Immediate ridge reconstruction with a composite tuberosity graft after removal of failing implants

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Conflict of interest

The author does not have conflicts of interest to disclose.

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Reconstruction of the soft and hard tissue following removal of one or more failed dental implants can be accomplished in a single, cost-effective surgical procedure using a composite bone graft harvested from the maxillary tuberosity.

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Abstract

Introduction

When a dental implant is discovered to be failing, the implant must be removed, resulting in a defect. Immediate reconstruction of the defect using an autogenous composite tuberosity graft has been reported following the removal of a single implant. Ridge reconstruction after removal of more than one failing dental implant poses an even greater challenge, given the substantial loss of hard and soft tissue.

To the author's knowledge, this is the first report to describe use of an autogenous composite tuberosity graft for reconstruction of hard and soft tissue for multiple sites.

Case presentation

Three patients with failing implants and ridge defects received a composite tuberosity graft comprising the bone, periosteum, connective tissue, and epithelium of the maxillary tuberosity for simultaneous hard and soft tissue reconstruction.

Bone from the maxillary tuberosity was positioned between the bony borders of the defect or fixed buccally to augment the ridge. Smaller bone pieces from the tuberosity were used to fill the gaps. The soft tissue portion of the graft was allowed to heal spontaneously, thus eliminating the need for further surgery to increase keratinized gingiva and vestibular depth. All sites recovered uneventfully, and the ridge dimensions were reestablished.

Conclusion

For patients with sufficient tuberosity bone volume, using a one-piece composite tuberosity bone graft appears to be a promising approach for rebuilding the ridge in a single surgery.

Keywords: Alveolar Ridge Augmentations, Dental Implants, Tissue Graft, Alveolar Bone Graft, Connective Tissue

Background

Following removal of failing implants, reconstruction of the hard and soft tissue defects can be performed immediately or in stages after soft tissue healing is complete. Barrier membranes, particulate bone grafting, and block grafting alone or in combination with soft tissue grafts may be used for this purpose.

Coronal flap advancement is routinely used for wound closure, resulting in the need for additional surgeries to reestablish the vestibulum. Wound dehiscence is the most common complication following ridge augmentation.[1] After implant removal and subsequent immediate graft placement, wound closure becomes even more challenging.

One case series has reported successful immediate reconstruction of the bone and soft tissue in the esthetic region after removal of one failed dental implant.[2] The technique involved a composite tuberosity graft (CTBG) harvested with a trephine bur at 16 sites. Using a flapless procedure, the bony section was inserted into the socket, while the soft tissue portion was left exposed and sutured to the recipient gingiva, as allowing the soft tissue to heal by secondary intention minimizes flap elevation and mobilization.

The present report expands upon the study previously described by demonstrating that CTBG can be successfully applied at multiple sites for immediate reconstruction of soft and hard tissue following the removal of more than one dental implant.

Clinical Presentation

Three systemically healthy patients with failing dental implants were referred to a private clinic in Rijeka, Croatia, in 2017. The patients comprised two women and one man between 52 and 66 years of age. One patient smoked regularly. Two patients presented with two adjacent failing implants and

peri-implant hard and soft tissue defects, while one patient presented with one failing implant and adjacent edentulous ridge atrophy.

All surgeries were performed by a single surgeon (SP).

Written informed consent was obtained from the patients for the publication of this manuscript and its accompanying images.

Case Management

The dimensions of the defect and the maxillary tuberosity were evaluated using preoperative cone-beam computed tomography (CBCT). Four implants were retrieved using a counter-torque ratchet system. One implant was submerged subcrestally.

After thorough defect debridement, the CTBG was harvested (Figure 1). Incisions were made perpendicular to the bone, circumscribing a quadrangle as per the defect dimensions. A full-thickness buccal flap with mesial- and distal-realizing incisions was elevated. The mesial, distal, apical, and palatal bone cuts were made using piezosurgery. The palatal bone plate was left in place. Bone chisels were used to mobilize the CTBG, and a rongeur was used to harvest smaller pieces from the tuberosity to fill the gaps between the recipient bone and the tuberosity block graft. The wound edges were approximated and sutured.

In two patients (Figures 2–5), a crestal incision was placed with minimal flap elevation at the recipient site. The bony portion of the CTBG was inserted as an inlay graft. Using a rongeur, the tuberosity bone was shaped according to the defect and wedged between the bone borders of the defect. Gaps were filled using small tuberosity bone pieces. The graft was secured using a single screw or pin, and the tuberosity connective tissue was de-epithelialized to the section left exposed and sutured to the recipient area, providing additional graft stabilization.

In one patient (Figures 6 and 7), the CTBG was placed as an onlay graft after buccal flap elevation. The cortico-cancellous tuberosity bone plate was fixed buccally to augment the horizontal and vertical ridge dimensions.

Clinical Outcomes

The recipient and donor sites healed uneventfully. Further, the vertical and horizontal ridge dimensions were reestablished, and the amount of keratinized gingiva and vestibular depth was increased. In the cases involving reimplantation, implants could be placed in a favorable position with sufficient primary stability. The tissue appeared stable and healthy at 1–3 years of follow-up.

Discussion

The application of tuberosity bone blocks has previously resulted in favorable outcomes and minimal donor site morbidity.[3–6] Immediate dentoalveolar restoration, a technique for the treatment of compromised sockets, popularized the usage of tuberosity grafts.[7,8] The cortical portion of the graft provides structural support, while the cancellous part has osteogenic, osteoinductive, and osteoconductive properties.[9] Furthermore, the connective tissue attached to the bone in CTBG may be used to reconstruct the damaged buccal soft tissue.[10,11] This connective tissue also seals the socket and protects the graft when used for socket preservation/reconstruction after tooth and implant removal.[2,12,13] In the present study, the epithelium was retained on the exposed portion of the CTBG to provide greater stability. Interestingly, CTBG expanded in one case, a phenomenon previously described for inlay grafts.[14,15]

An added benefit of this technique is its cost-effectiveness due to the use of only autologous tissue; however, that is also the primary limitation of the procedure, as candidates must have sufficient and accessible tuberosity tissue. When these requirements are satisfied, CTBG can be used as an inlay or onlay graft for the reconstruction of multiple ridge defects in a single surgical procedure.

Conclusion

CTBG is a feasible, cost-effective technique for reconstruction of soft and hard tissue immediately after the removal of one or more failed implants.

Summary

Why is this case new information?	• Large hard and soft tissue defects are reconstructed immediately after the removal of one or more failed implants • Keratinized gingival width and vestibular depth are improved
What is the key for successful management of these cases?	• Cone-beam computed tomography for tuberosity and defect evaluation • Careful handling of tuberosity bone • Proper graft shaping • Composite tuberosity graft fixation • Fixed provisional prosthesis for grafted area protection
What are the key limitations to the success of these cases?	• Unavailability of tuberosity • A technique-sensitive approach

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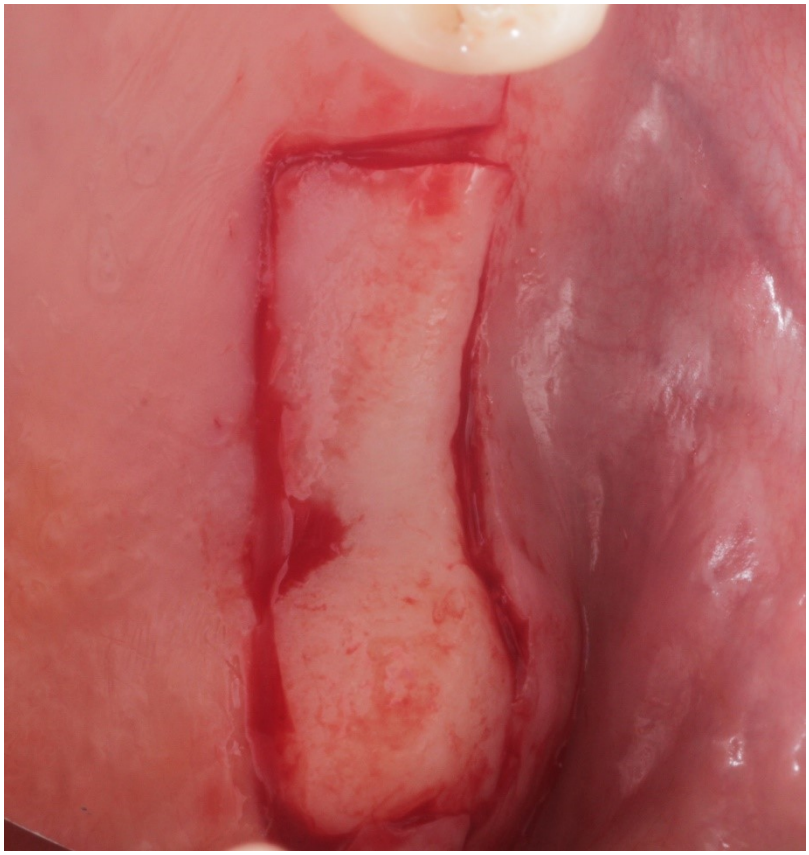
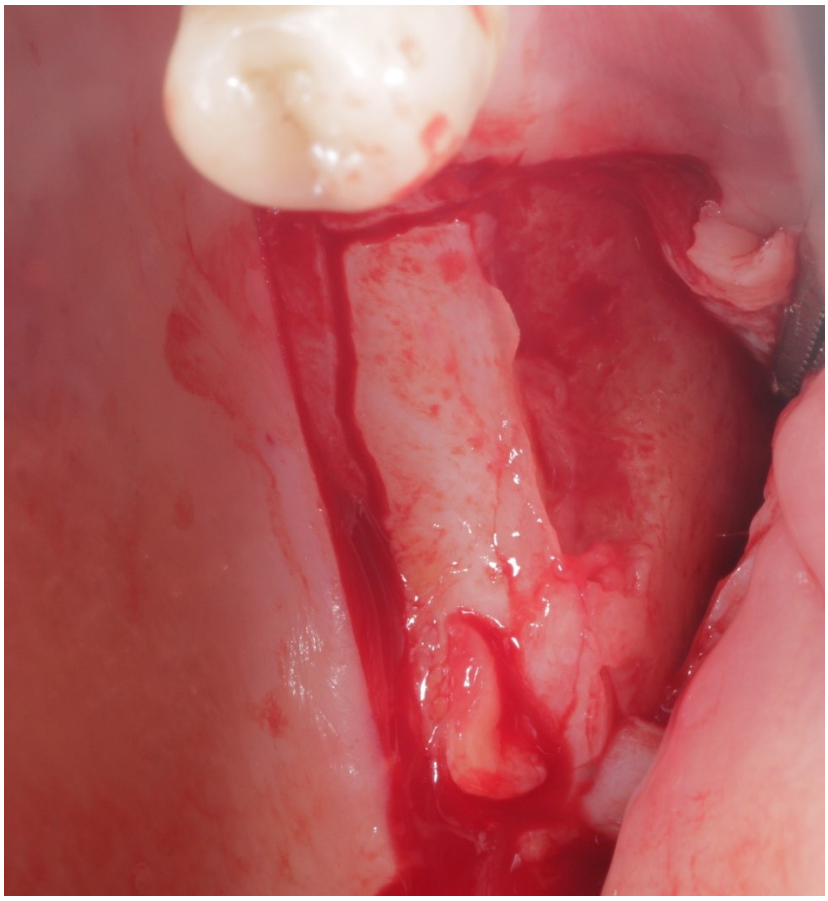
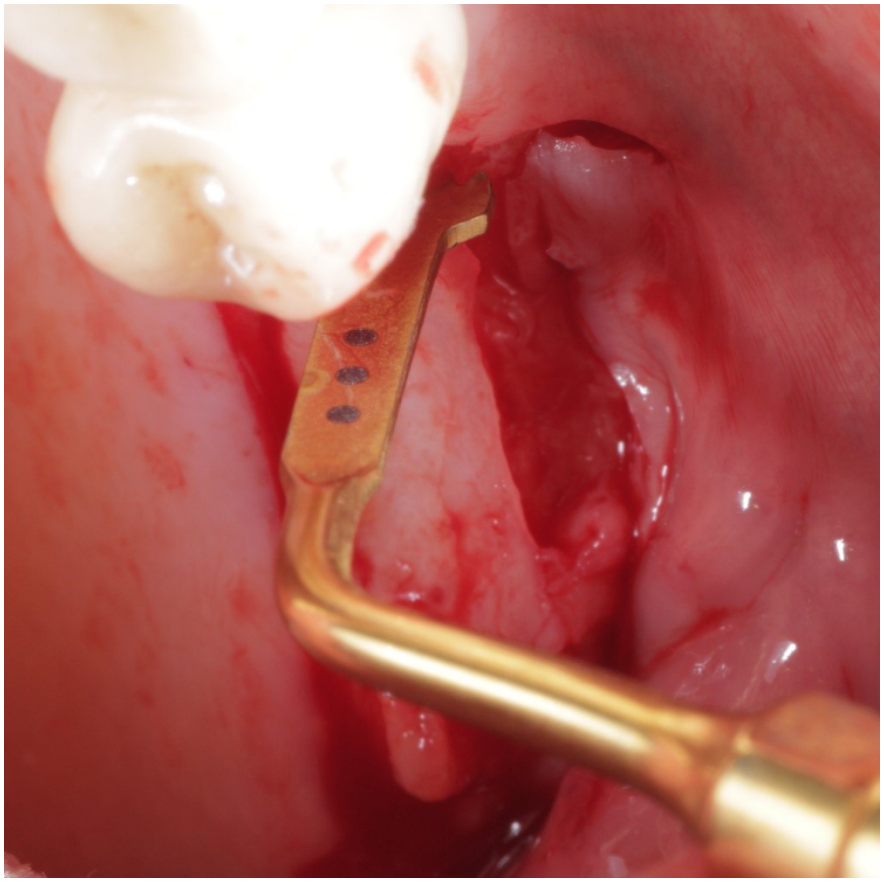
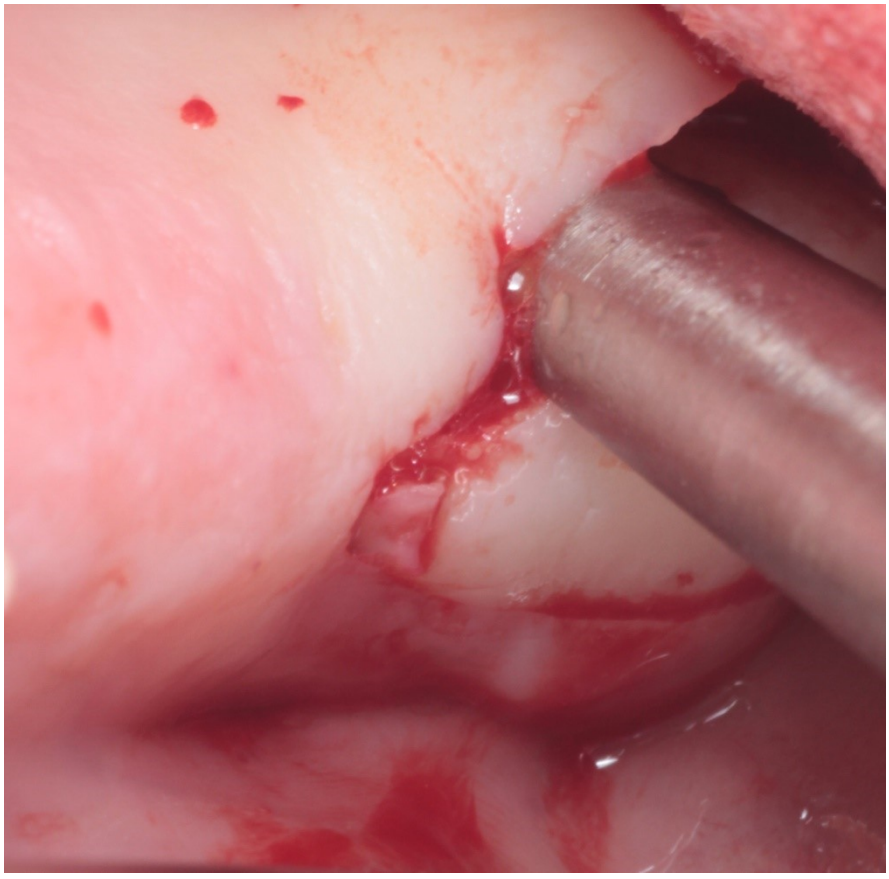
Figure legends









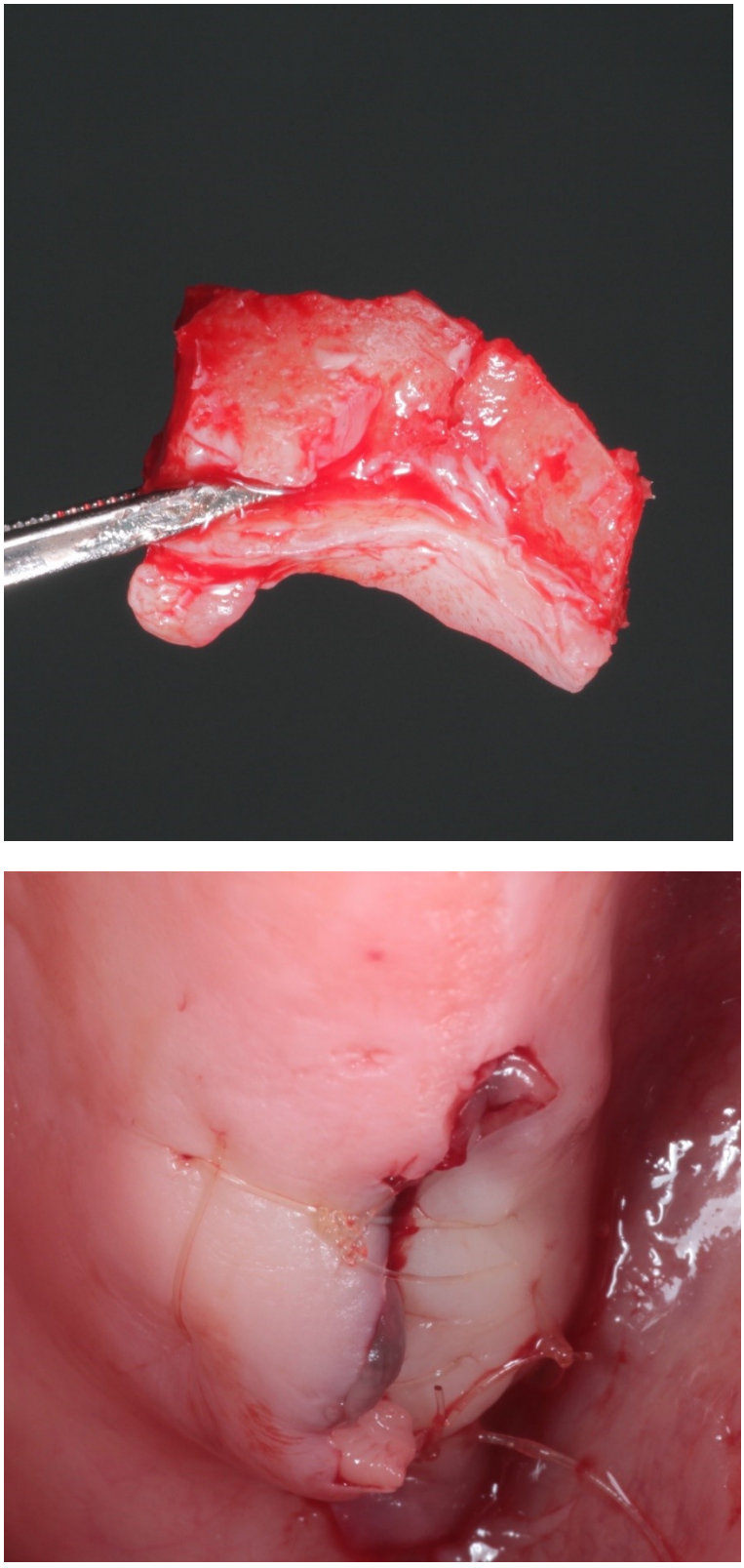
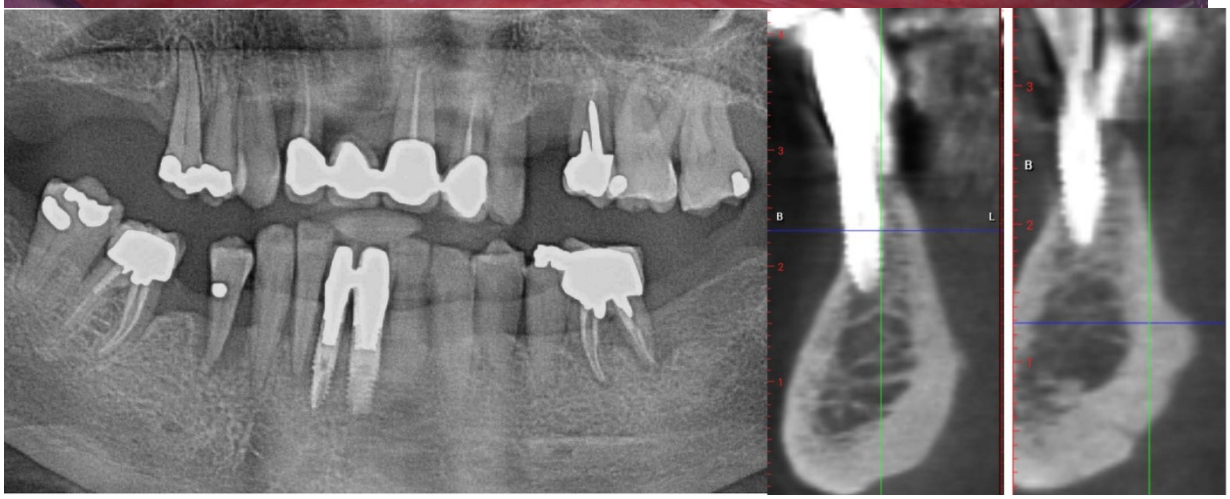
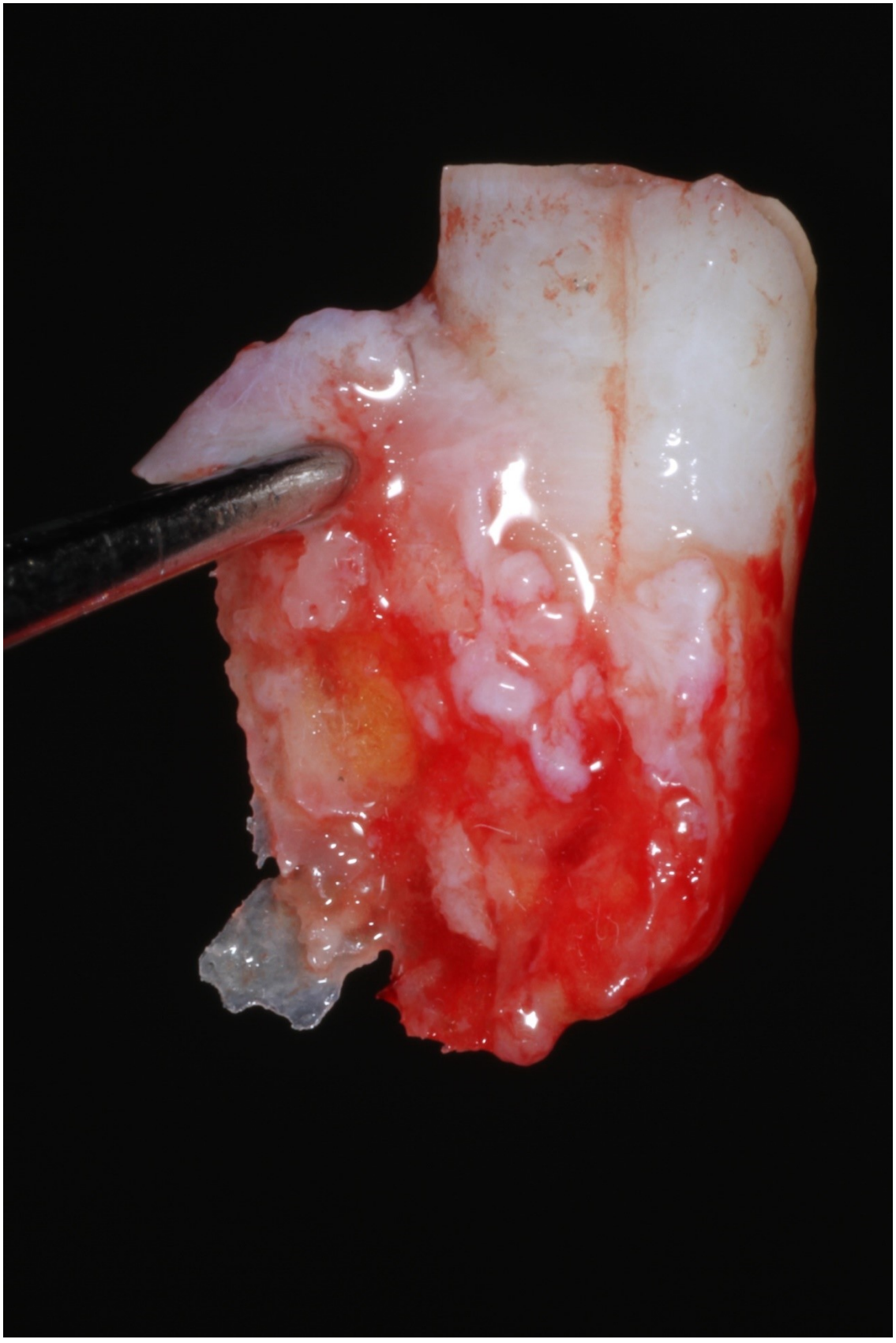
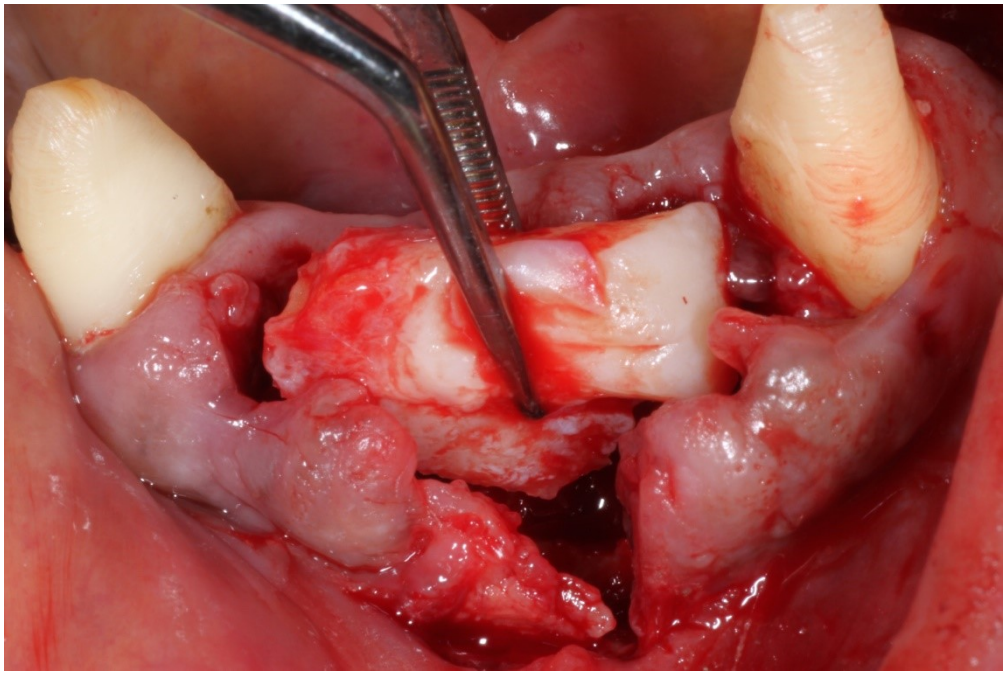


FIGURE 1 Composite tuberosity graft (CTBG) harvesting. **(1a)** Incisions placed at the bone. **(1b)** Elevation of full-thickness buccal flap. **(1c)** Bone cuts performed using a piezoelectric device. **(1d)** CTBG harvested in one piece using bone chisels. **(1e)** The harvested CTBG. **(1f)** Wound closure.







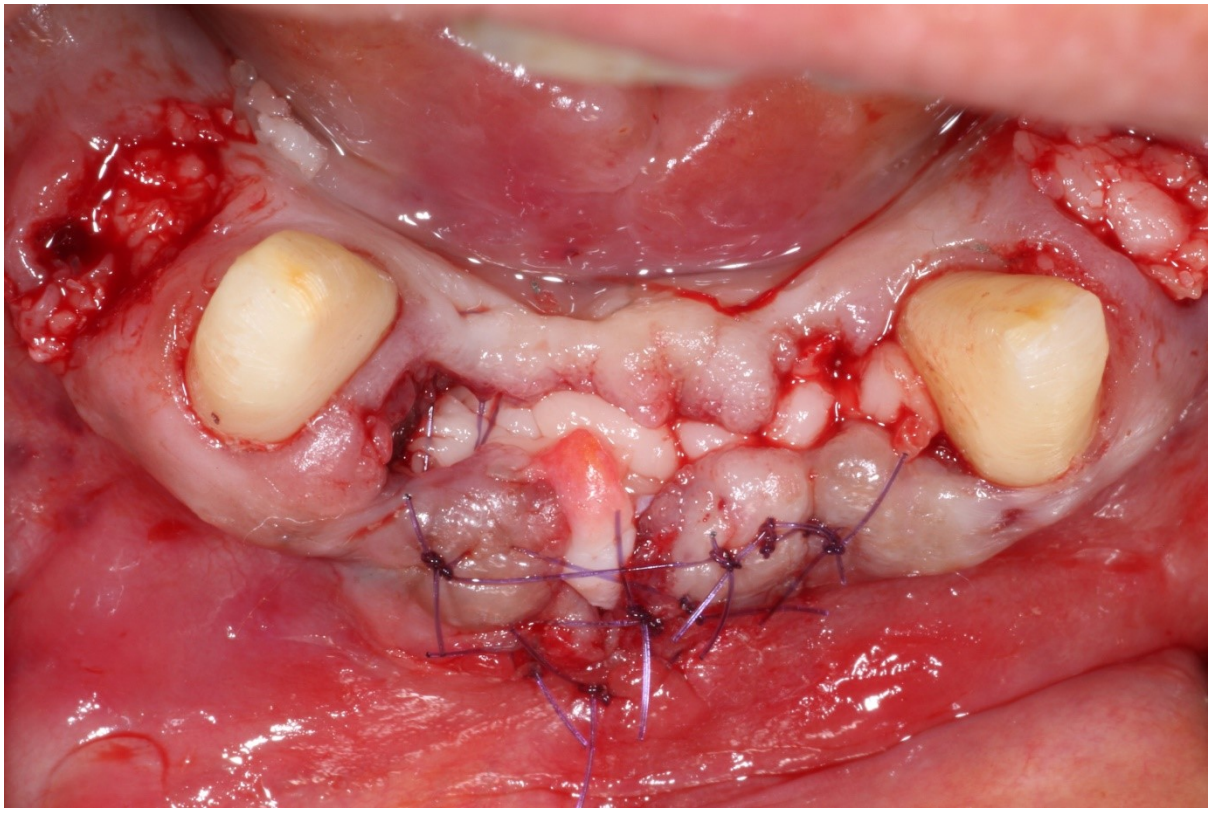
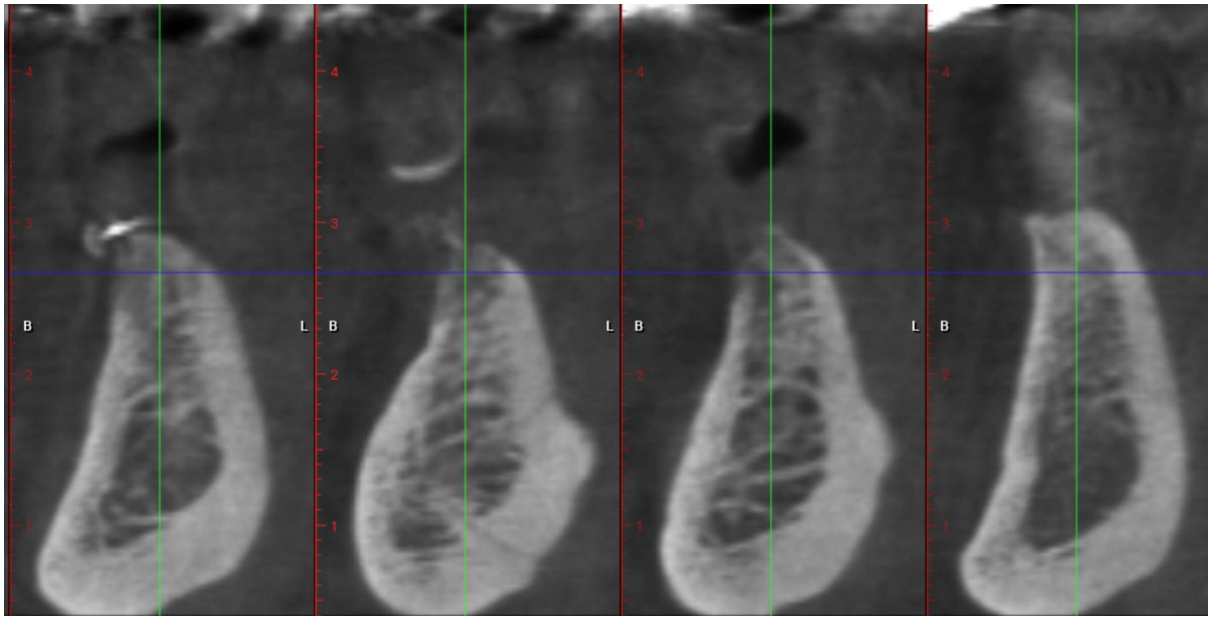
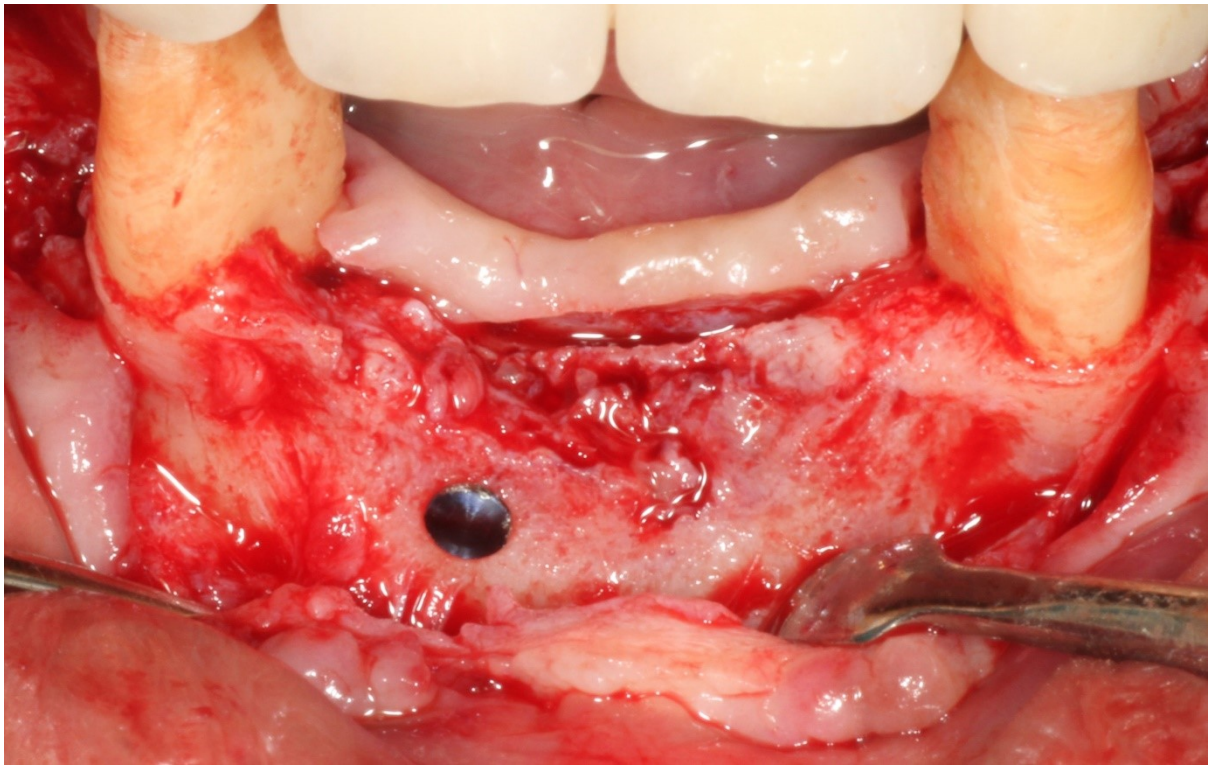
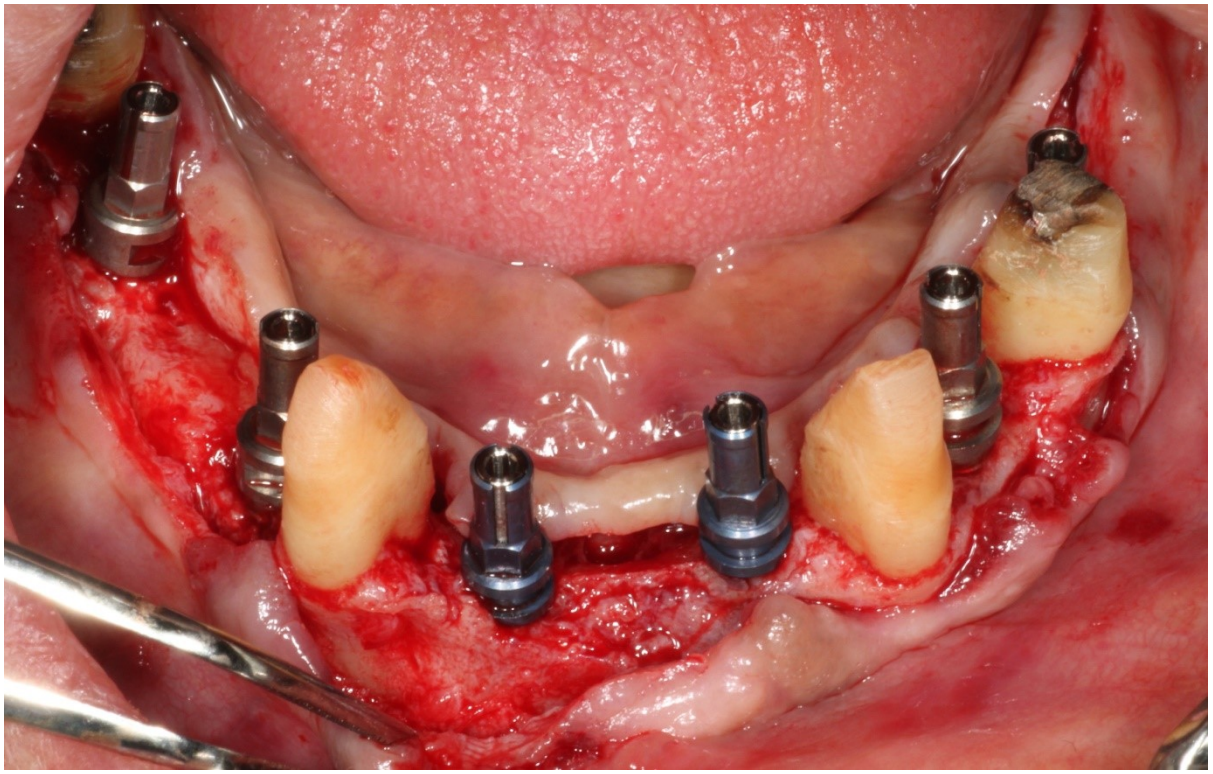


FIGURE 2 Patient 1. **(2a)** Failing adjacent central incisor implants with soft tissue defect. **(2b)** Initial radiograph and cone-beam computed tomography (CBCT) scan of failing implants. **(2c)** Composite tuberosity graft (CTBG) harvested. **(2d)** Insertion of CTBG into defect after removal of implant fixtures and lateral incisors. (**2e)** Wound closure. (**2f)** Ridge appearance 4 months after the surgery.







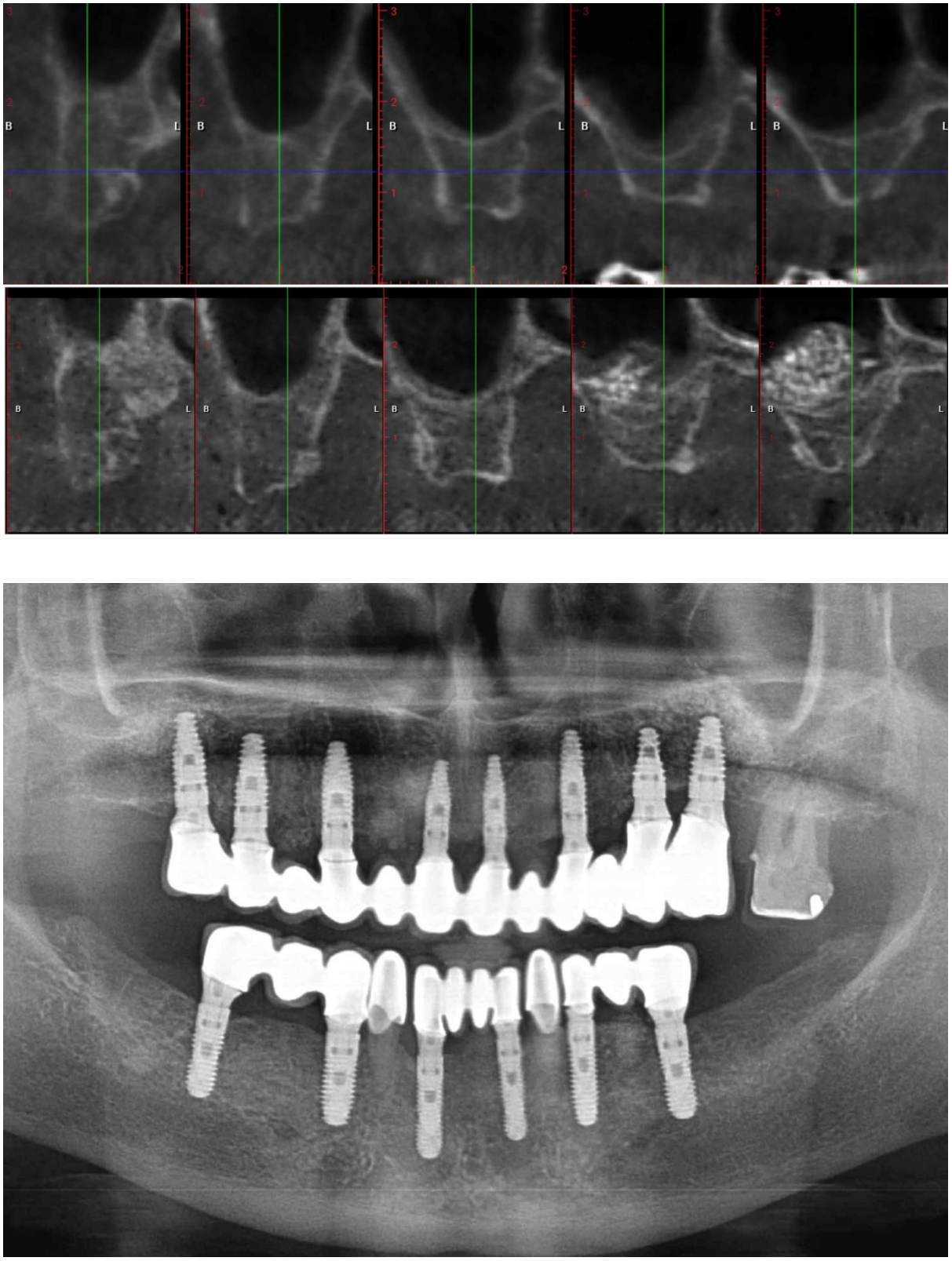
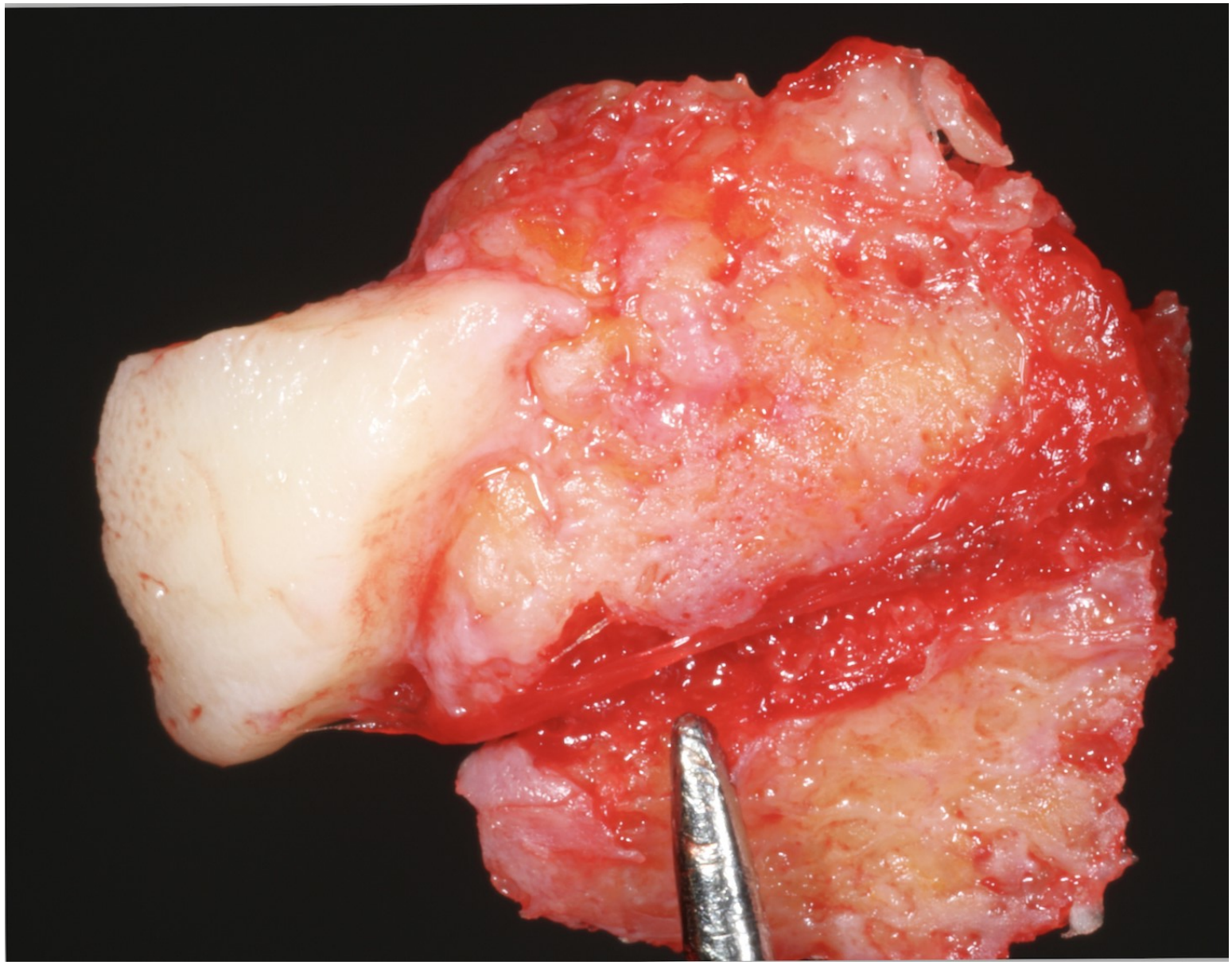


FIGURE 3 Patient 1. **(3a)** Cone-beam computed tomography (CBCT) scan 4 months after ridge reconstruction. **(3b)** Hard tissue at re-entry showing defect resolution. **(3c)** Implant placement. (**3d)** 2-year follow-up. **(3e)** Radiograph taken 2 years after final prosthesis delivery. **(3f)** CBCT scan of tuberosity before and 8 months after CTBG harvesting. Notice complete recovery of hard tissue.



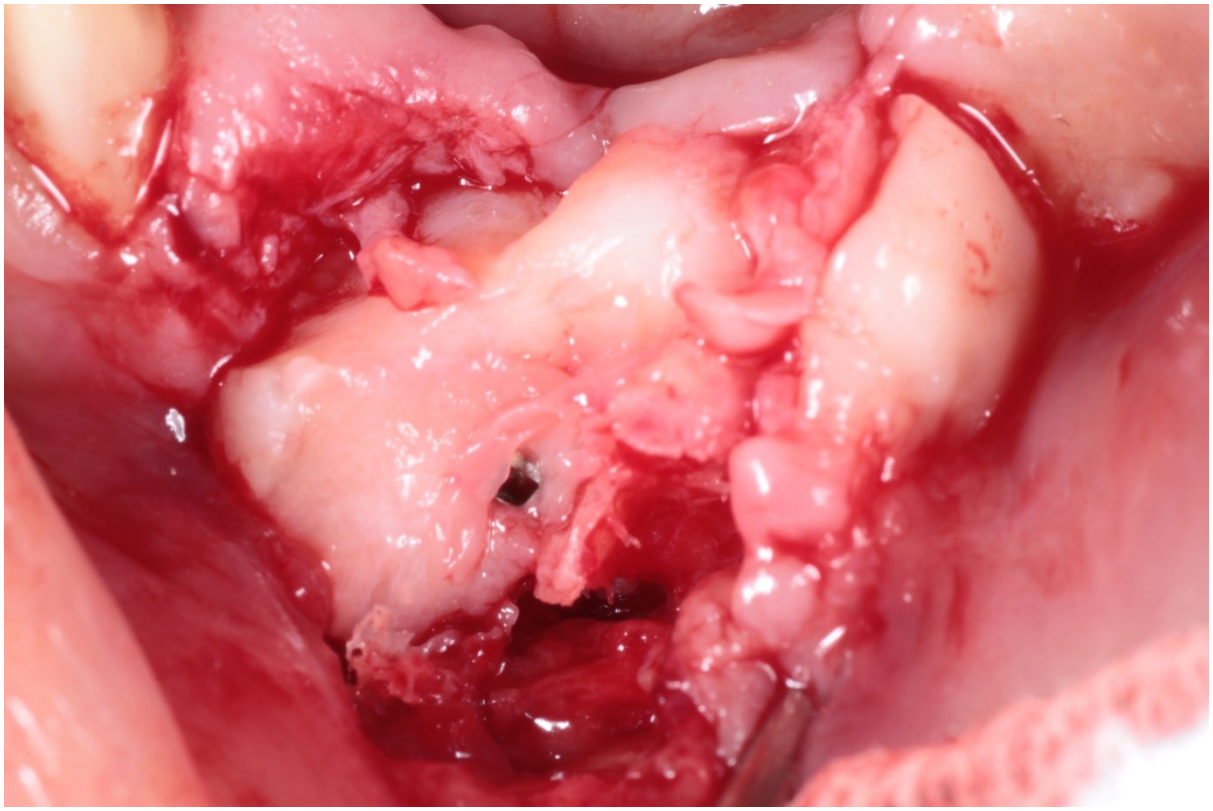


FIGURE 4 Patient 2. **(4a)** Initial condition showing failing implant with soft tissue defect. **(4b)** Initial radiograph and cone-beam computed tomography (CBCT) scan. **(4c)** Adjacent edentulous ridge atrophy. **(4d)** Composite tuberosity graft (CTBG) harvested. **(4e)** After submerging of implant, CTBG was inserted and fixed with one screw.

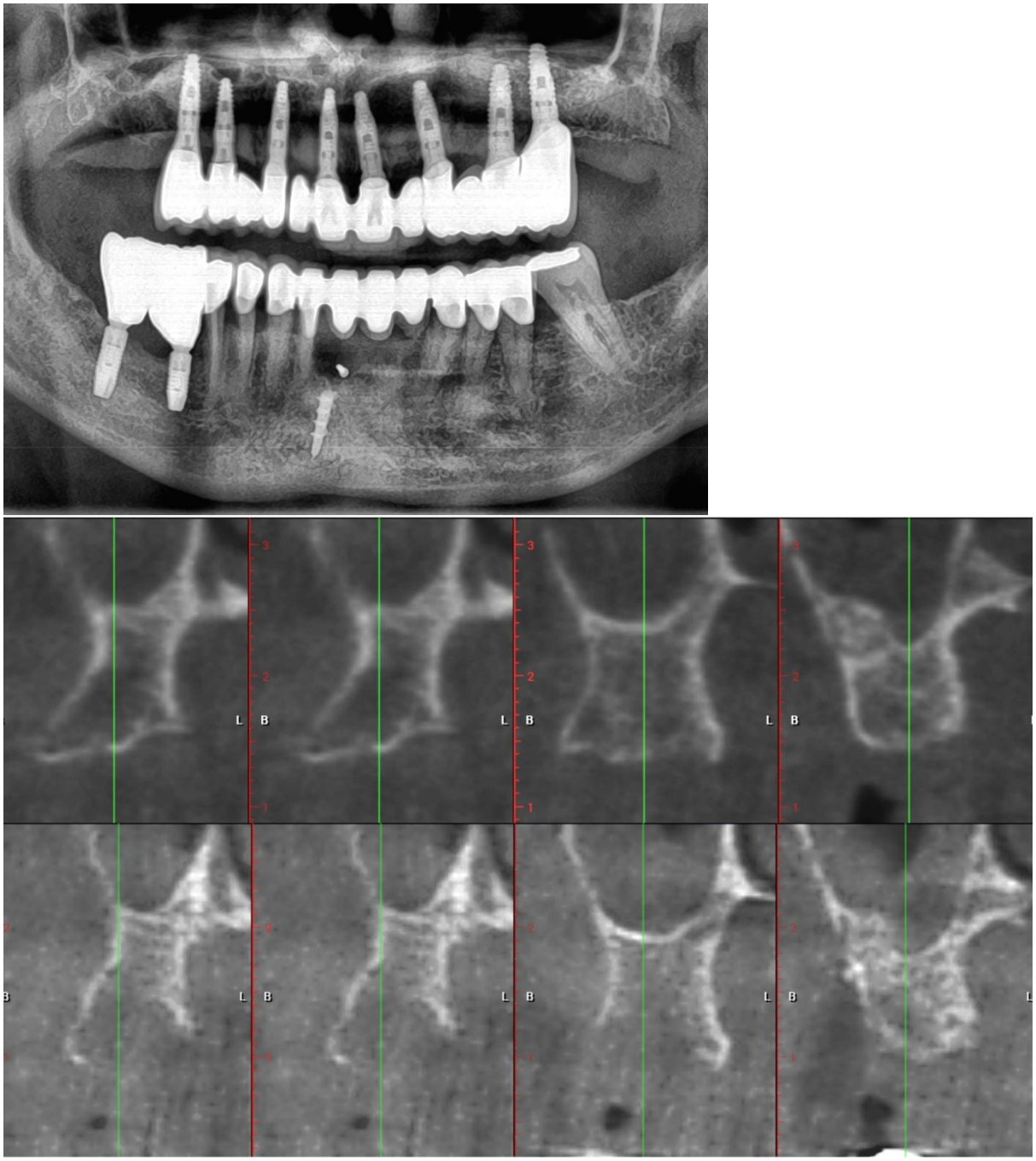
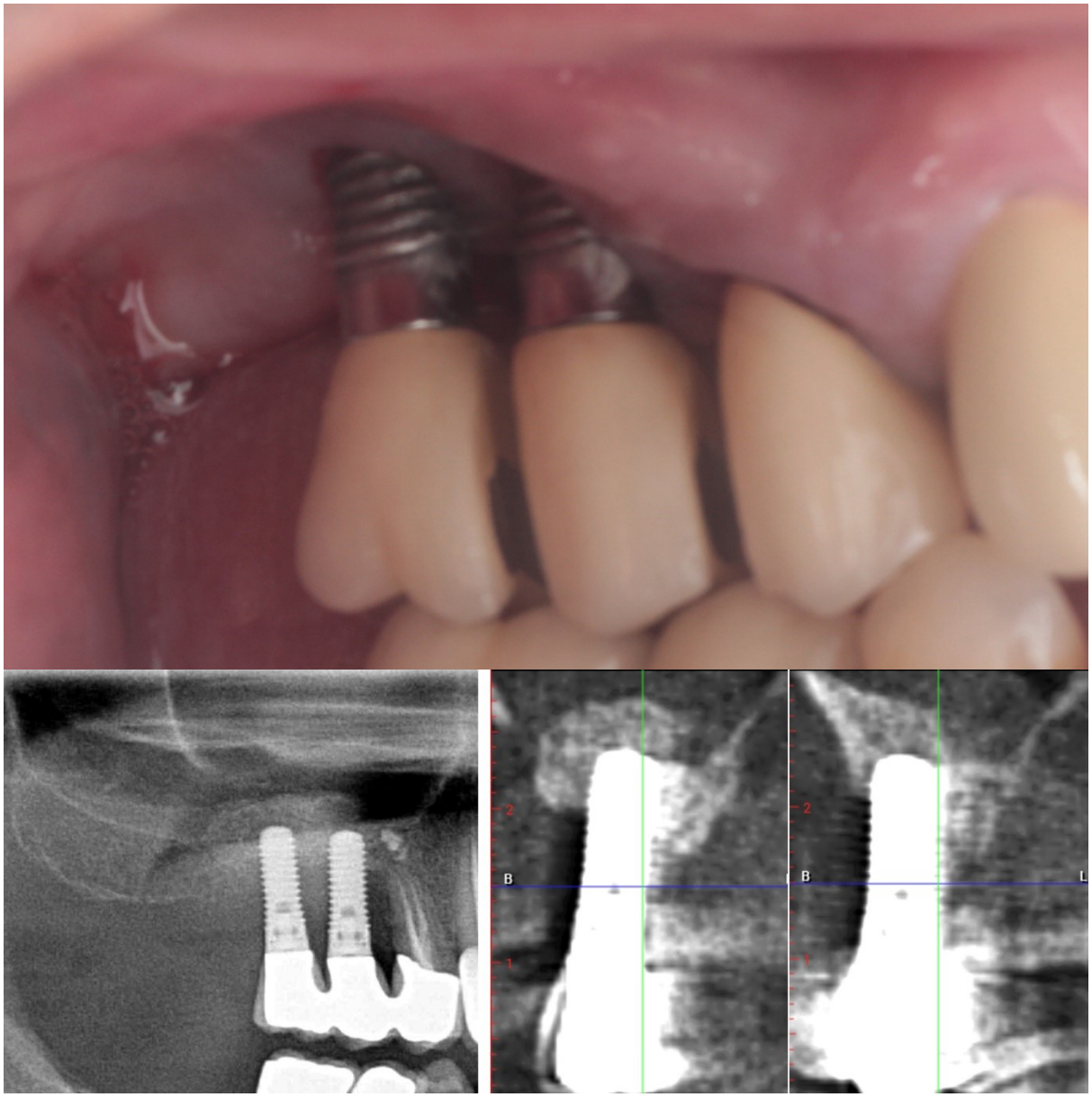
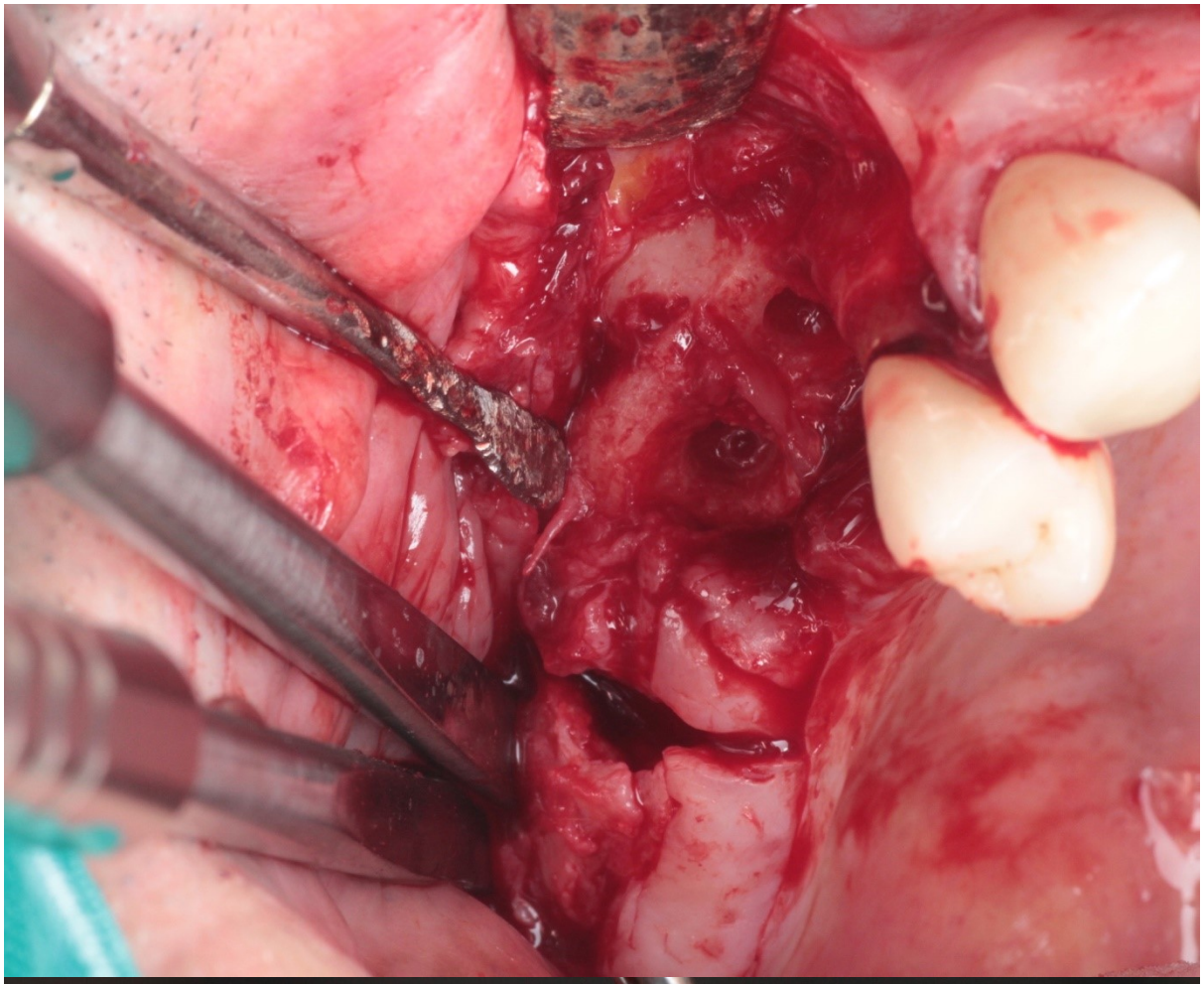
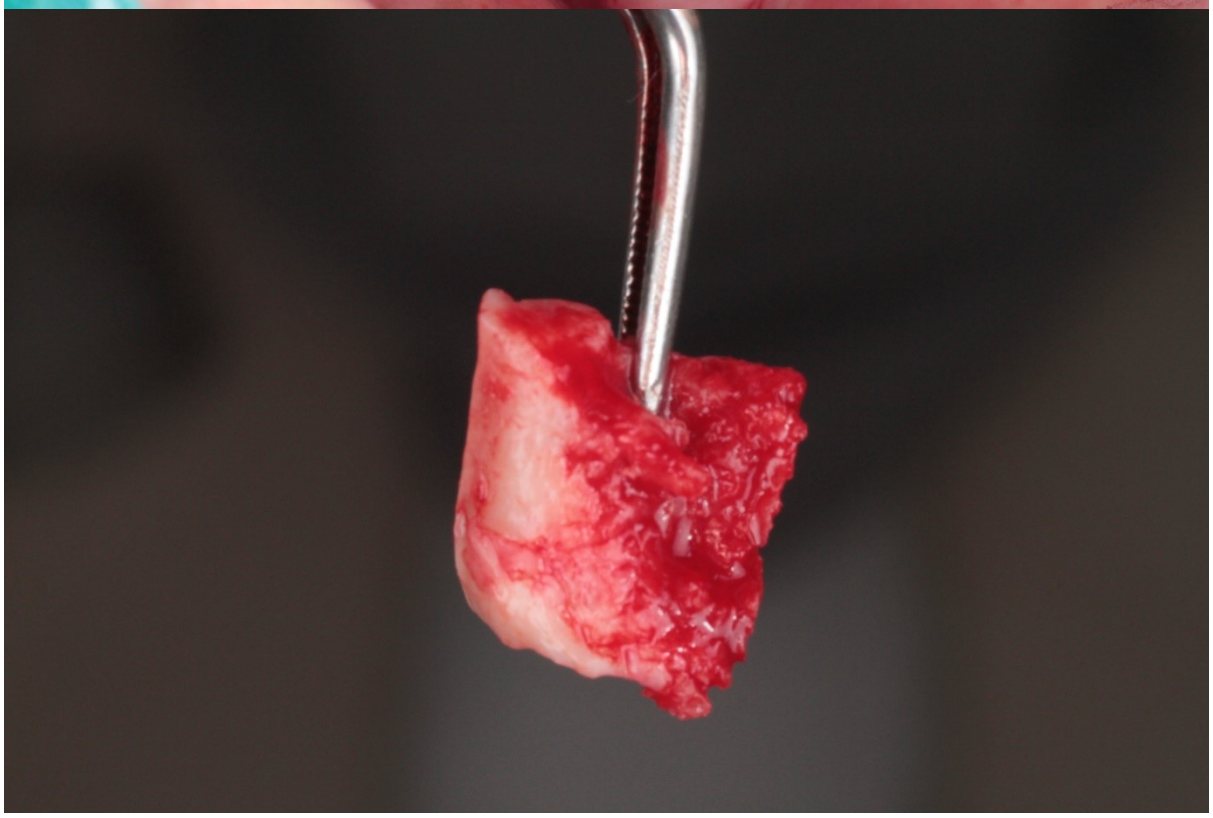
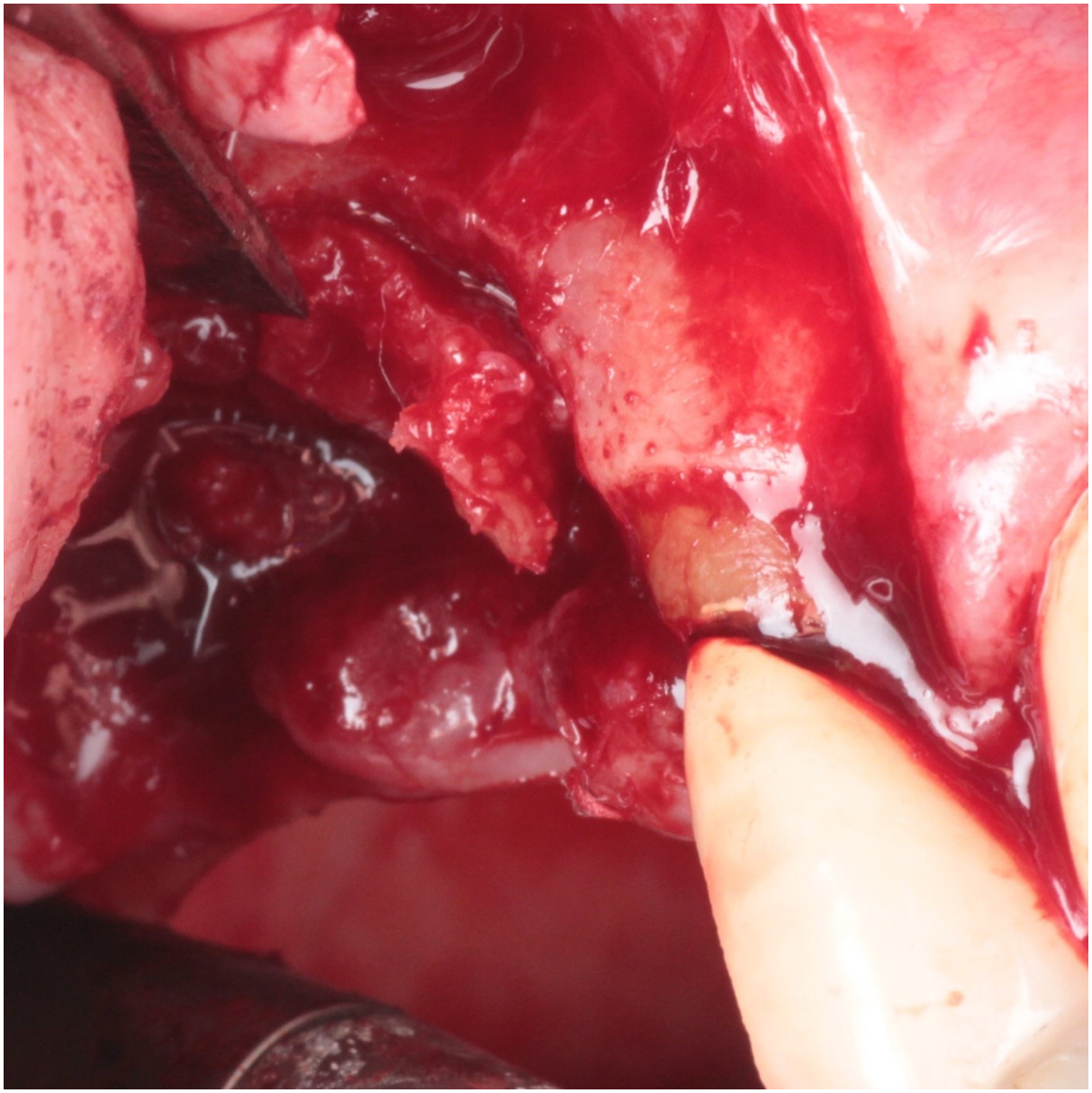


FIGURE 5 Patient 2. **(5a)** Composite tuberosity graft (CTBG) sutured at recipient site. **(5b)** Ridge expansion in augmented area after 4 months. **(5c)** Temporary bridge. **(5d)** Clinical appearance at 3-year follow-up. **(5e)** Radiograph at 3-year follow-up. **(5f)** Tuberosity area before and 4 months after tuberosity bone harvesting.









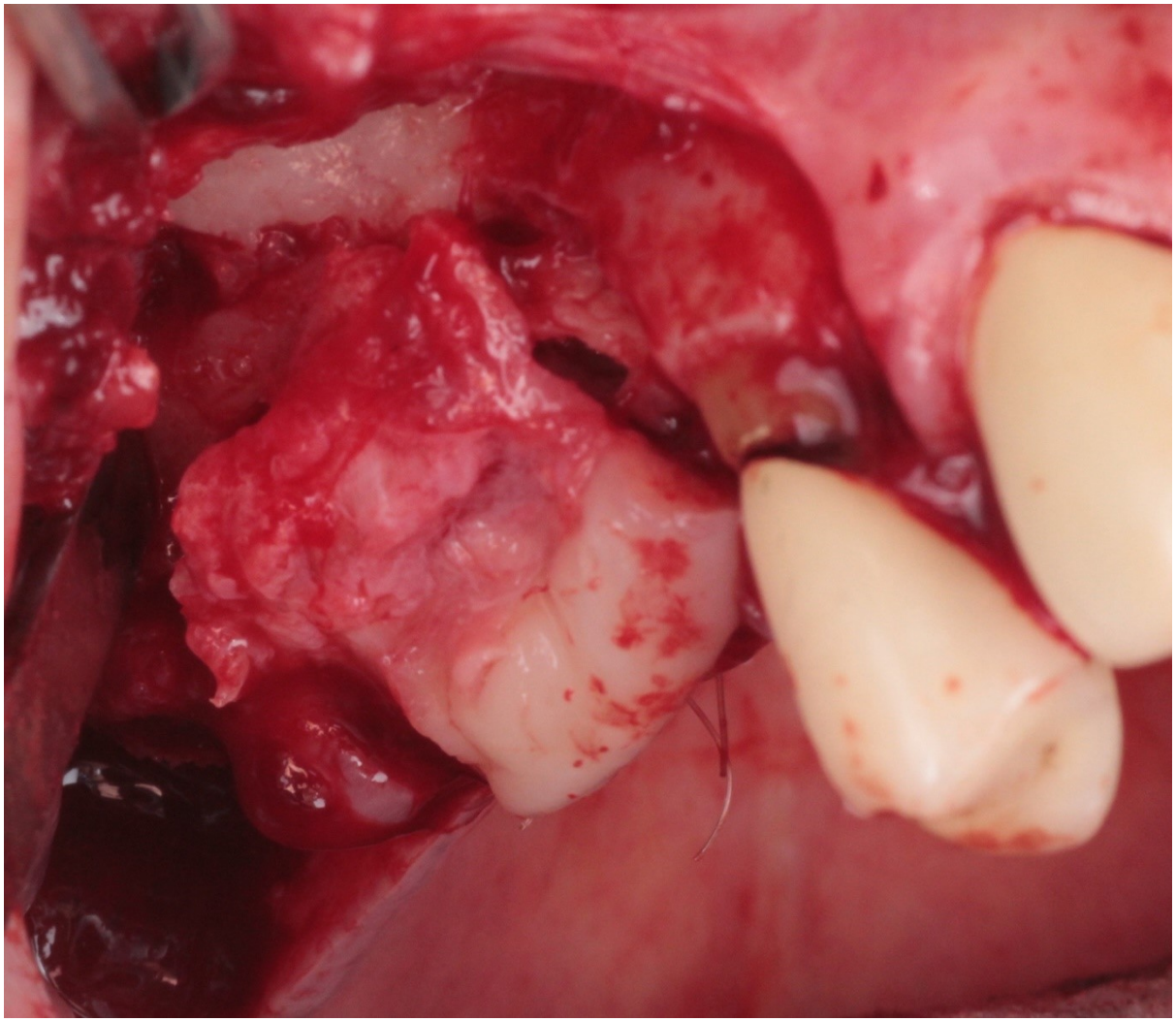
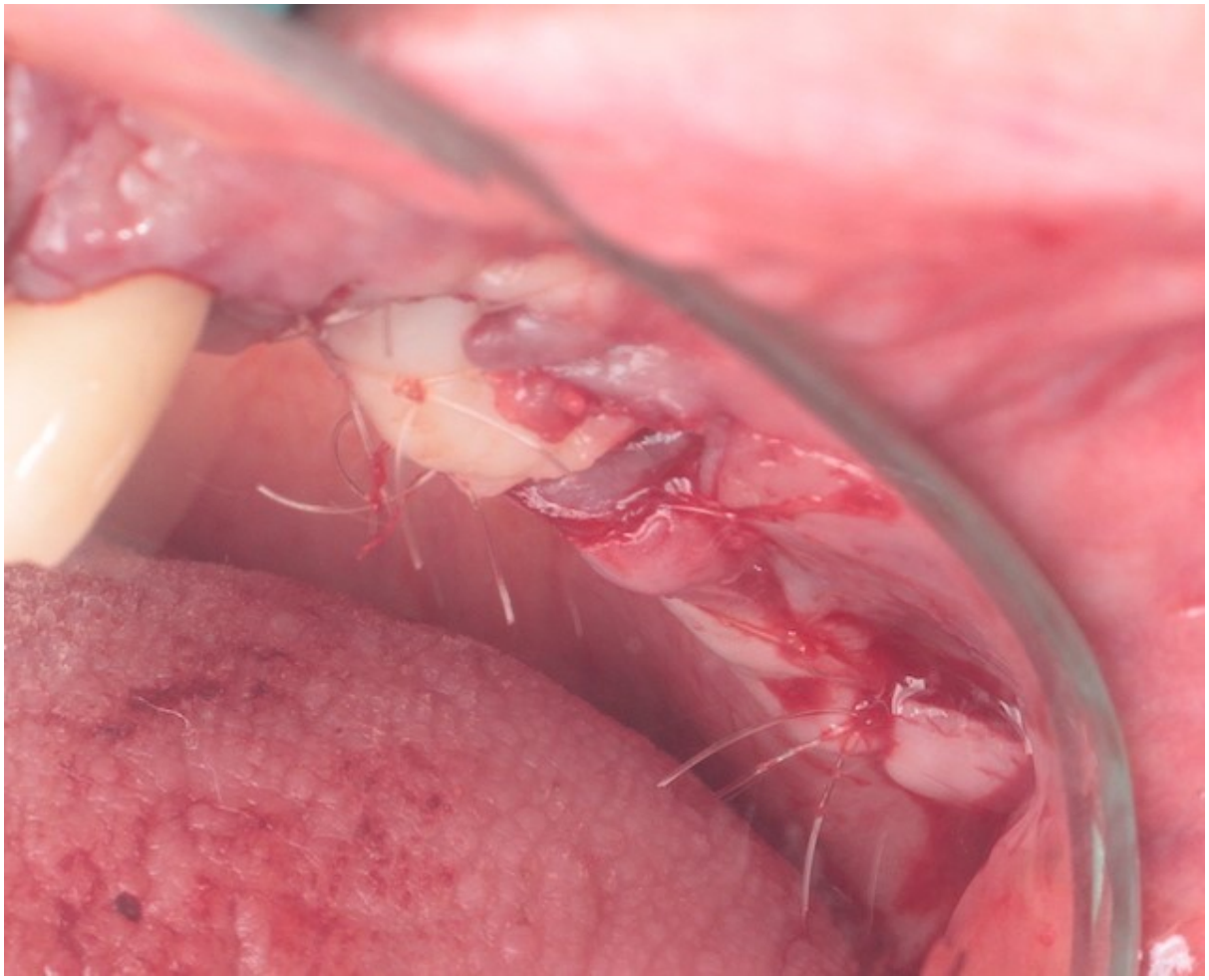
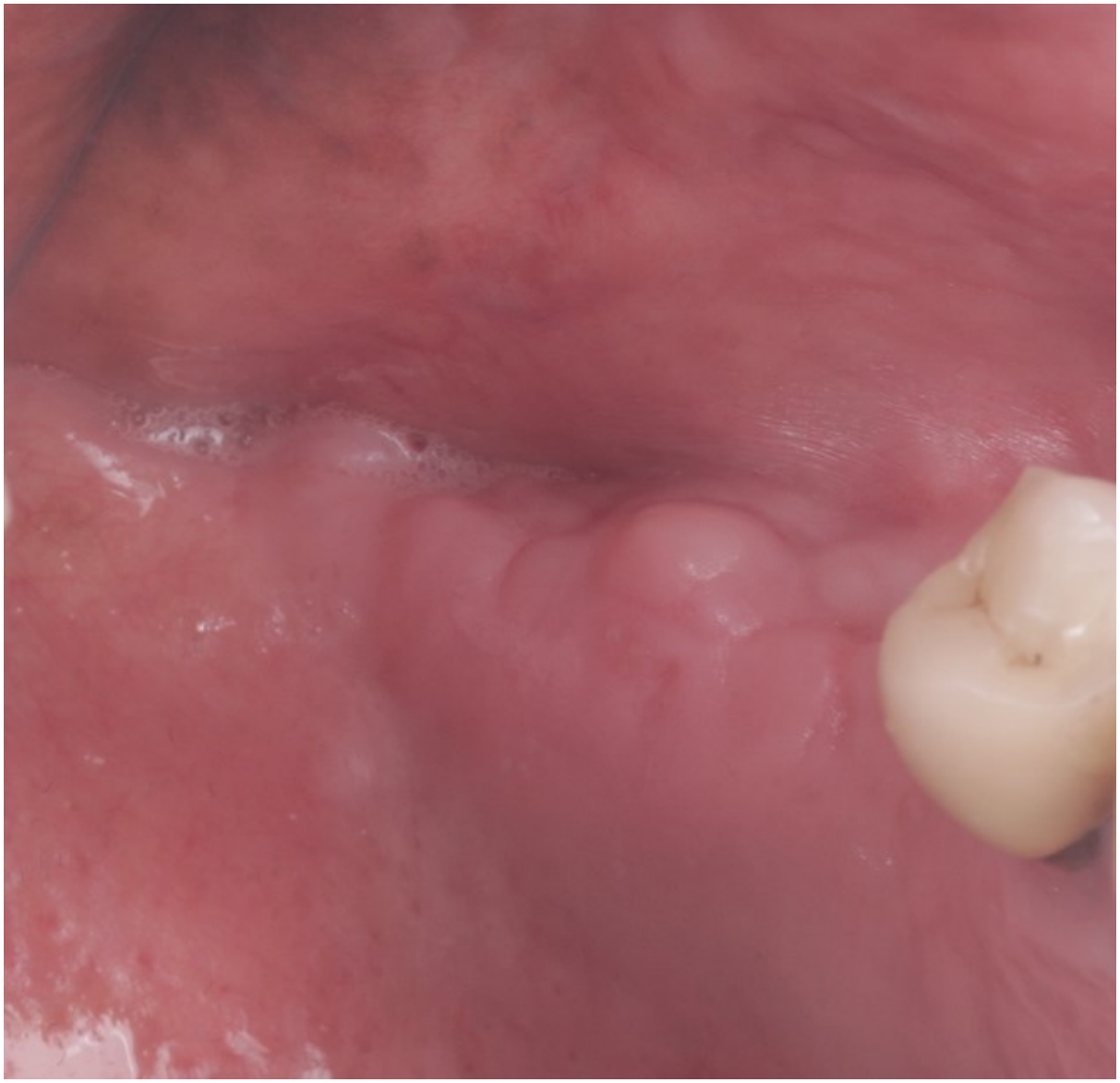
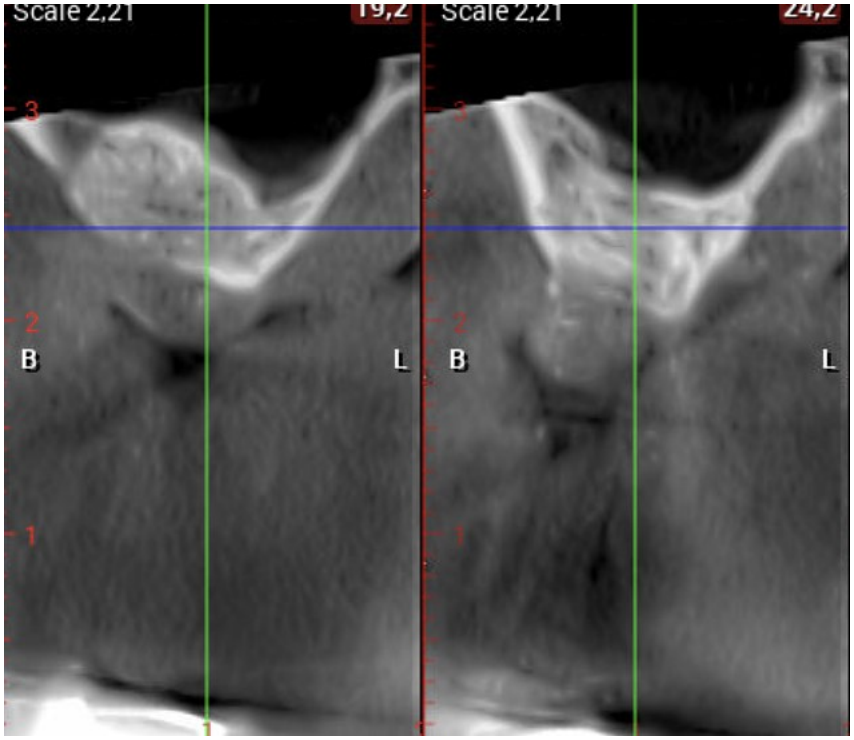
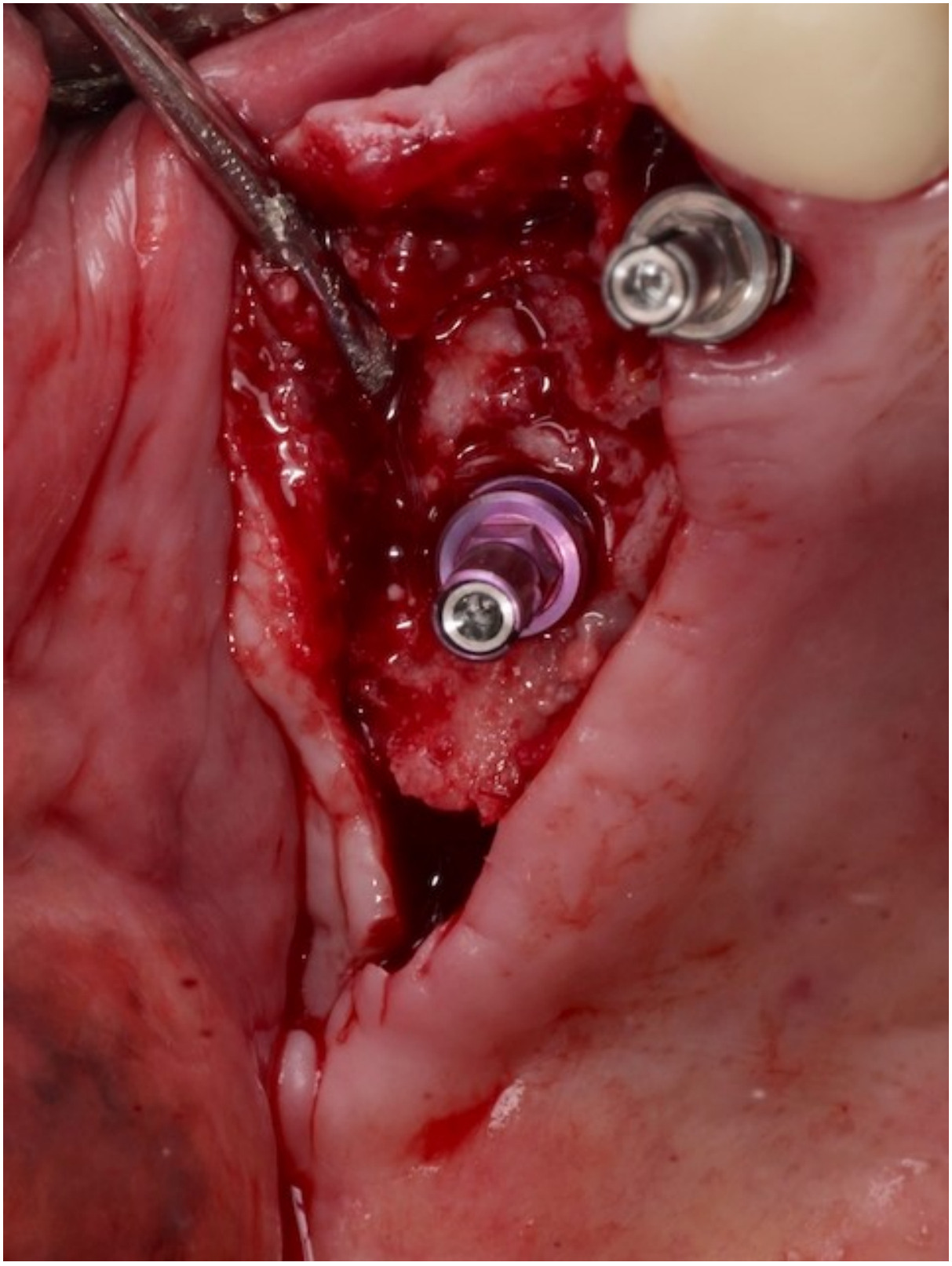


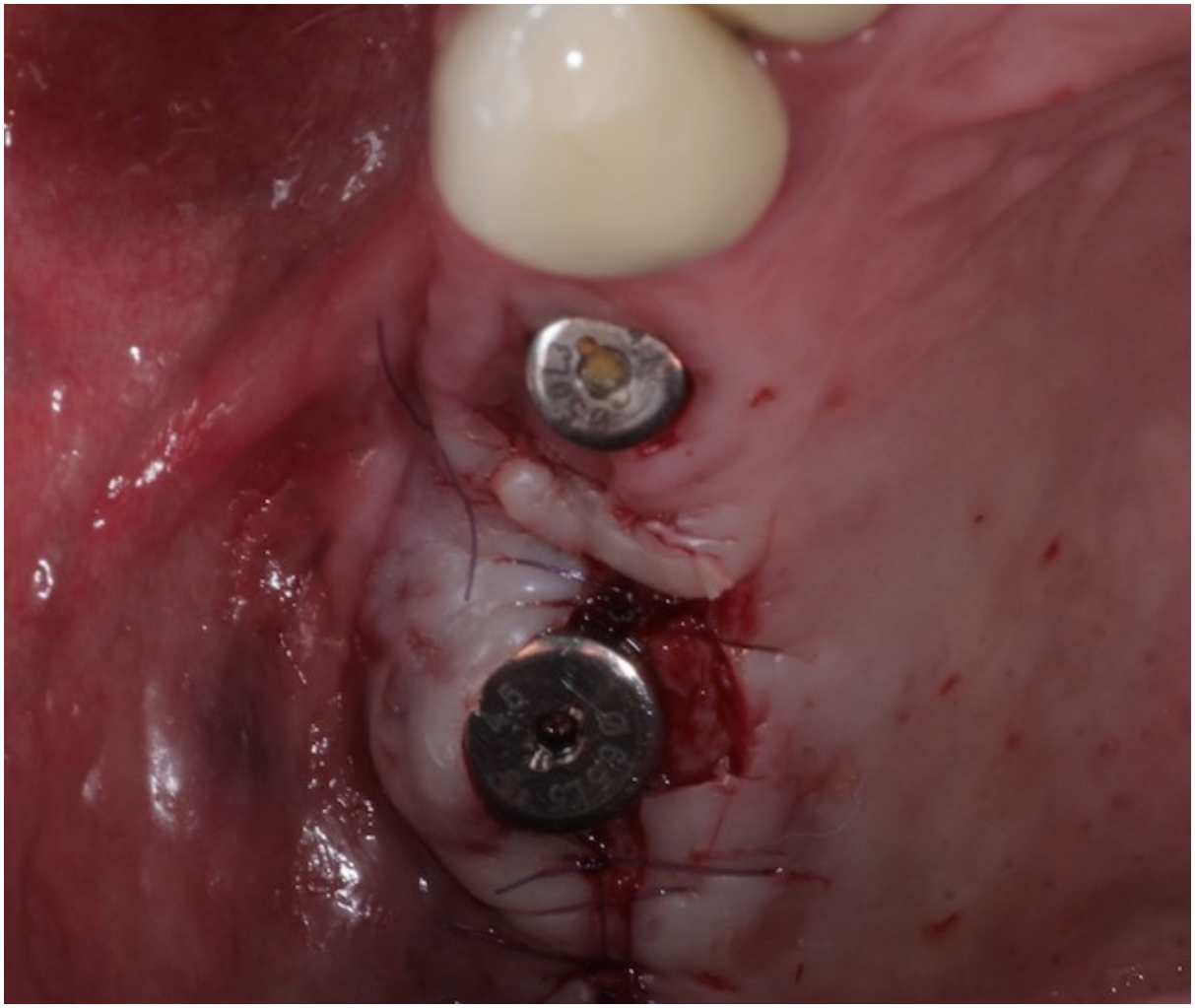
FIGURE 6 Patient 3. **(6a)** Initial clinical situation showing failing implants with hard and soft tissue defects. **(6b)** Initial radiograph and cone-beam computed tomography (CBCT) of failing implants. **(6c)** Condition after implant removal. **(6d)** Composite tuberosity graft (CTBG) harvested. **(6e)** Defect filled with tuberosity bone pieces. **(6f)** CTBG fitted to augment ridge vertically and horizontally.











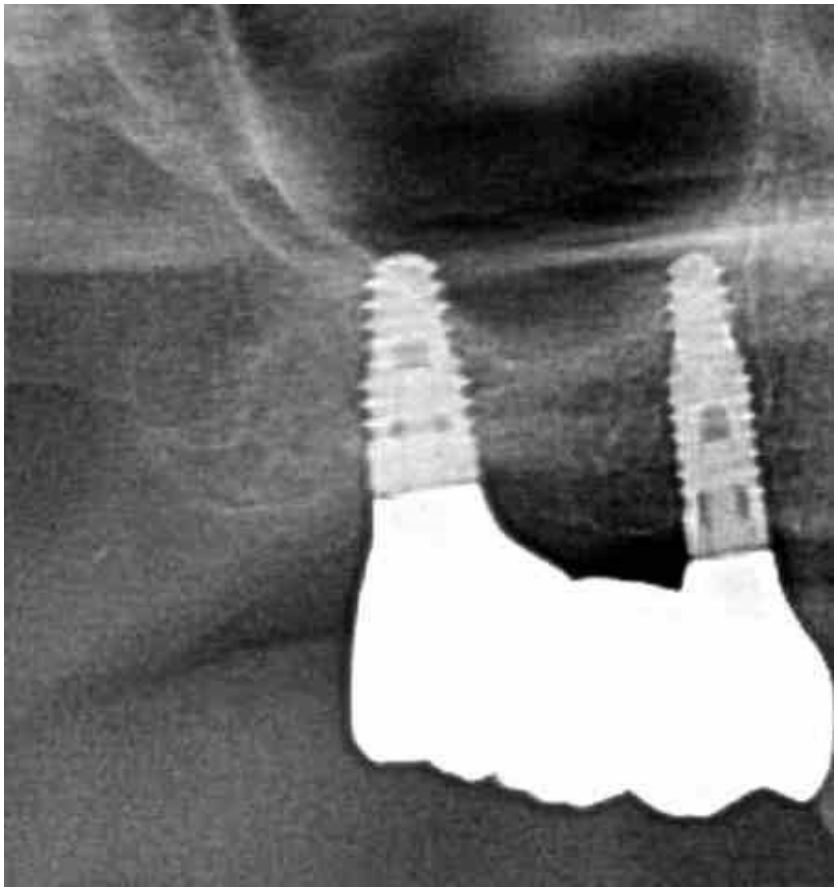


FIGURE 7 Patient 3. **(7a)** Wound closure, with epithelium left exposed. **(7b)** Condition after 4 weeks. **(7c)** Cone-beam computed tomography (CBCT) scan 4 months after ridge augmentation. **(7d)** Implant placement 3 months after initial surgery. **(7e)** Implant uncovering procedure. **(7f)** Definitive prosthesis. **(7g)** Radiograph after treatment completion.