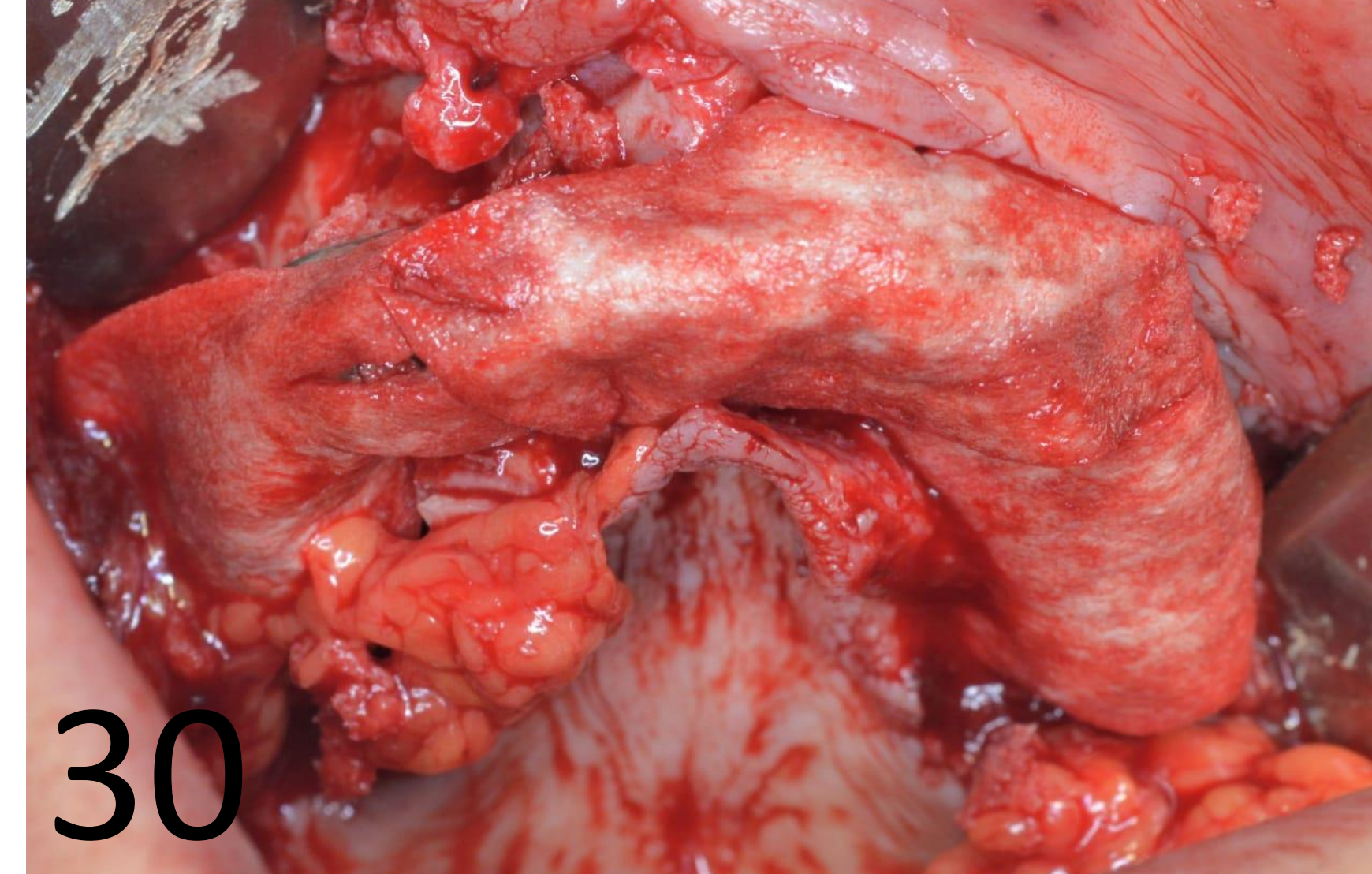
27 (b)



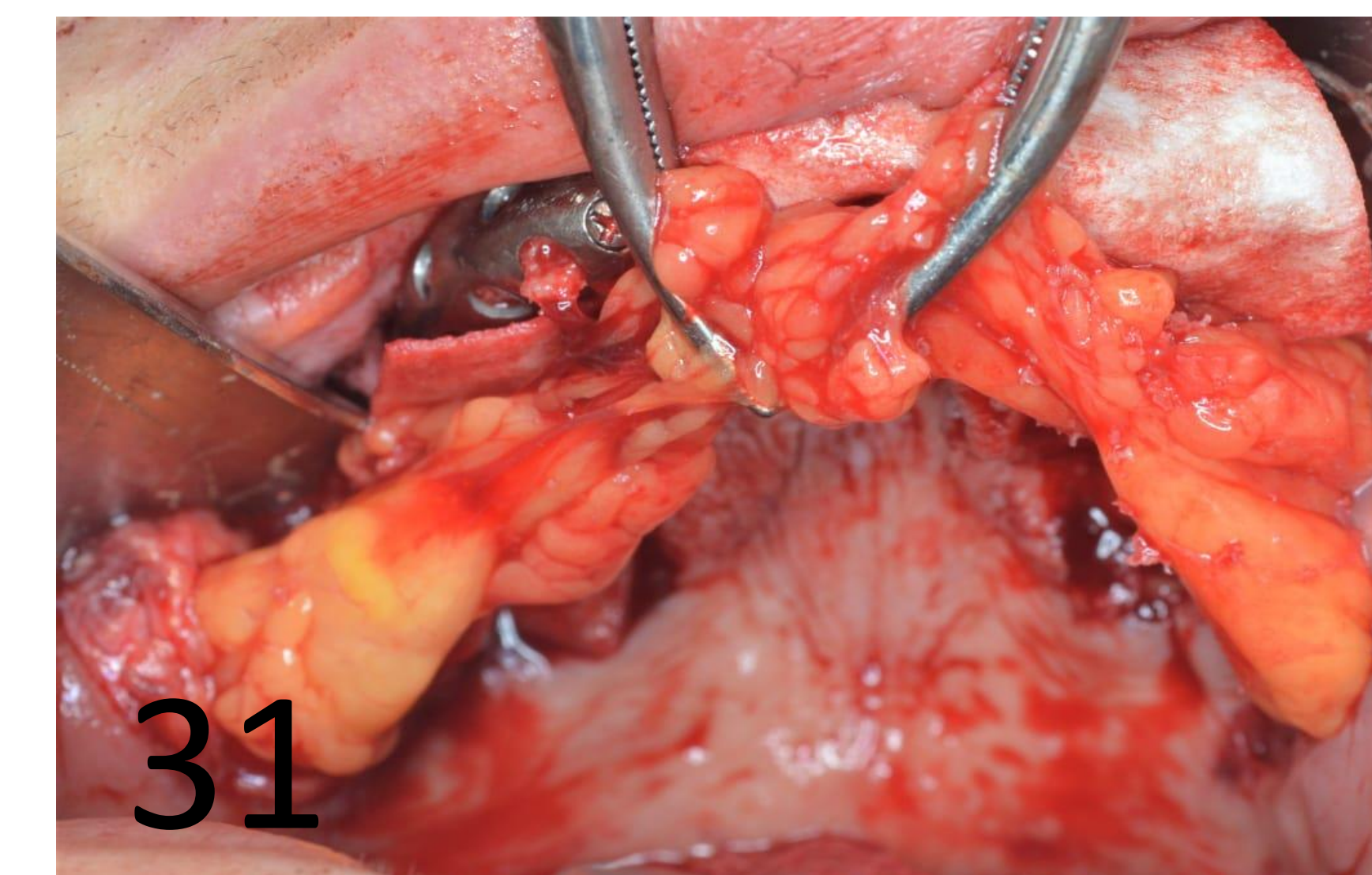
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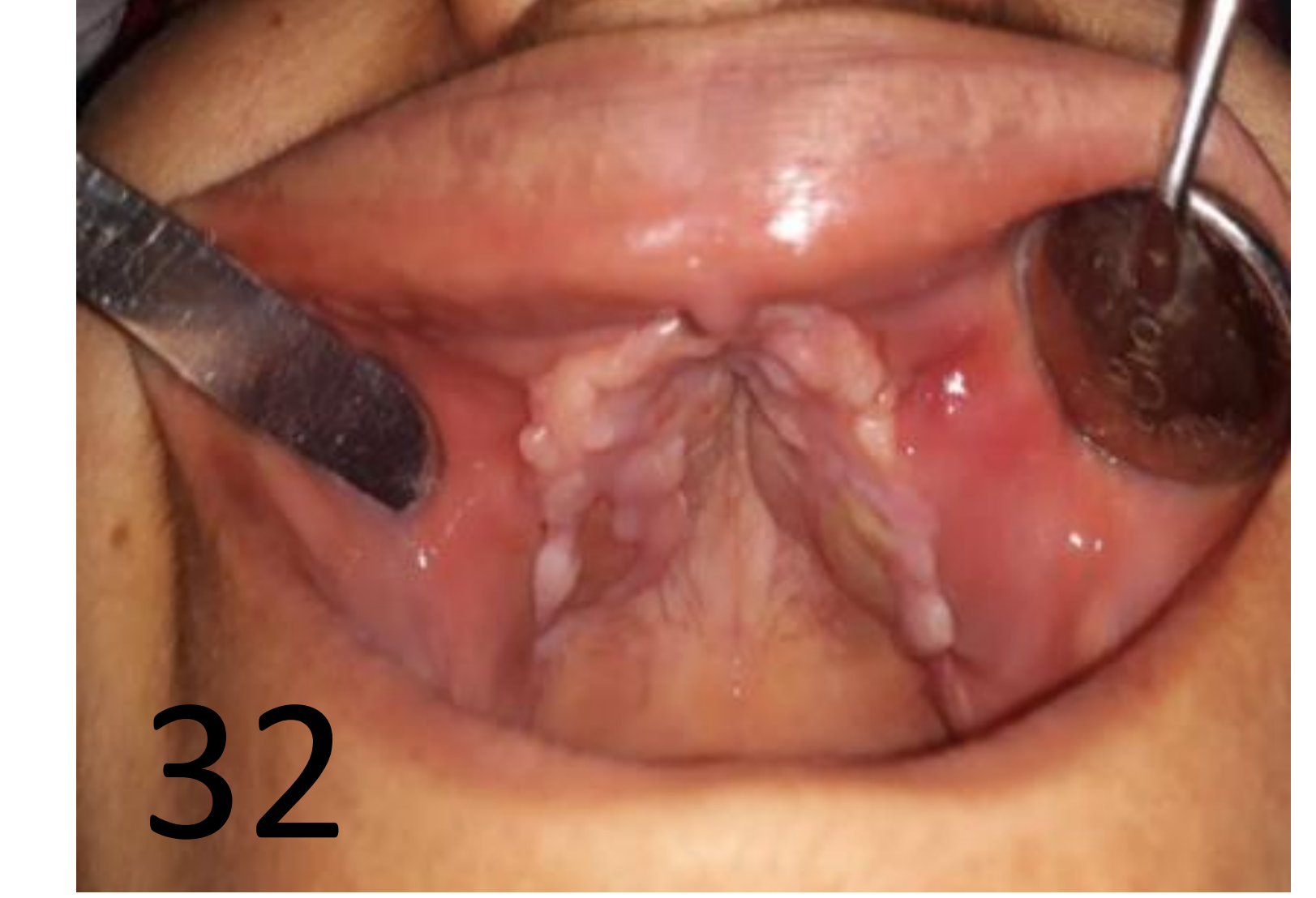
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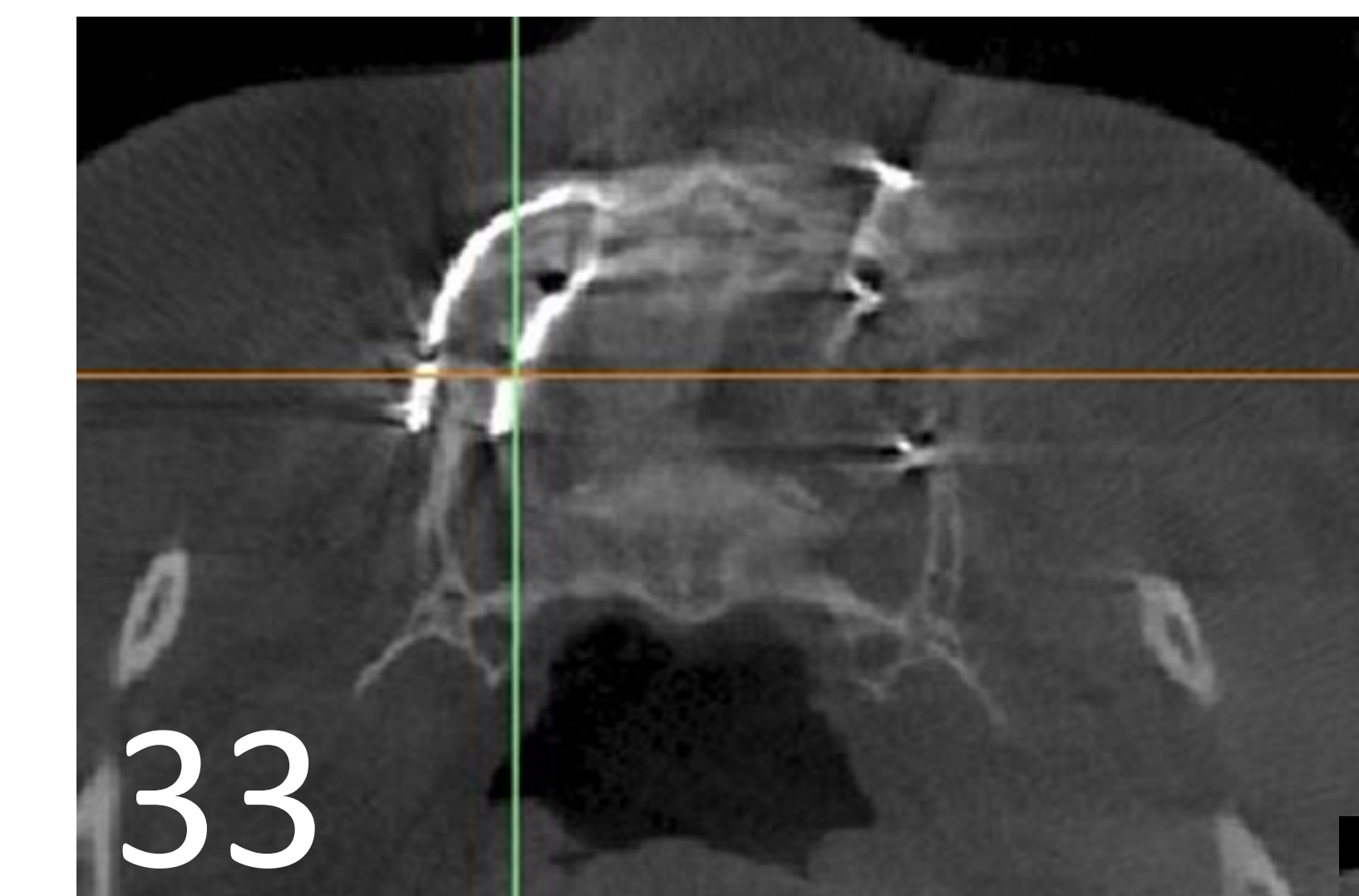
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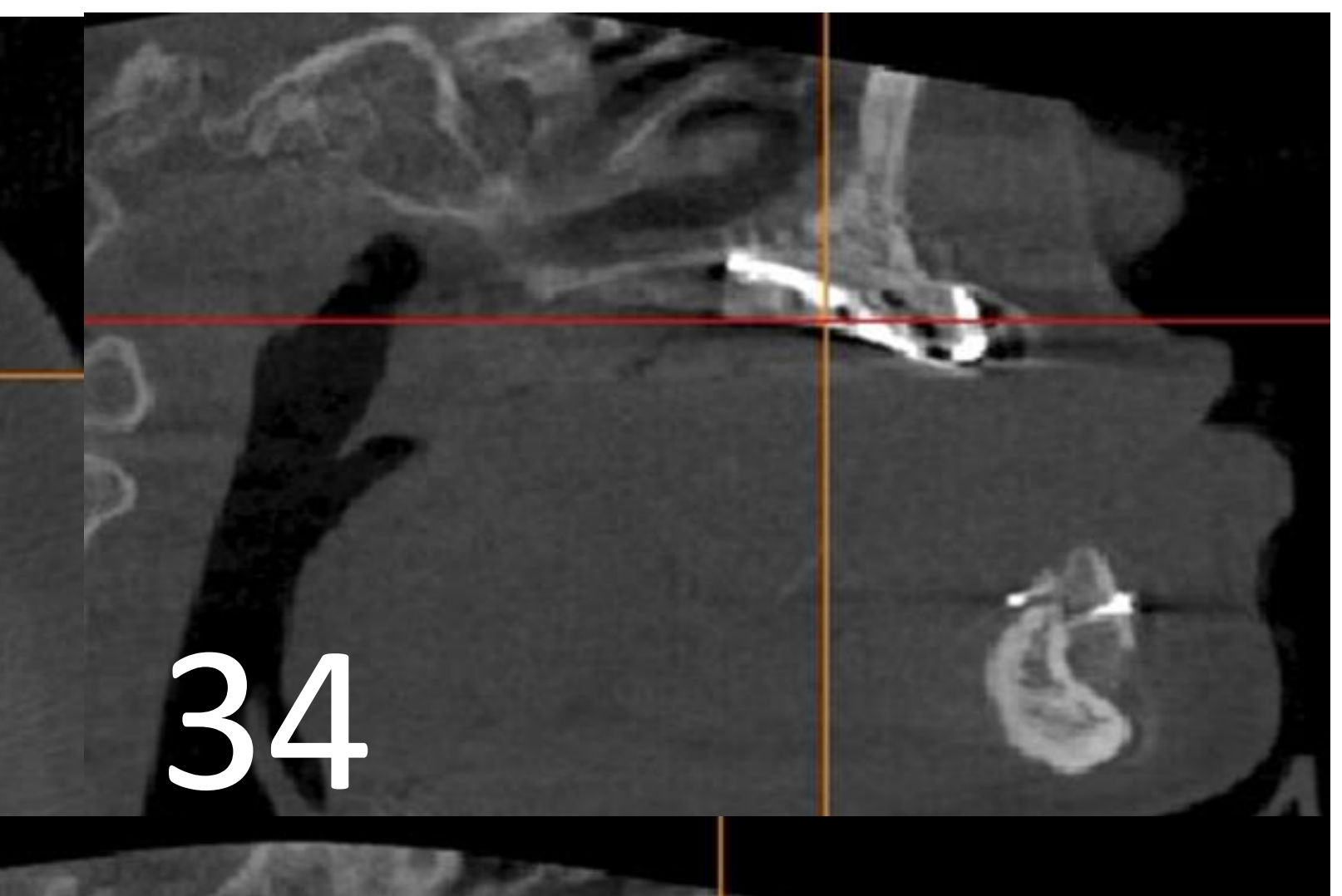
32

Figures 28-31: customized meshes fixed in place with mini screws followed by triple layer closure with collagen membrane ,pedicled buccal pad of fat and buccal advancement mucosal flap, then fig 32 showing healing after 4 months

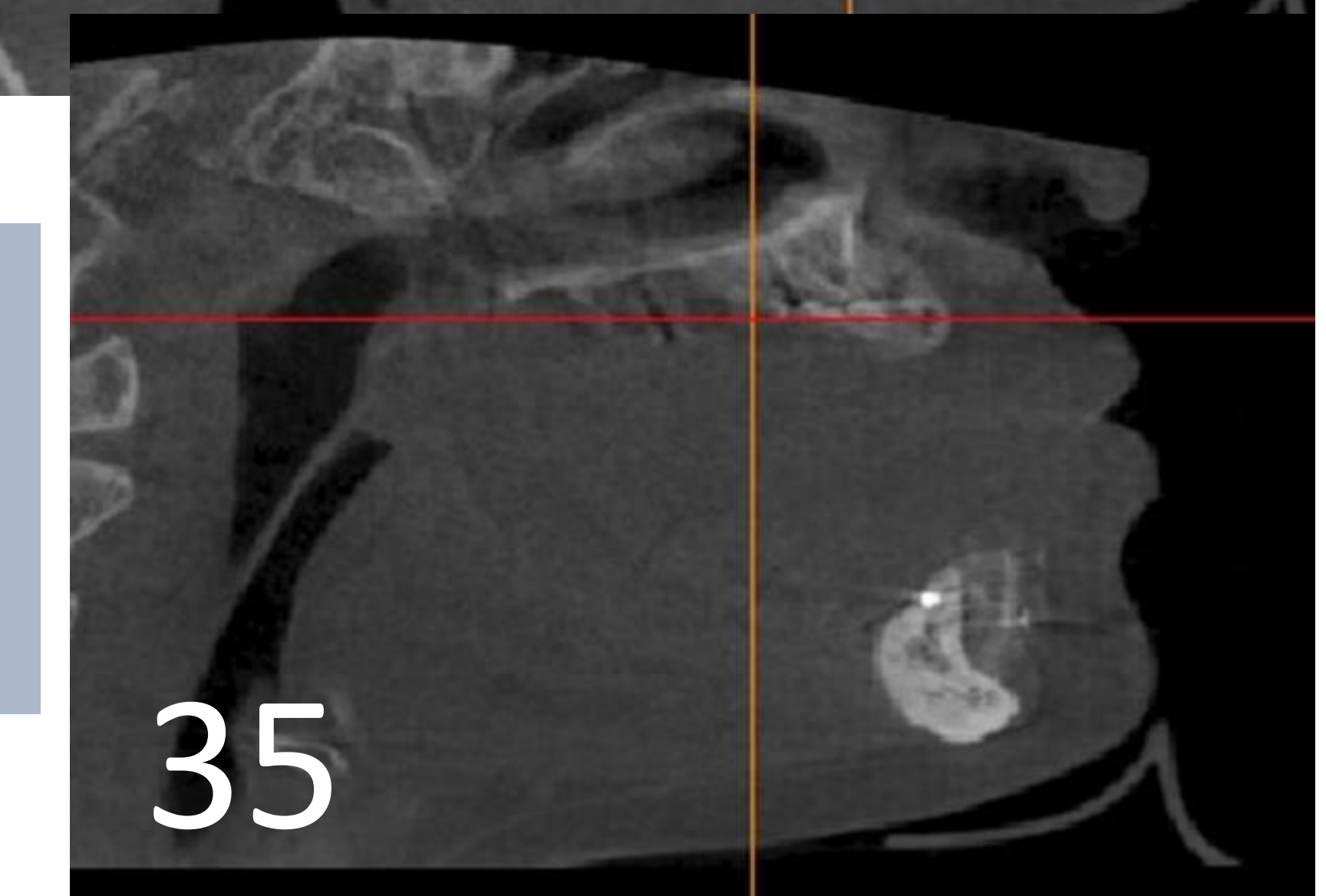
Results: wound healing was uneventful in all cases except one case in the titanium group showed dehiscence after 3 weeks from the first surgery that did not affect the final outcome of the procedure. meshes were removed for dental implant placement after 4 months from the first surgery, and prosthetic loading was done for both groups 4 months later .all implants were functionally stable after one year



33



34



35

Figures 33-35: Post op.
CBCT showing both
titanium and peek meshes
reconstructing the ridge

Conclusion: within the limitations of the sample size of this study, the application of customized titanium vs PEEK parts produced through CAD/CAM technology appears to be reliable ,time saving and accurate method for 3D augmentation of severely atrophic maxilla. Also; Peek group showed better overlying soft tissue response and bone quality than that of the titanium.

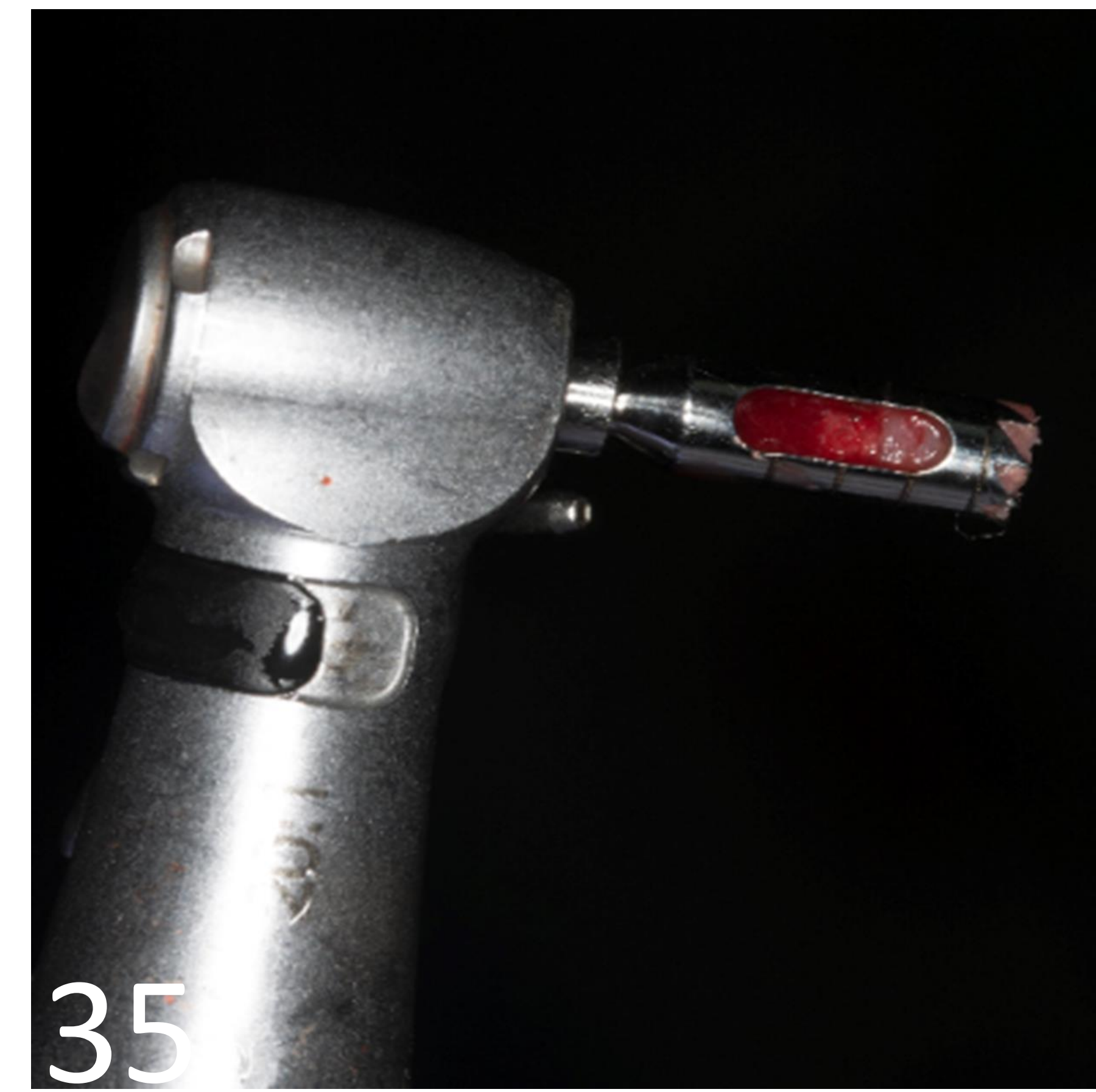
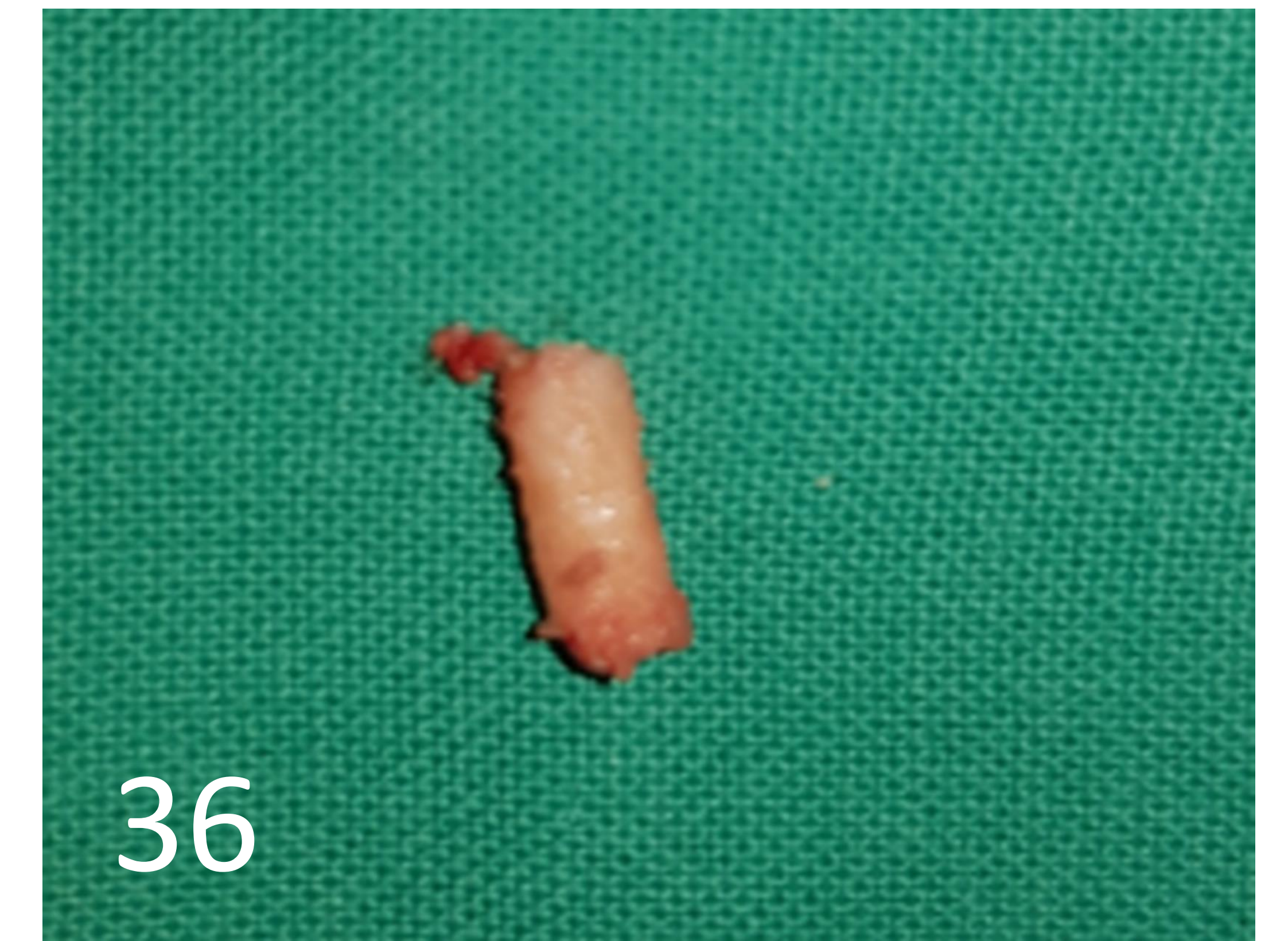


Figure 35,36 : core biopsy retrieval after peek and titanium meshes removal

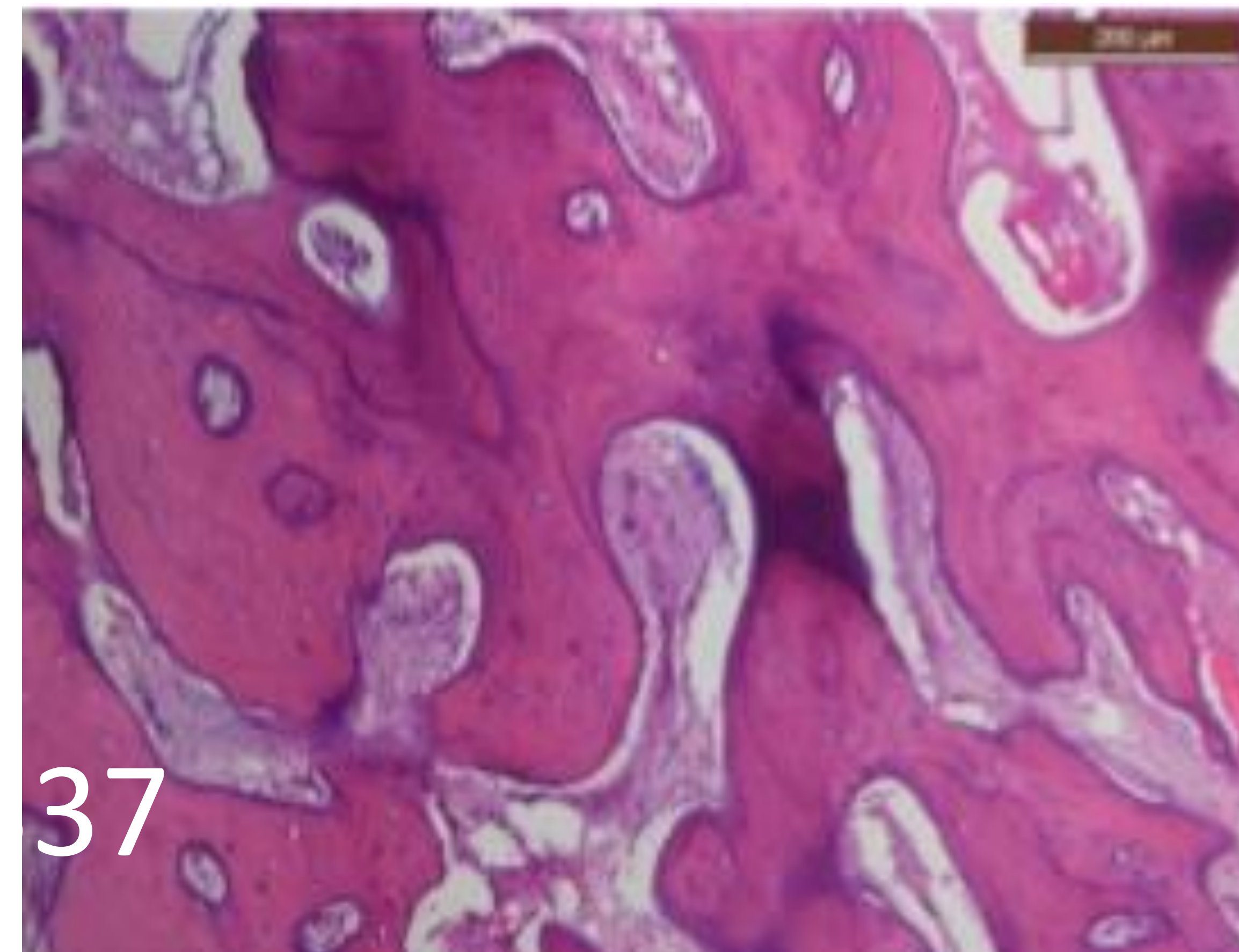


Figure 37 : microscopic picture of core biopsy taken from peek group showing trabeculae of lamellar bone with interfering bone marrow (magnification 100)

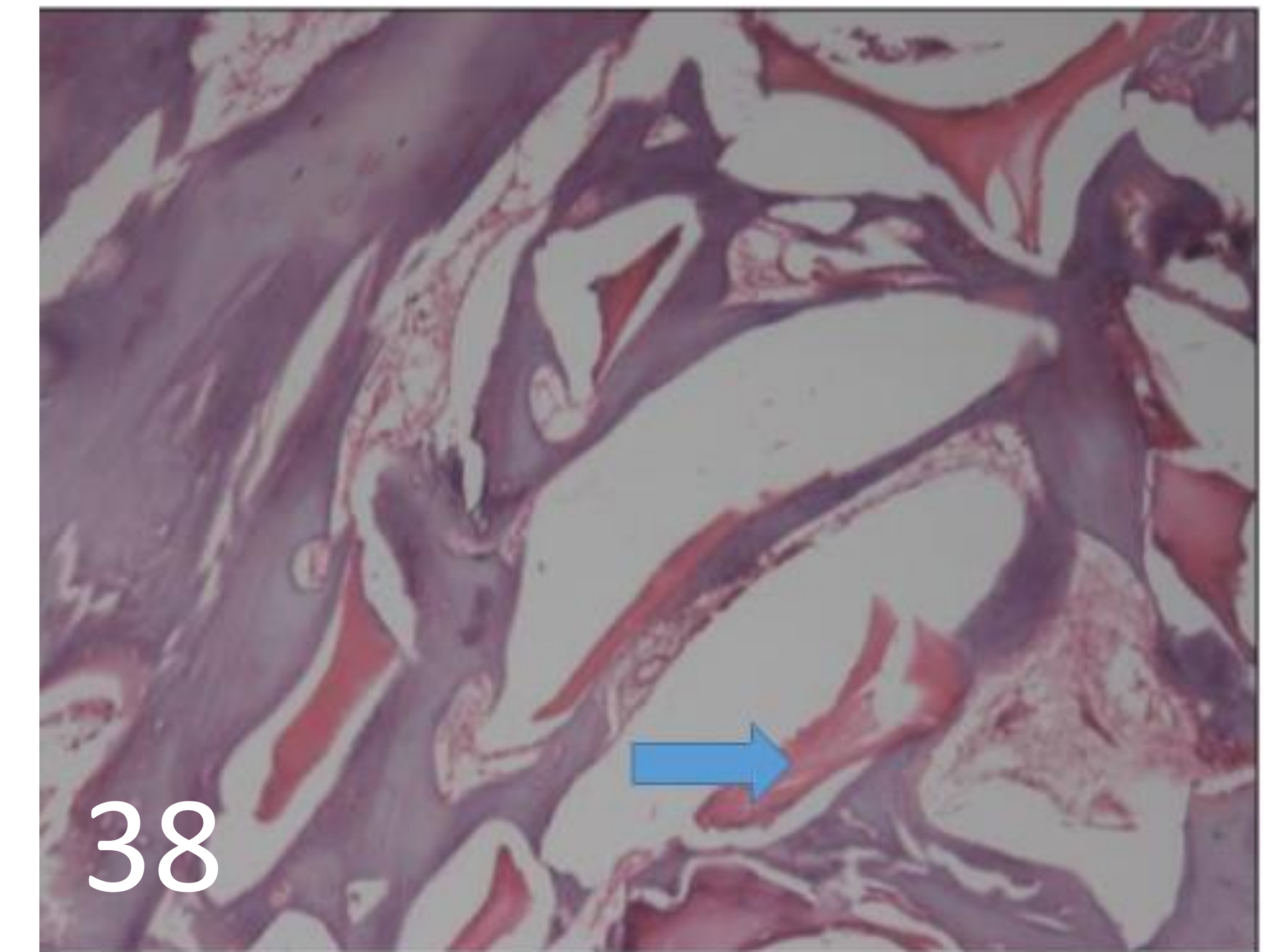


Figure 38 : microscopic picture of core biopsy taken from titanium group showing trabeculae of woven bone with interfering xenograft particles (magnification 100)