

1

Background

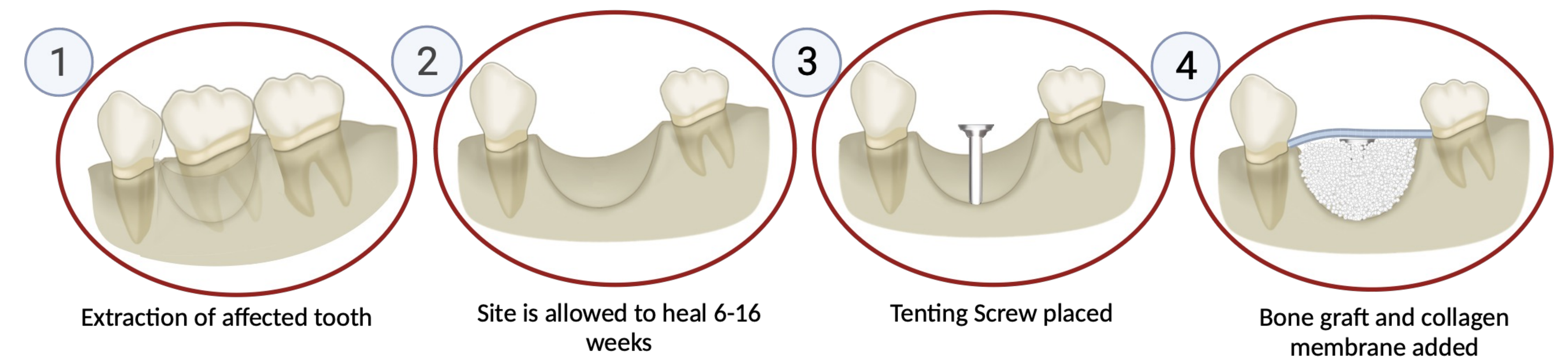
There are multiple augmentation protocols documented in the literature to rebuild the deficient alveolar ridge after tooth extraction; however, achieving adequate vertical augmentation remains the most challenging goal. Alveolar ridge preservation (ARP) is recommended post-tooth extraction to minimize ridge alterations, proving more effective than natural healing in reducing bone resorption and lessening the need for complex later augmentations. Despite its benefits, ARP has its challenges, such as wound closure and inadequate bone volume gain. This study demonstrates a novel surgical technique of early vertical bone augmentation post-dental extraction. This technique offers several biological and technical advantages about the timing of the procedure and its relative simplicity compared to other complex methods.

2

Material and Methods

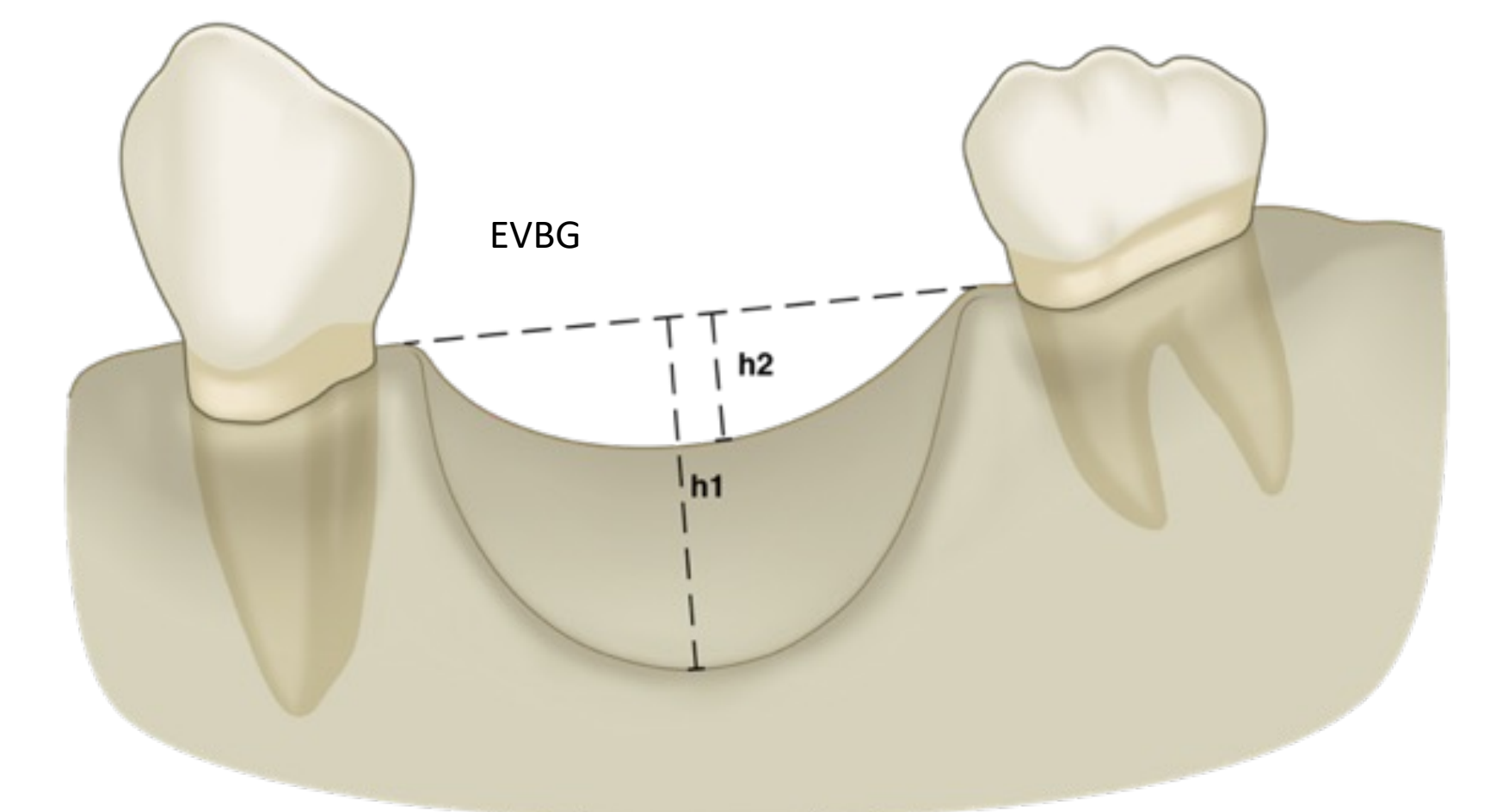
Study design and population: This retrospective study of 50 sites from 44 participants who had received early vertical bone augmentation procedures 6-16 weeks post extraction in either the maxilla or the mandible from May 2016 to Nov 2022 in a private clinic.

Surgical protocol:

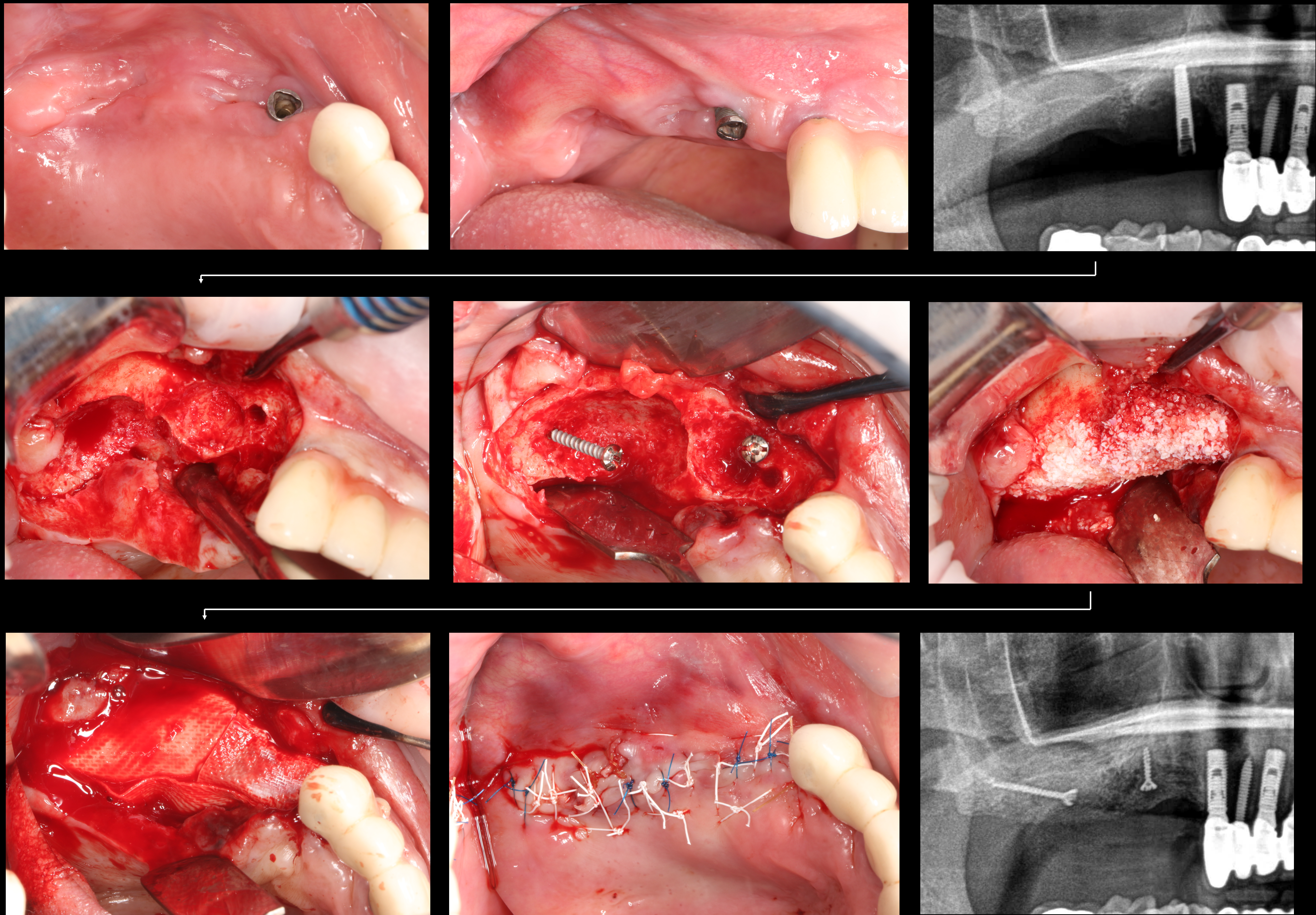


CBCT bone measurement:

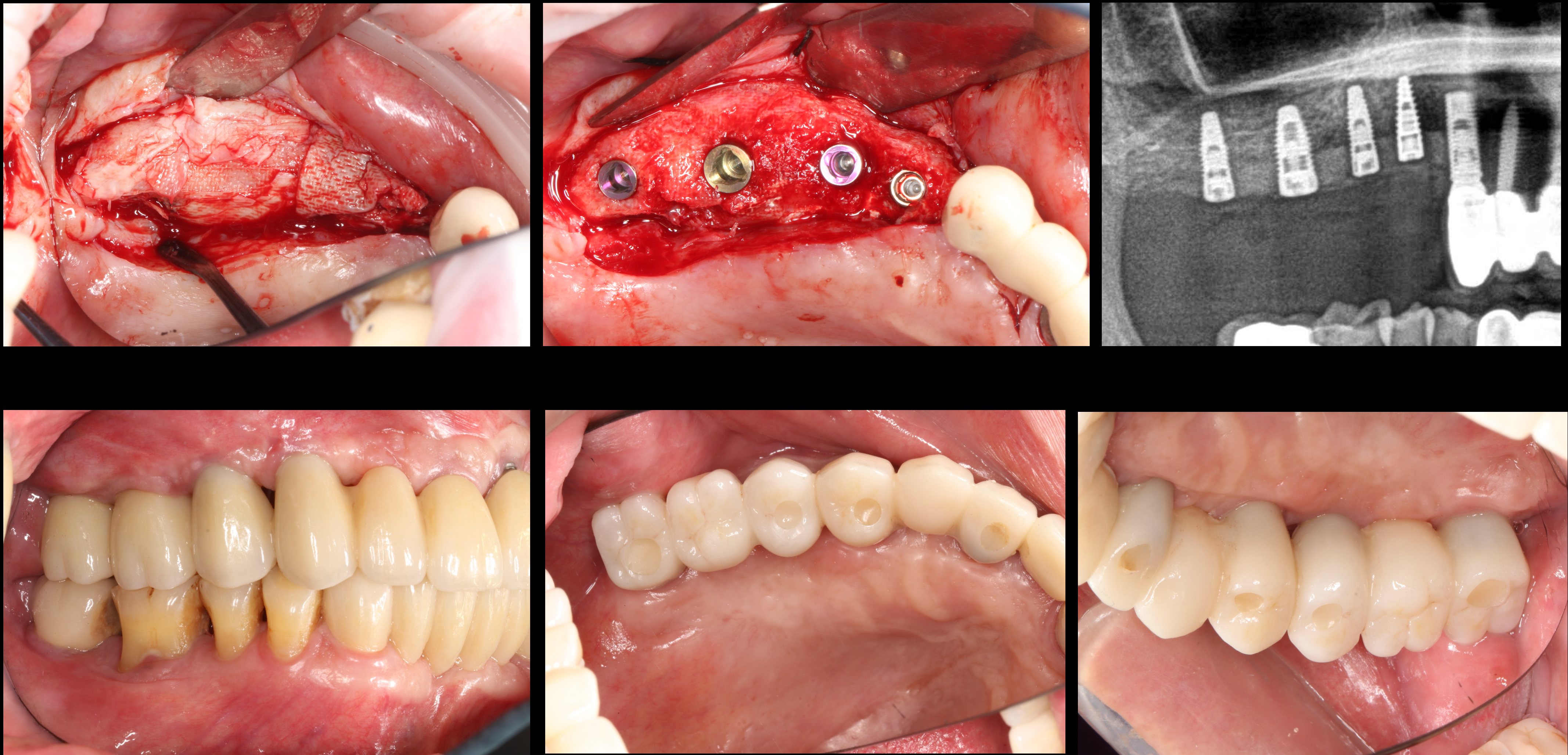
Pre-operative and post-operative CBCT images were superimposed, and the amount of vertical bone gain was measured by using Simplant (Densply Sirona, USA) software. Then the difference between the true vertical bone gain (TVBG) and the expected vertical gain (EVBG) were calculated. A positive value was assigned in cases where bone gain exceeded the EVBG, and a negative value in cases where the TVBG was less than the EVBG.



Case 1: Posterior Area



After 9 months ...



Case 2: Anterior Area

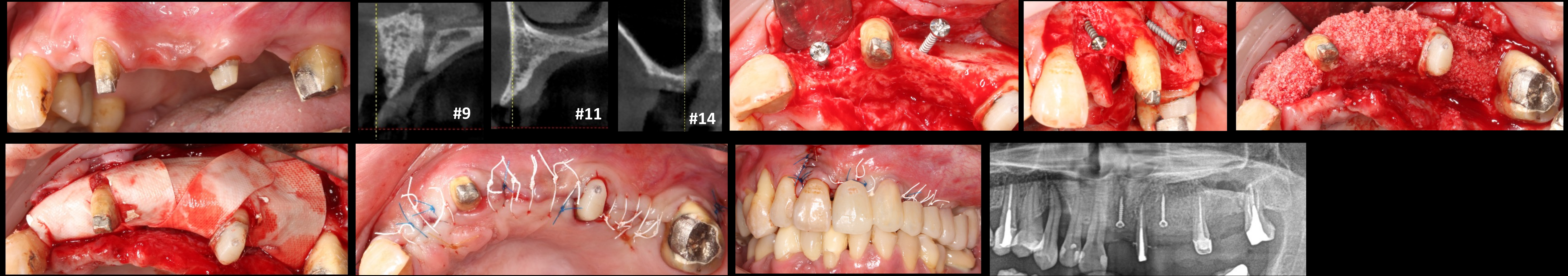
Initial photos



Simple extraction #9, 14



After 6 weeks, early vertical ridge augmentation using tenting screws at sites #9 and 11 with particulate allograft material



Case 2: Anterior Area

After 9 months

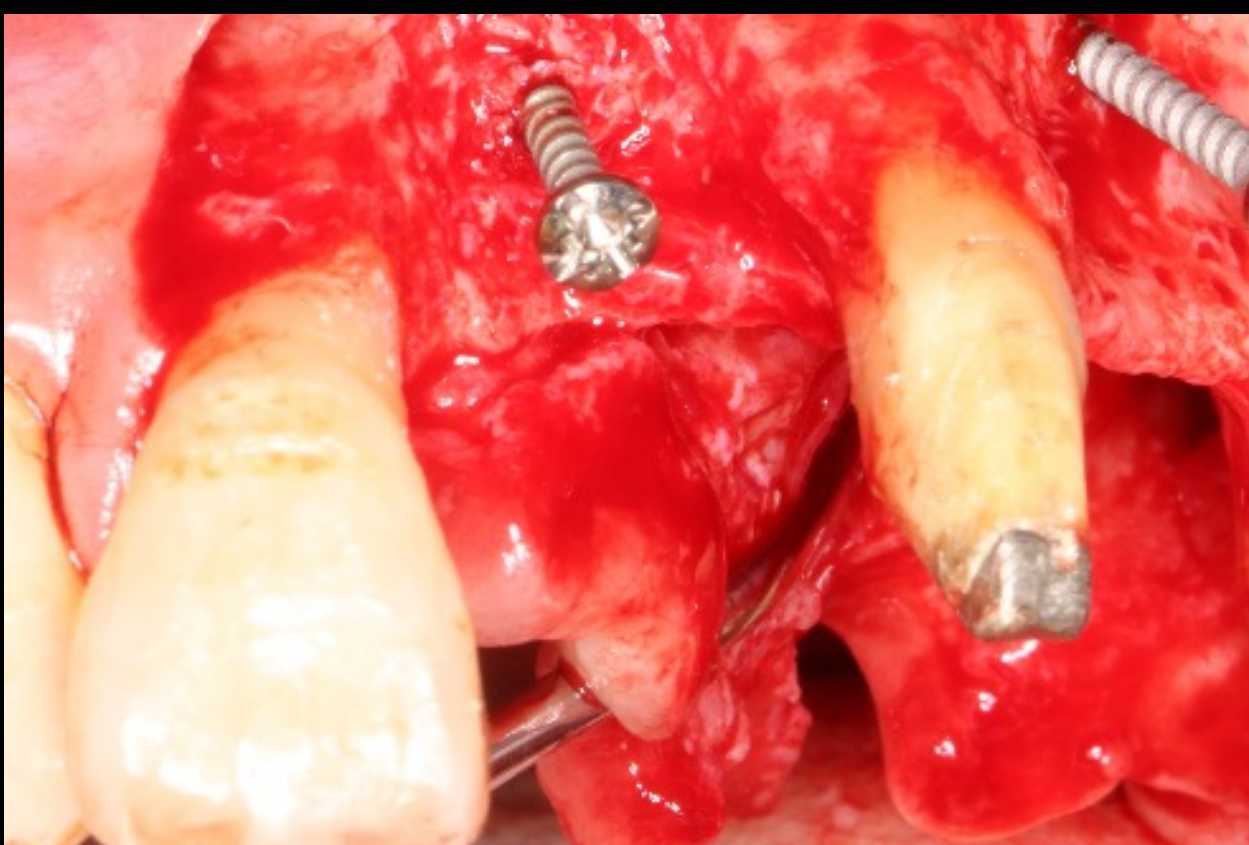
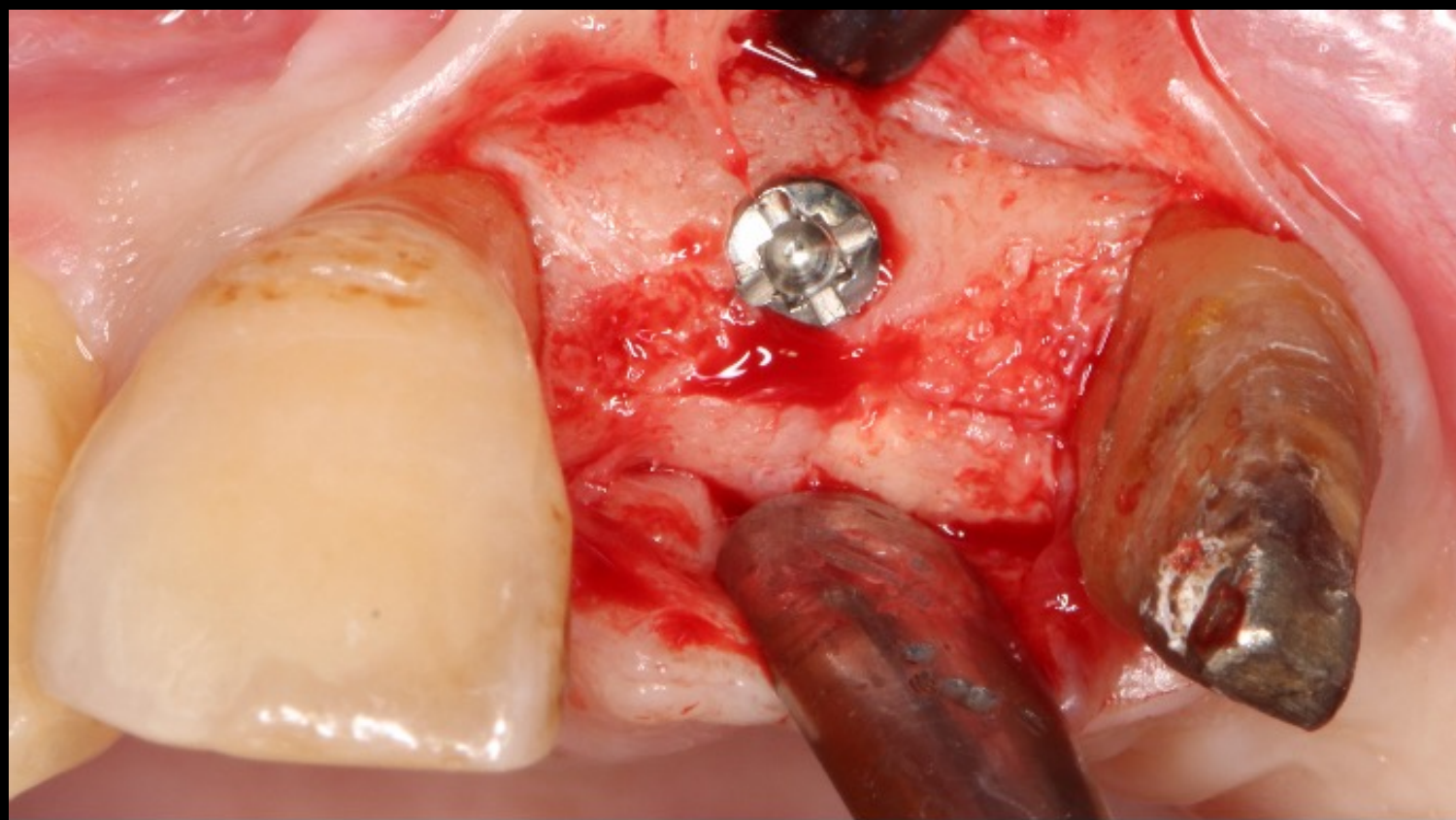
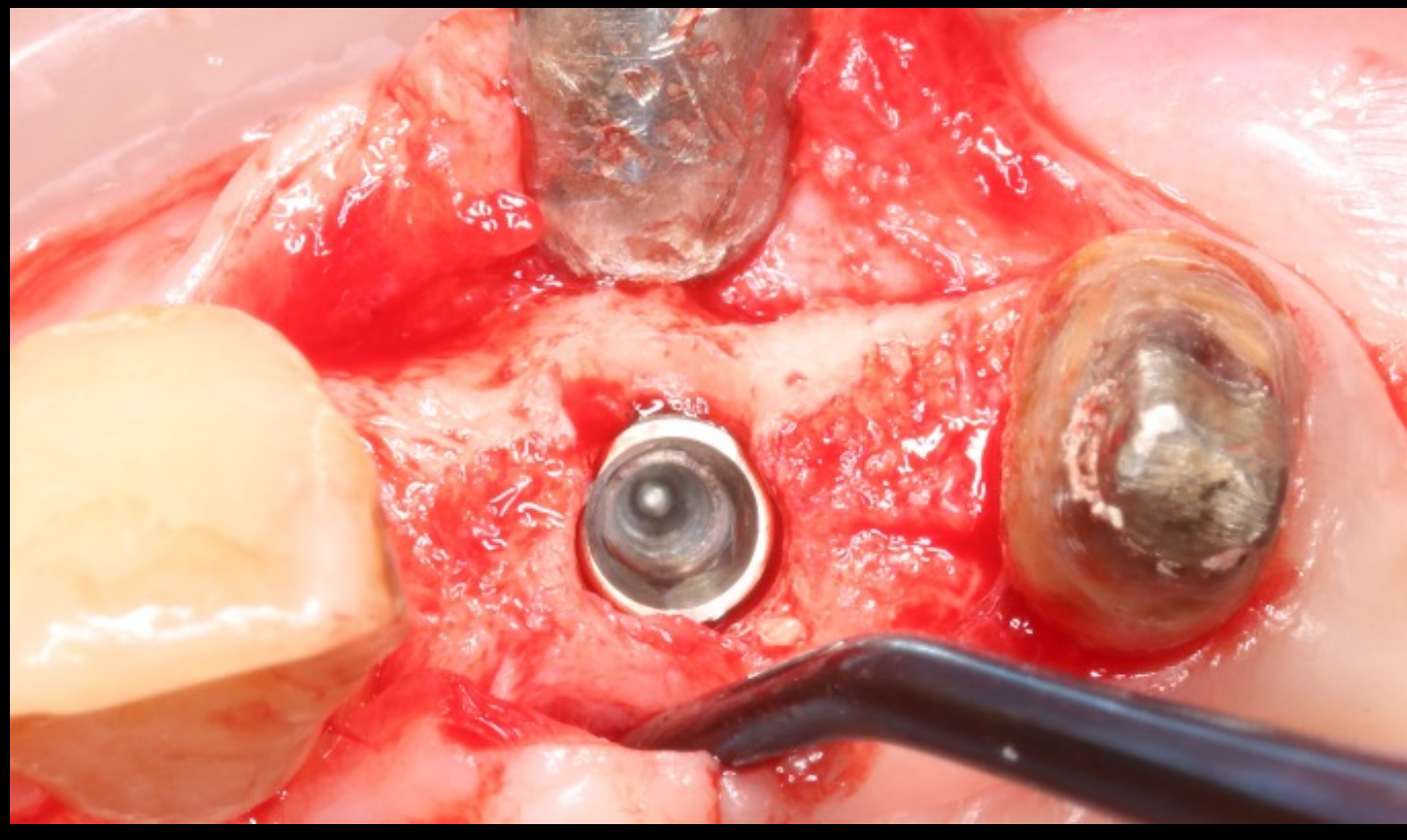


Initial

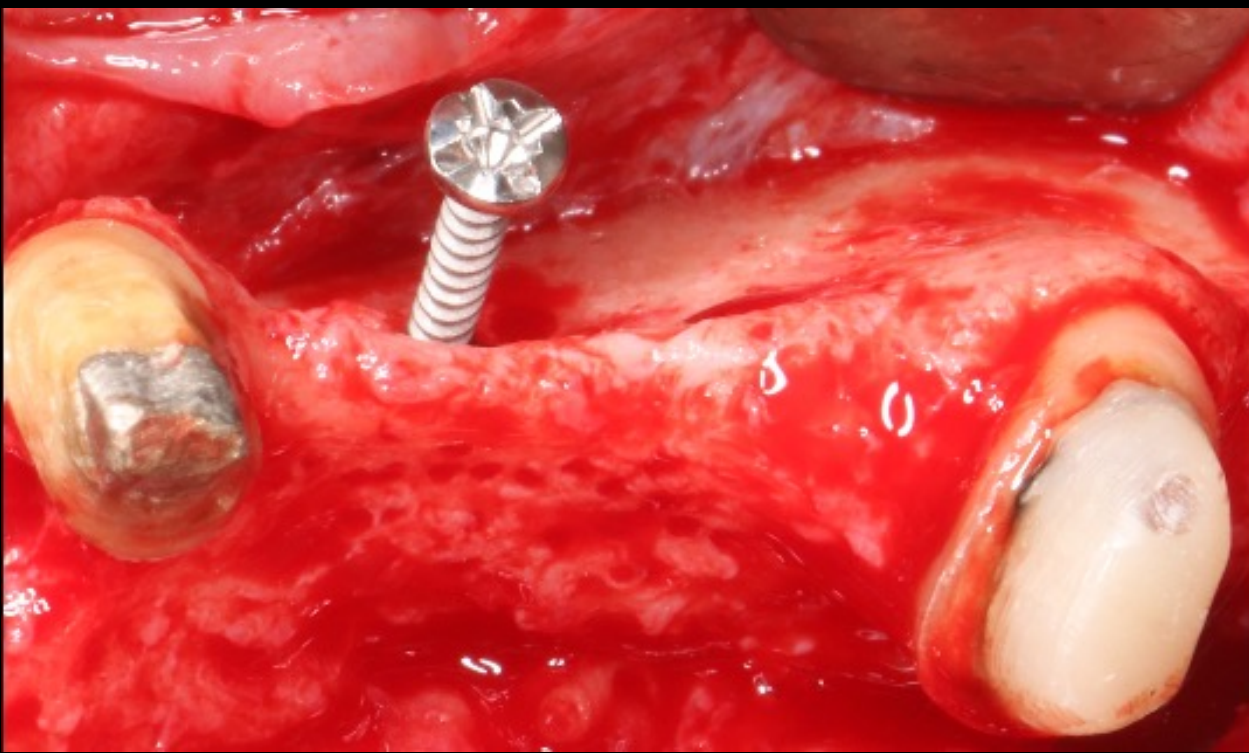
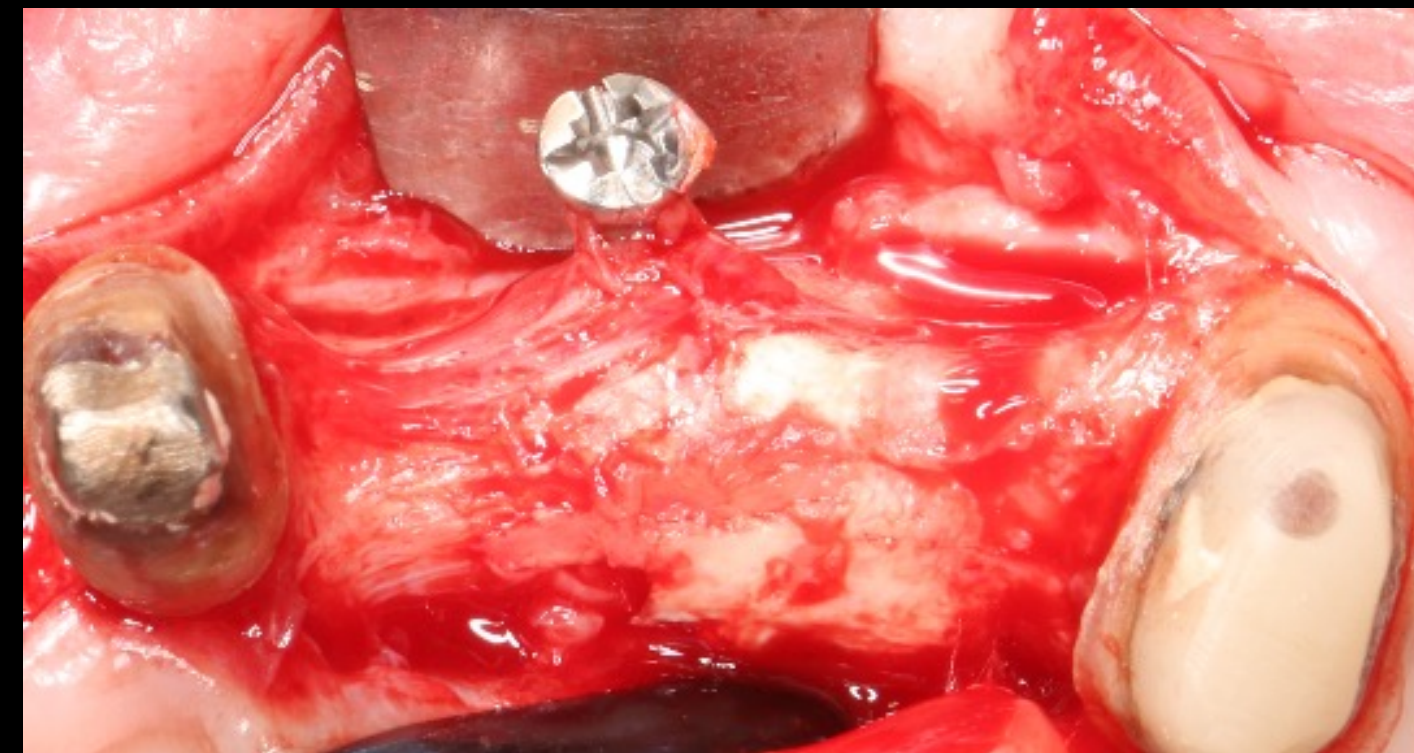
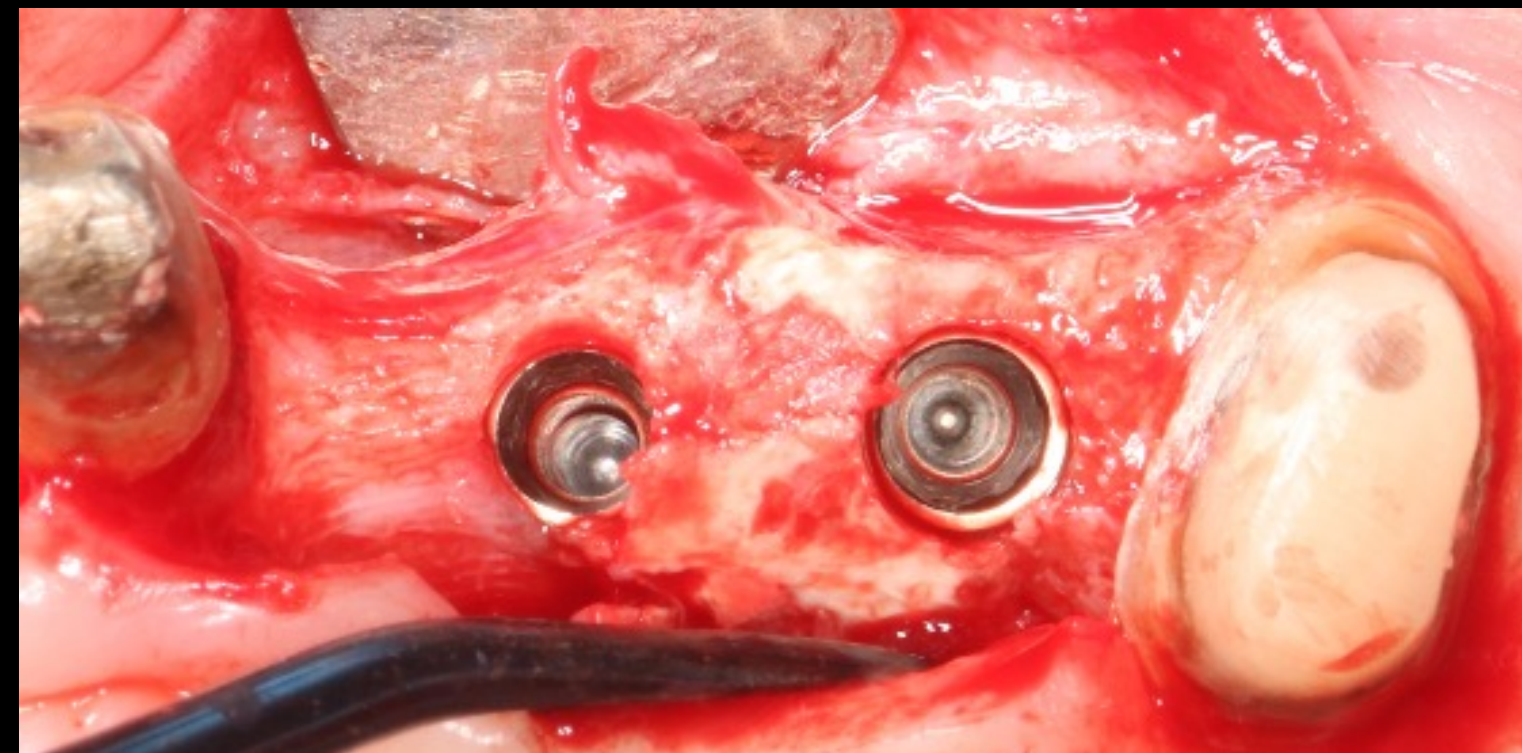
9 months

Implant Placement

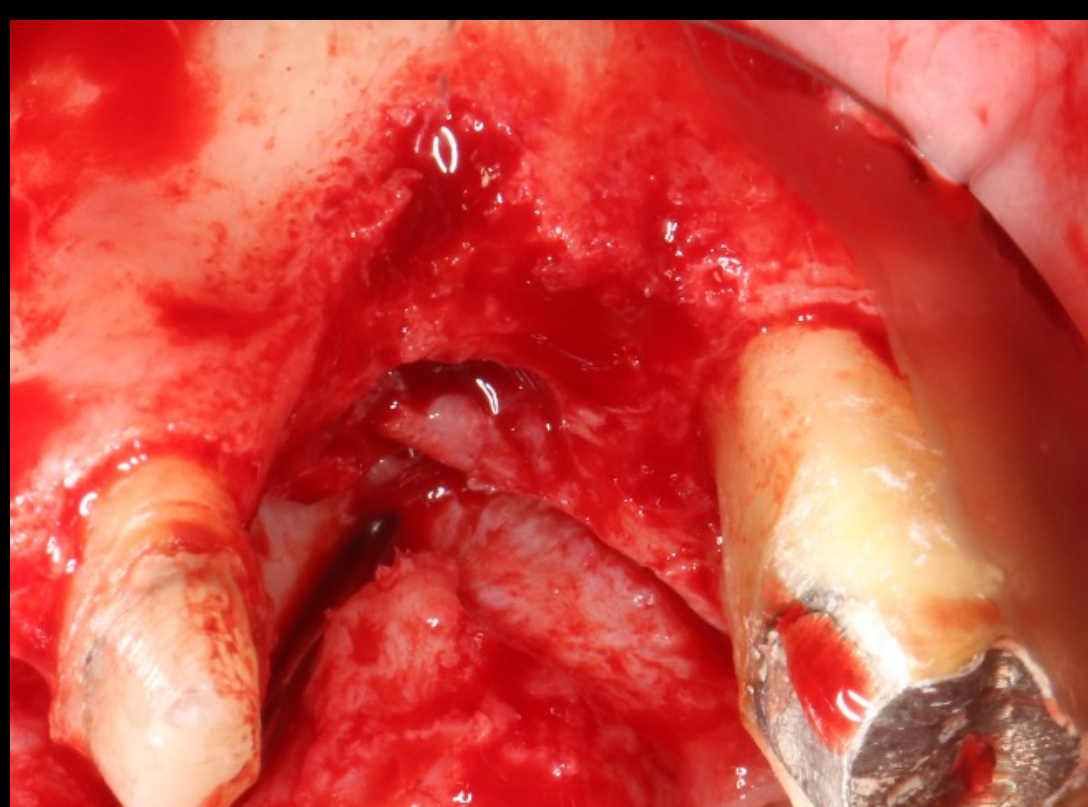
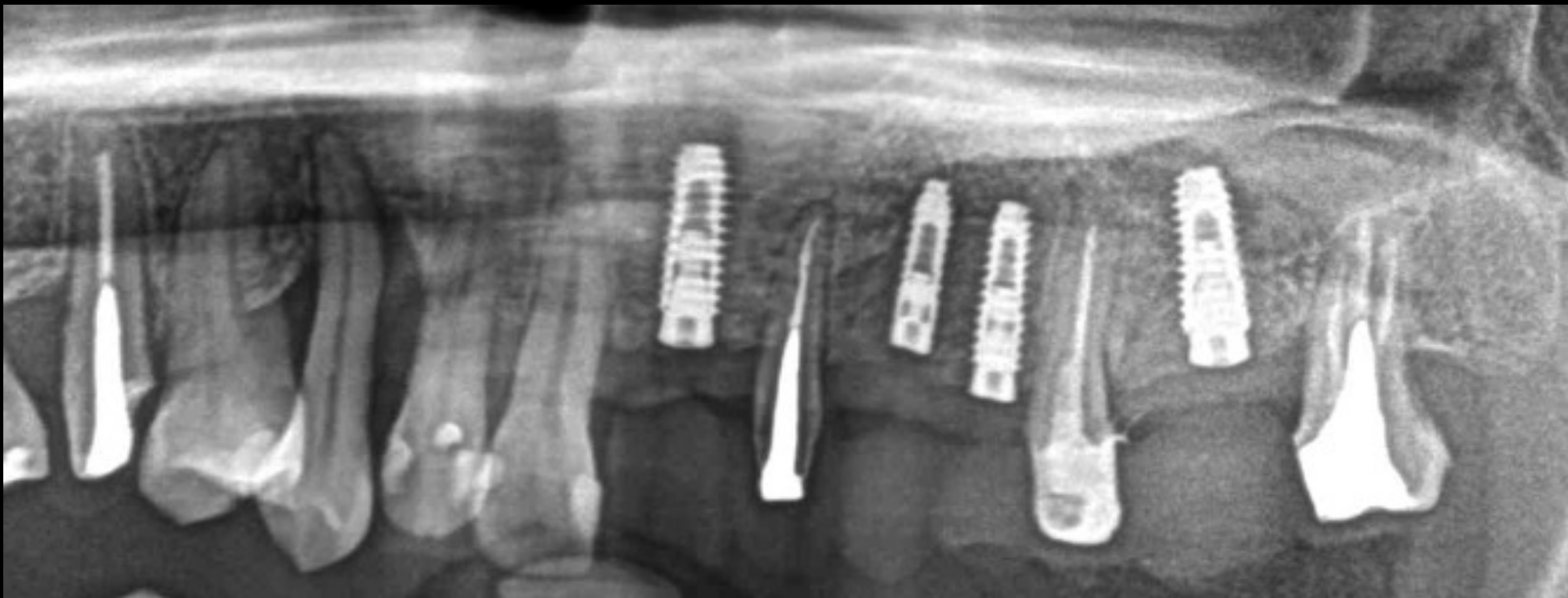
Site #9



Site #11, 12



Site #14

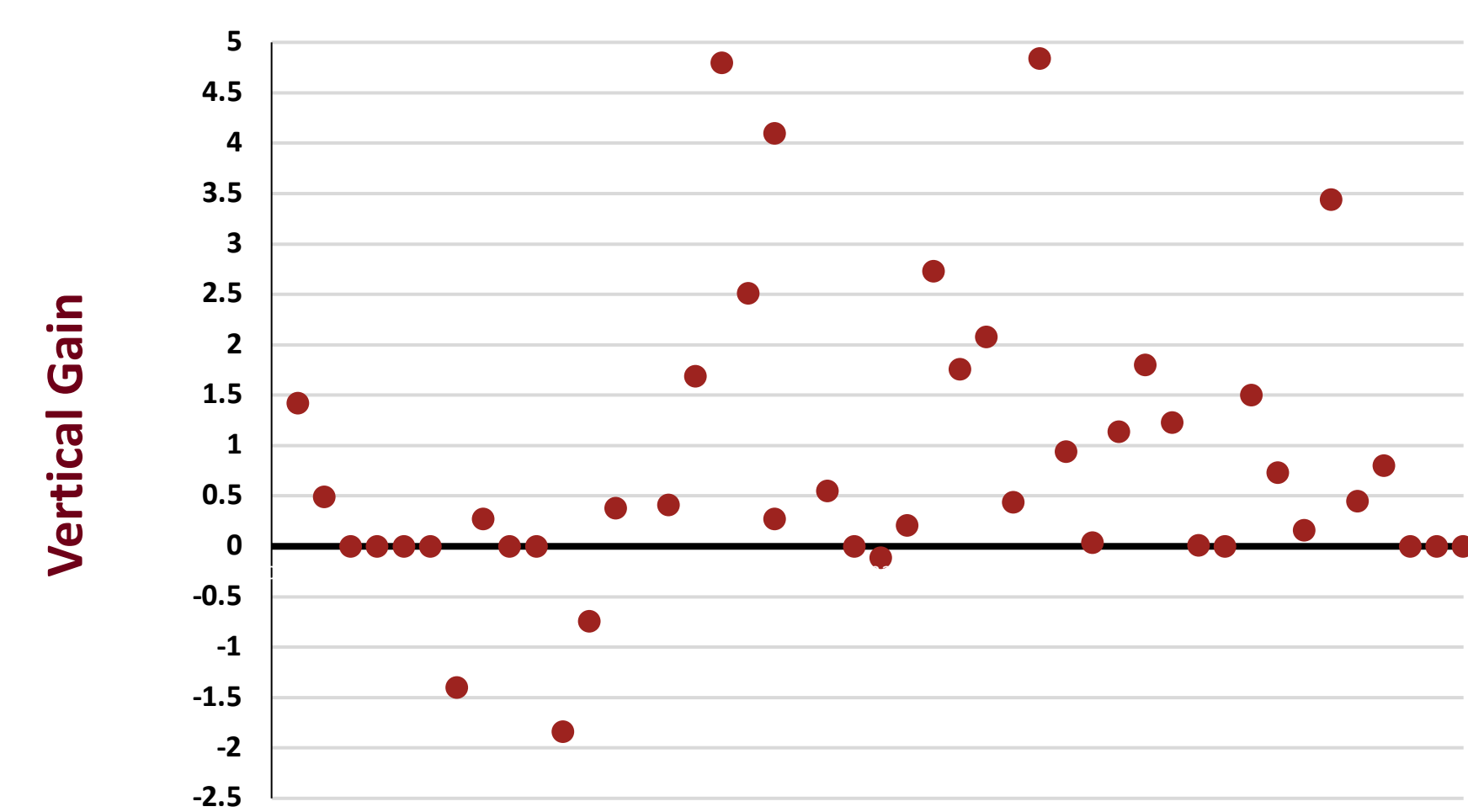


3

Results

A total of 50 sites from 44 patients were treated with early augmentation 6-16 weeks post extraction. The mean patient age was 55 years (range: 38-77 years), two thirds were women (n = 34), and one third were men (n = 16). Most of the augmented sites were single missing tooth (n = 29) while 21 sites were multiple adjacent missing teeth. Cases were distributed between maxillary and the mandibular teeth.

- The total mean vertical bone gain measured after 6-9 months of augmentation was **4.64± 1.76 mm**.



Vertical Gain of all Sites Relative to the Expected Vertical Gain (0)

Table 1	≥ EVBG	< EVBG
n	40	10
%	80	20
Mean ± SD (mm)	+1.45 ± 1.47	-0.96 ± 0.78

- About 80% of augmented sites met or exceeded the expected vertical bone gain (EVBG)

4

Conclusion

Vertical alveolar ridge augmentation presents as a significant clinical challenge, with guided bone augmentation techniques showing effectiveness in vertical bone gain. Traditional titanium-reinforced PTFE membranes are effective but are associated with a high complication rate. Resorbable membranes, on the other hand, show improved soft tissue healing and fewer complications. Optimal results were observed when augmentation was performed after 12 weeks post-extraction, highlighting the importance of soft tissue volume and timing in the procedure's success. Additionally, the use of tenting screws with resorbable membranes has been shown to enhance outcomes, particularly in cases requiring space maintenance. This study suggests that with careful consideration of materials, timing, and adjunctive techniques, clinicians can achieve predictable and effective vertical ridge augmentation.

