



Loma Linda University
School of Dentistry

Dynamic Navigation for Guided Sinus Lateral Window Osteotomy. A Novel Technique

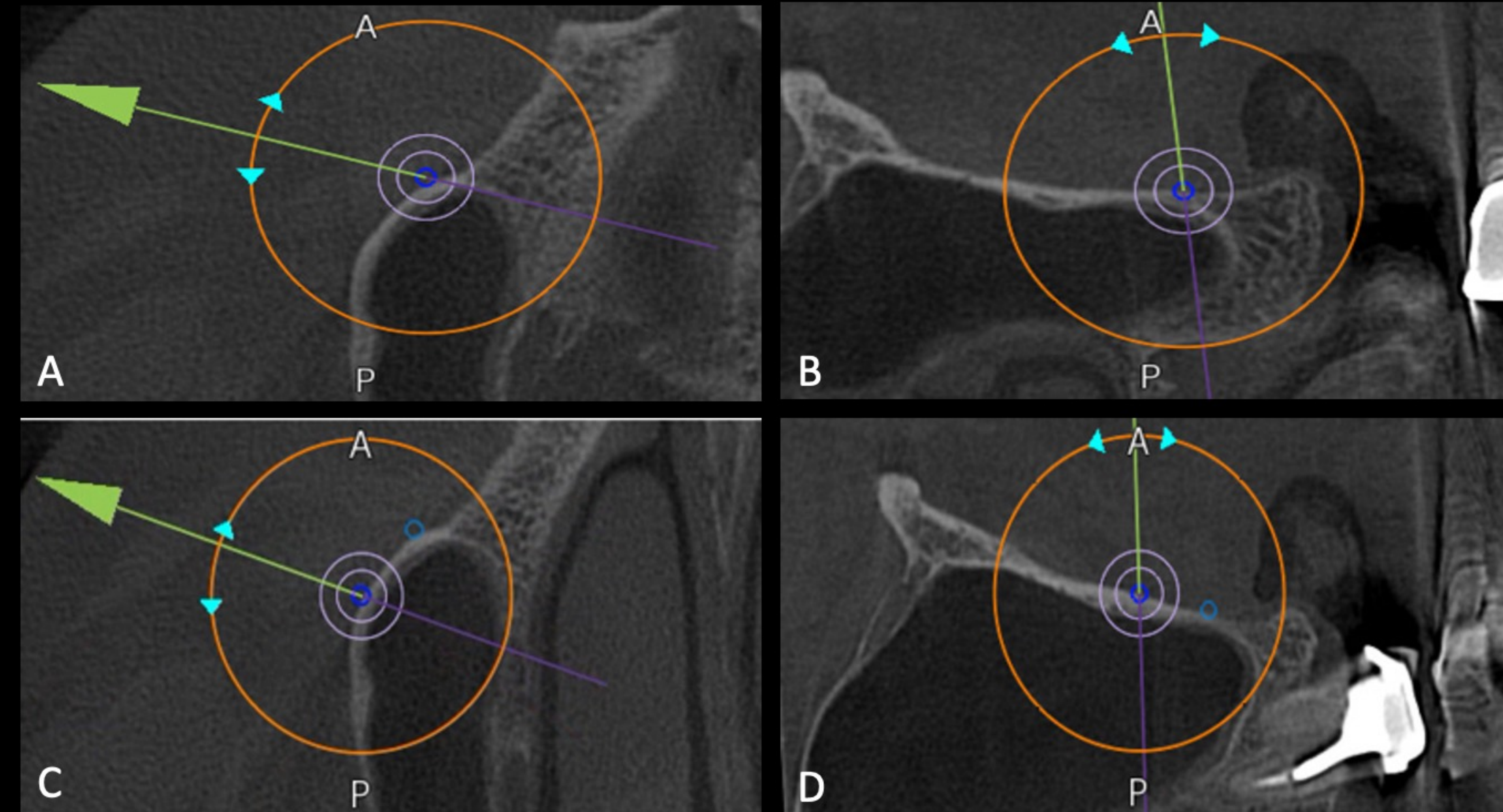
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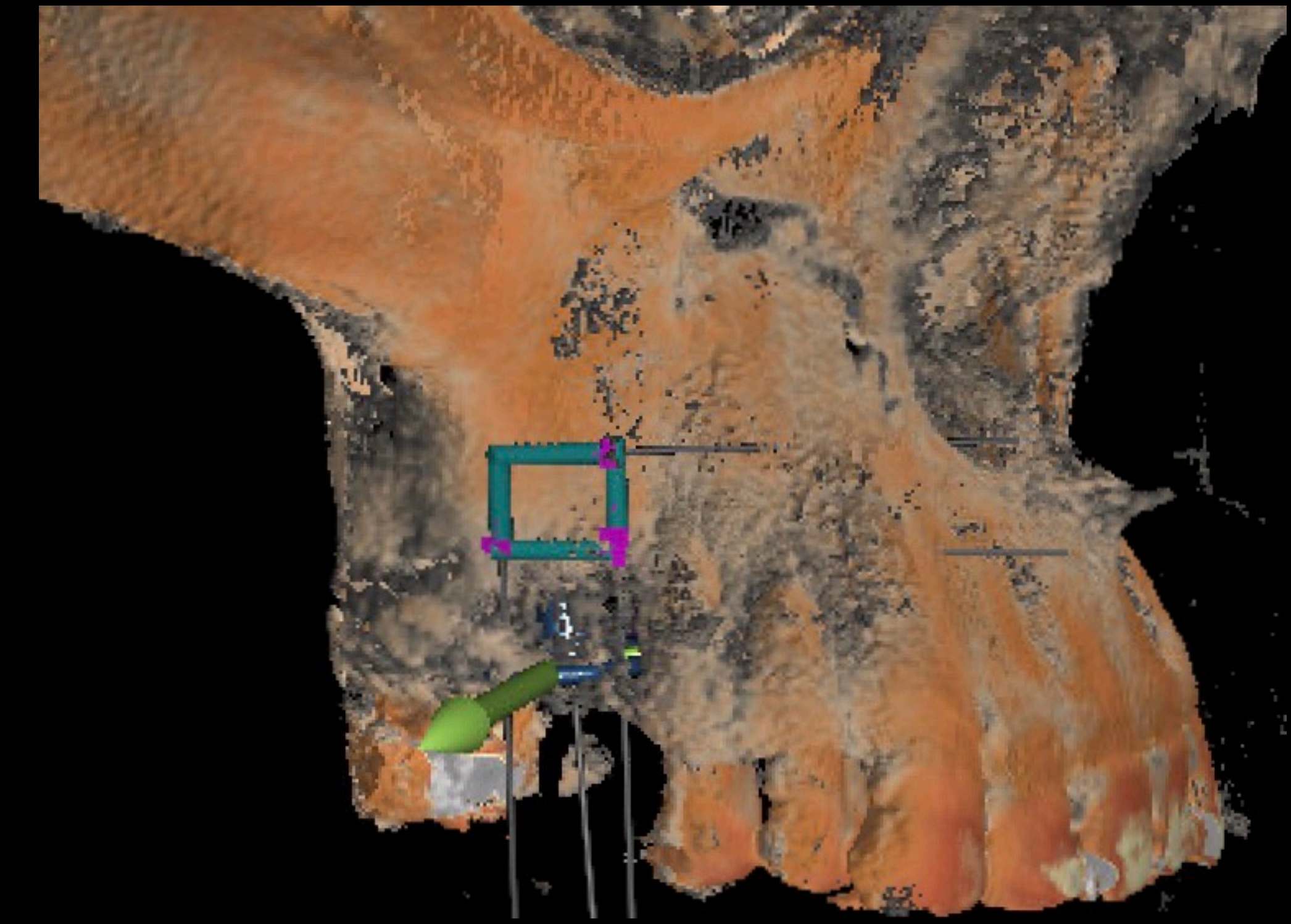
Introduction: Lateral window maxillary sinus augmentation is a well-established bone grafting method. The size and the position of the sinus antrostomy play a key role in making the procedure more predictable and effective with less complications.

Method: Case report: A 60-year-old male was referred to Advanced Periodontics program at Loma Linda University School of Dentistry for sinus augmentation and implant placement on Maxillary right first molar.

A CBCT and intraoral scan of the maxilla were taken, and the data were exported to the dynamic navigation system program. Implant on the first molar location was planned in a prosthetically driven position. Sinus lateral window position and dimensions were determined and planned using four 1.5mm diameter implants placed on the maxillary sinus lateral wall corresponding to the location of the future lateral window osteotomy lines (anterior, posterior, inferior and superior osteotomy lines).



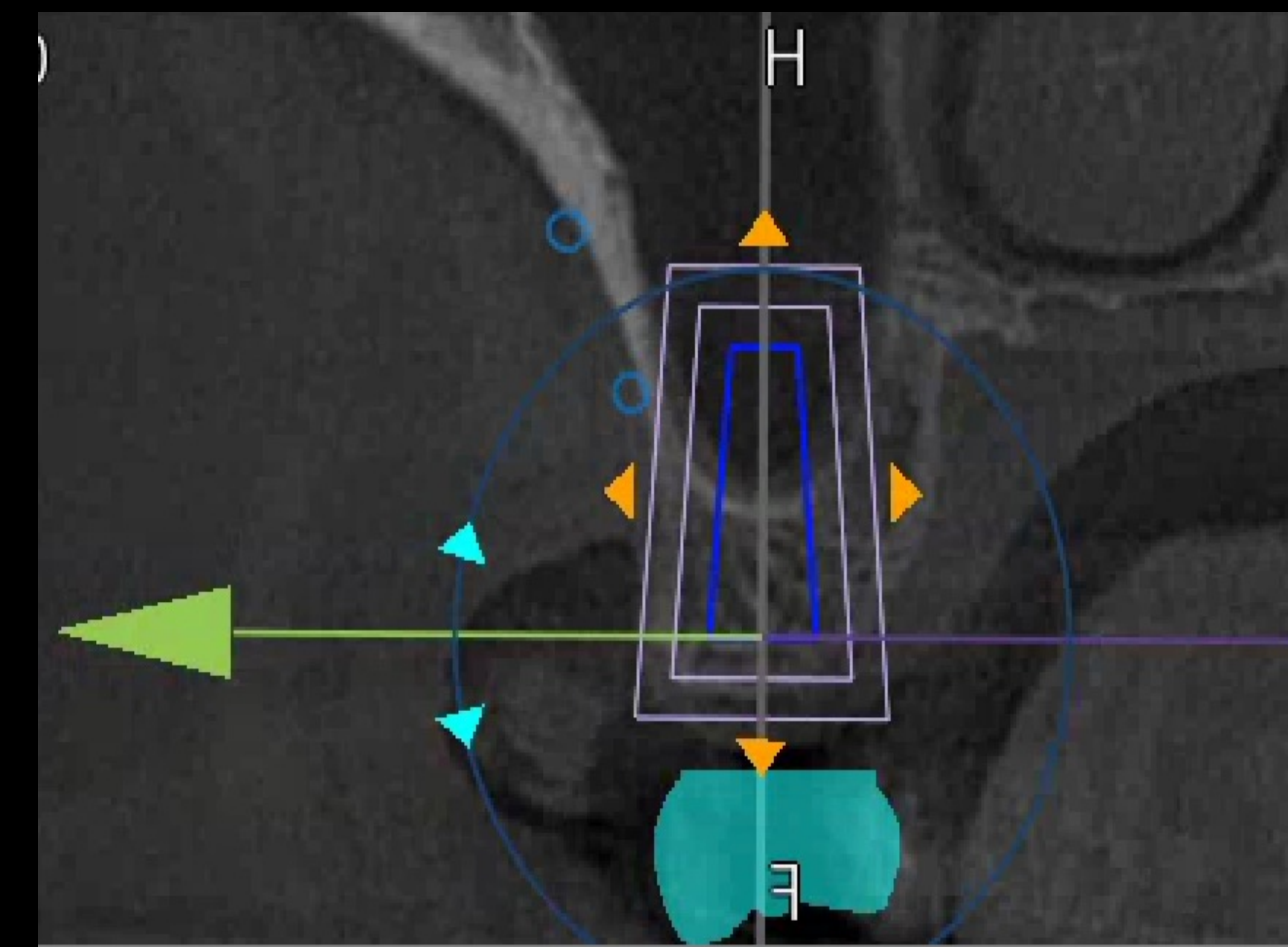
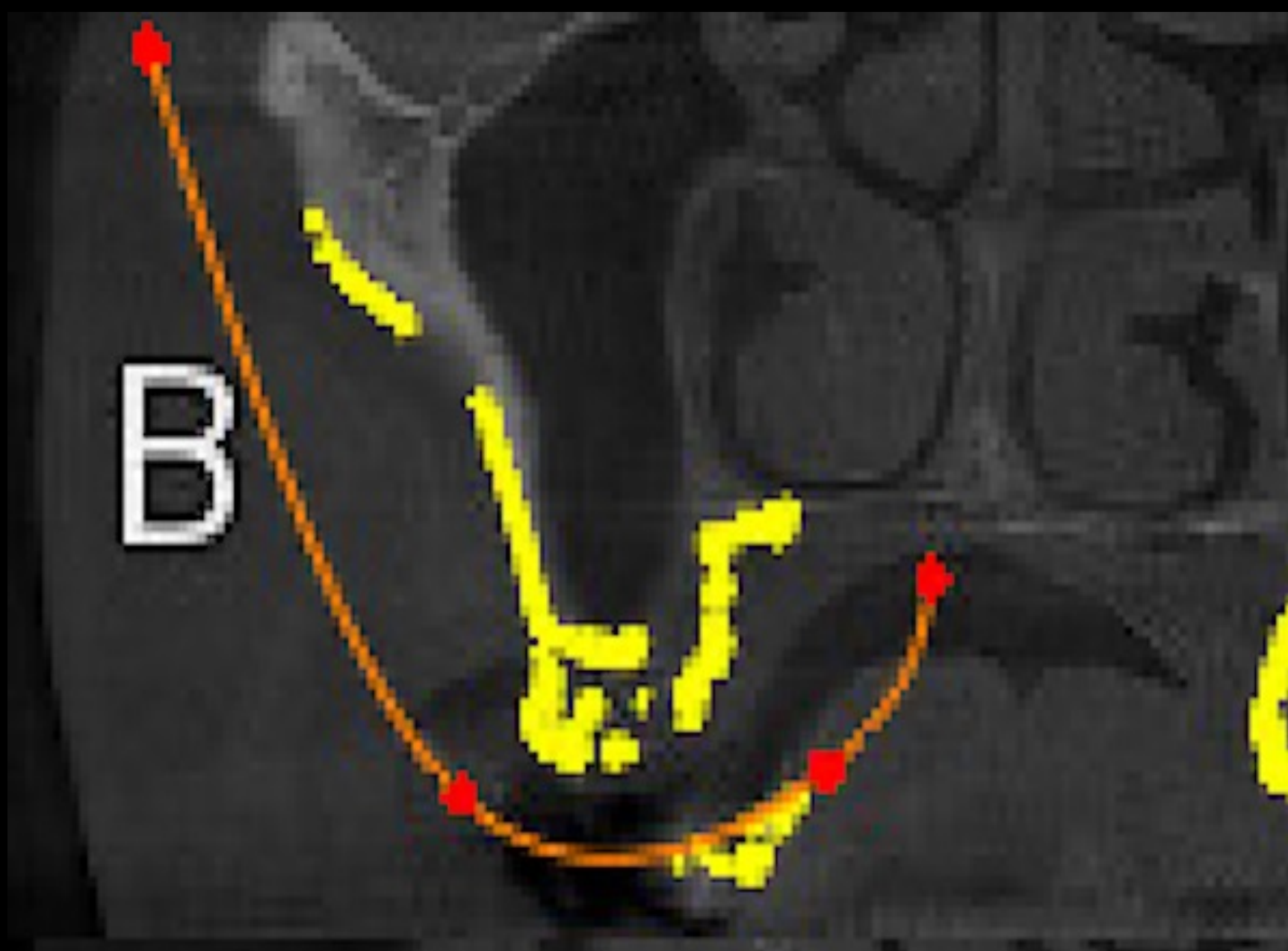
Cross section of the 4 narrow implants representing lateral window osteotomy lines



The overall lateral window position and dimension

On the day of the surgery, calibration and registration process of the dynamic navigation were done according to the system Instructions (X-Mark™, X-Guide; X-Nav Technologies, LLC). After local anesthesia and full thickness flap reflection, a 1.5mm diameter round bur was mounted on the handpiece, the drill length was measured, and the dynamic navigation system check was performed to verify the accuracy of the calibration and registration. Afterwards, the osteotomy was initiated following the planned four 1.5 mm implants. Please note that the system is designed for implant osteotomy perpendicular through the bony crest. Therefore, in the lateral sinus window osteotomy the round bur must be contacting the lateral sinus bone surface and moved in a parallel motion to the bone surface rather than perpendicular motion in order to outline the window osteotomy and not perforate the bone.

Once the osteotomy lines of the lateral window are completed, the lateral sinus window was greenstick fractured and the membrane was lifted, first molar implant osteotomy done, implant placed and bone graft material was placed. The flap was sutured, and Post-operative instructions and medications were given.





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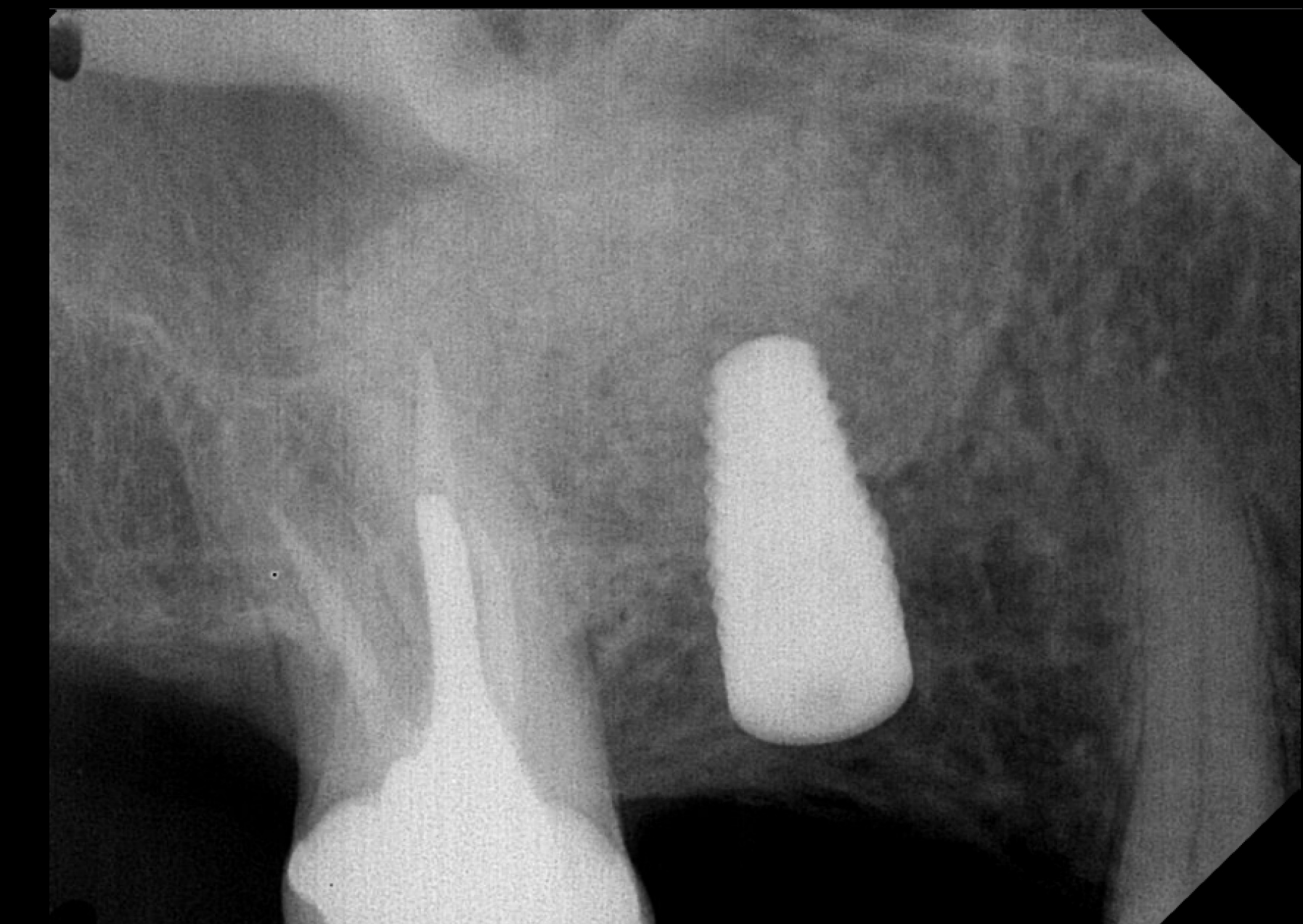
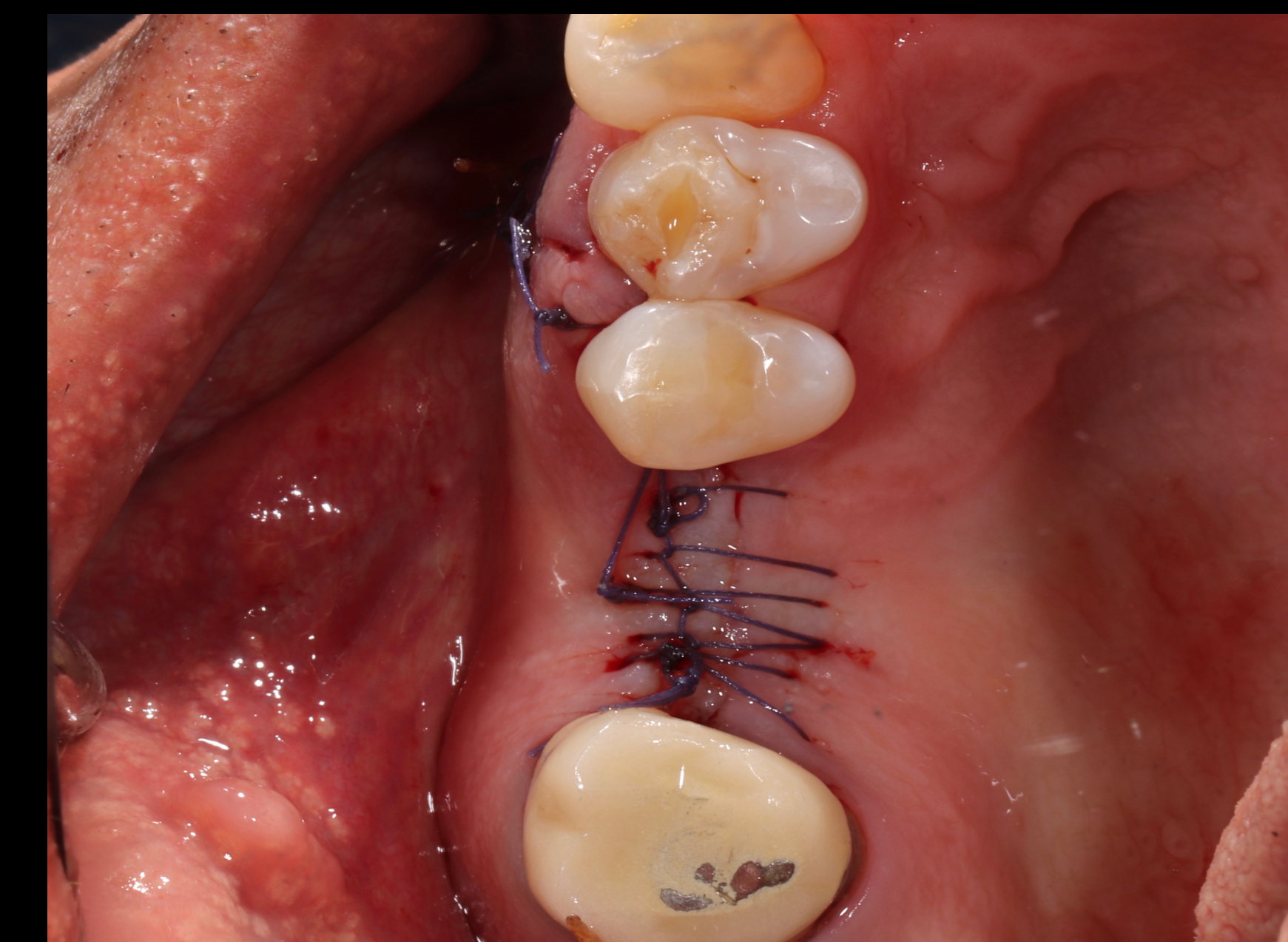
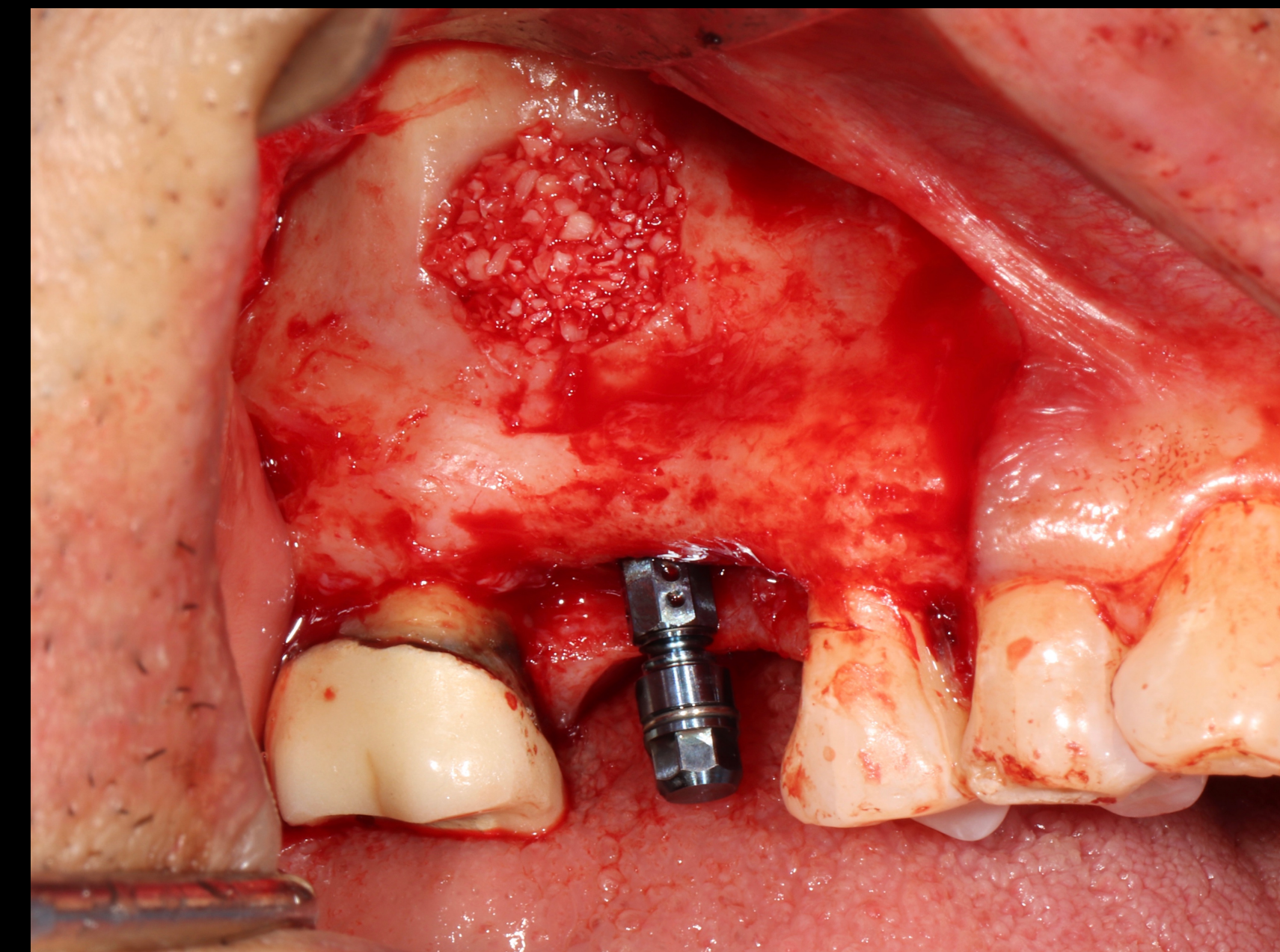
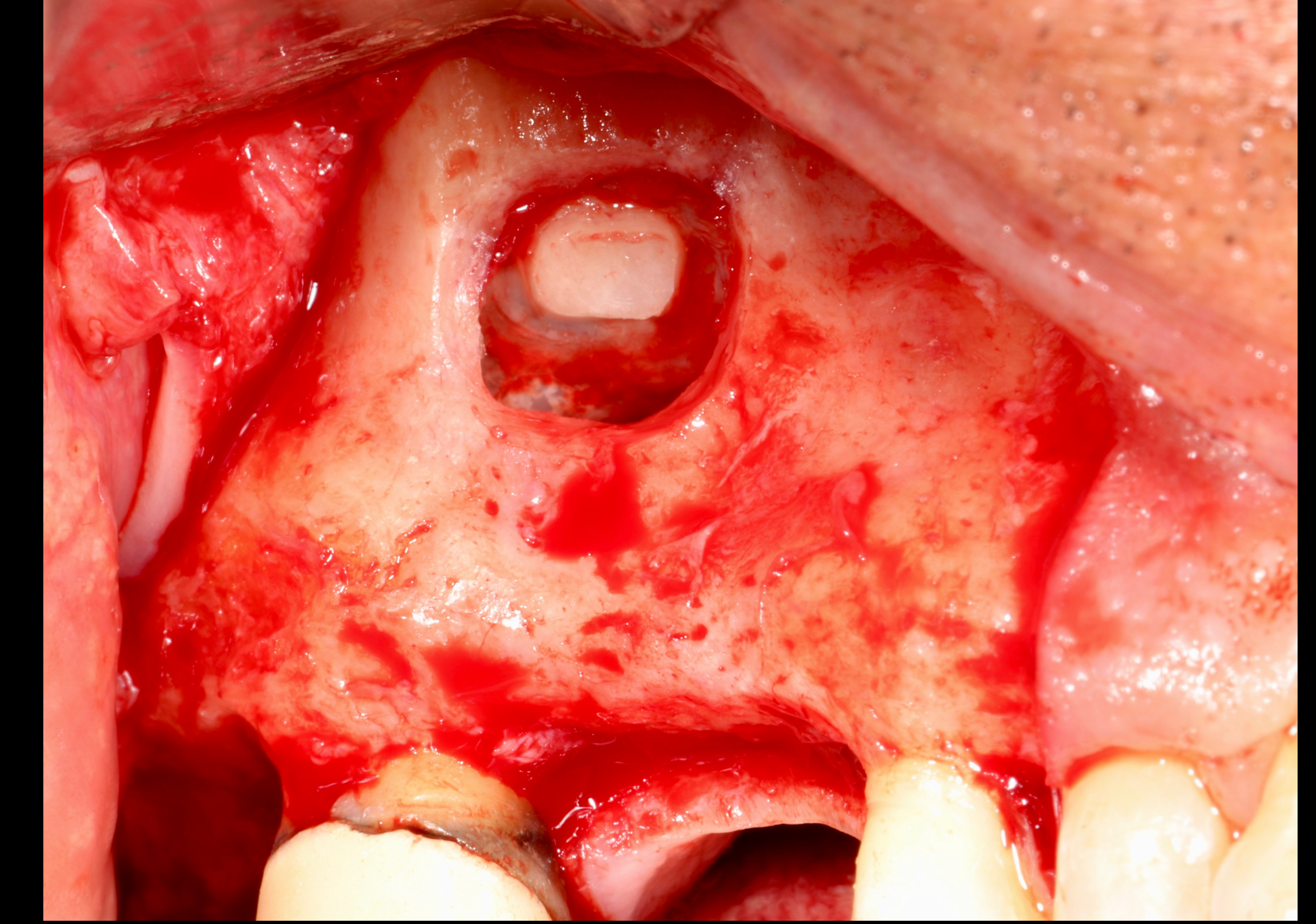
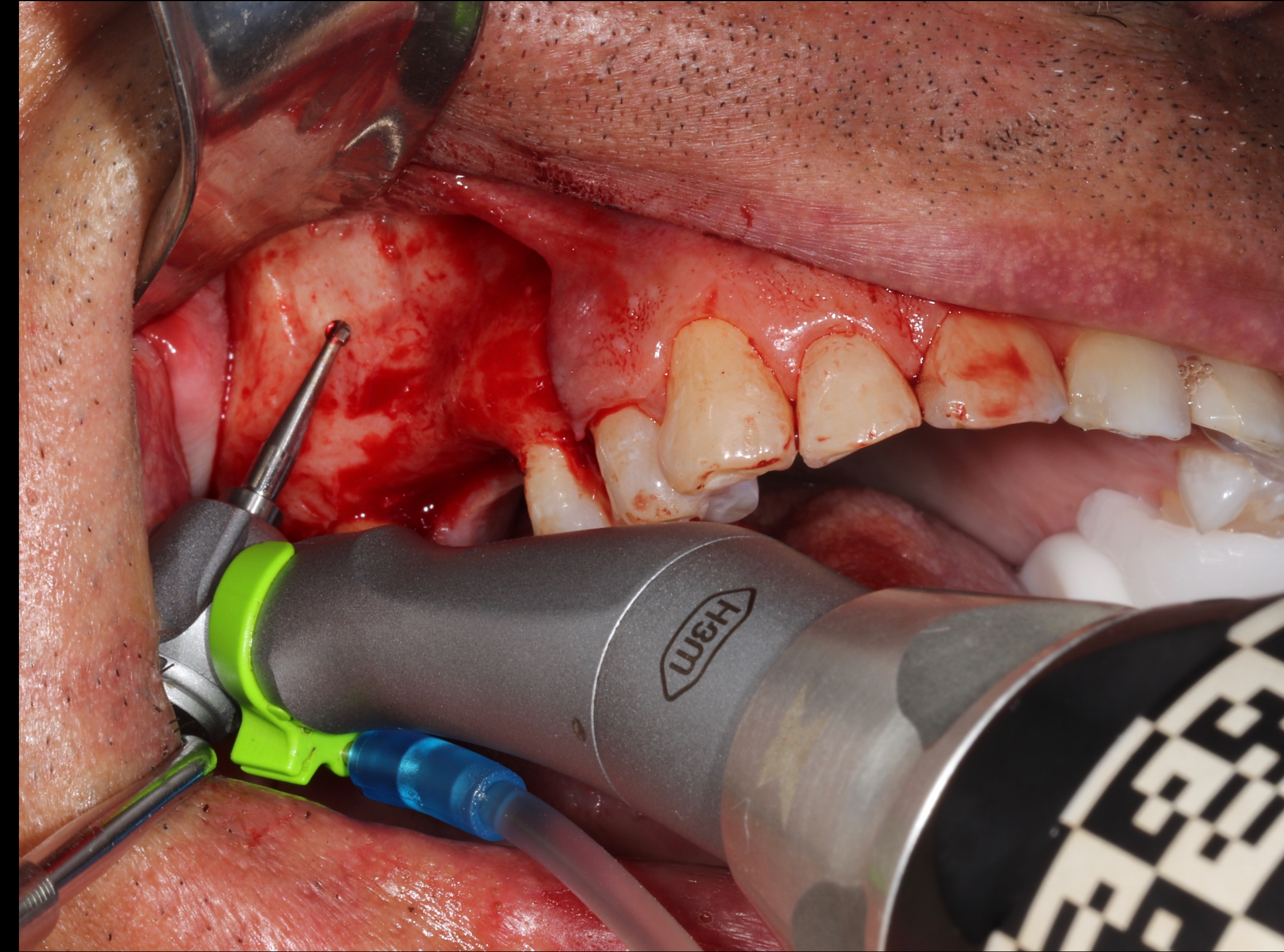
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Results: No post-operative complications noticed. Lateral window sinus graft and implant placement procedure were successful.

Discussion: The anatomy of the maxillary bone and sinus orientation can be misleading to the surgeon. The exact location of the lateral sinus window is sometimes hard to visualize especially in the presence of anatomic structures such as tilted roots, intraosseous vascular anastomosis, and prominent septa. Complications in sinus grafting surgery include membrane perforation, bleeding, damage to adjacent teeth and septa complications. Therefore, clinicians have proposed using stereolithography and 3-dimensional (3D) imaging to fabricate a surgical guide to increase accuracy in outlining the lateral sinus window.

Compared to static sinus surgery guides, the use of dynamic navigation offers easier planning as it involves only one software, it also eliminates the need to print guides and potential misfit problems. Additionally, Fitting a large static guide on lateral sinus bone involves large flap reflection, which increases surgical site morbidity and compromise healing. However, potential disadvantages of this technique include the cost of dynamic navigation device and software. Furthermore, the steep initial learning curve and the additional training needed to achieve hand-eye coordination of the surgeon.

Conclusion: The outline of the lateral window osteotomy along with implant osteotomy can be accurately planned and executed using Dynamic navigation technology which may potentially reduce complications and insure accurate placement of the implant and the graft.



References

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