

How to optimize aesthetics and function in the partially edentulous and atrophic anterior maxilla (the aesthetic zone) with reconstruction procedures and implants





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Loma Linda University
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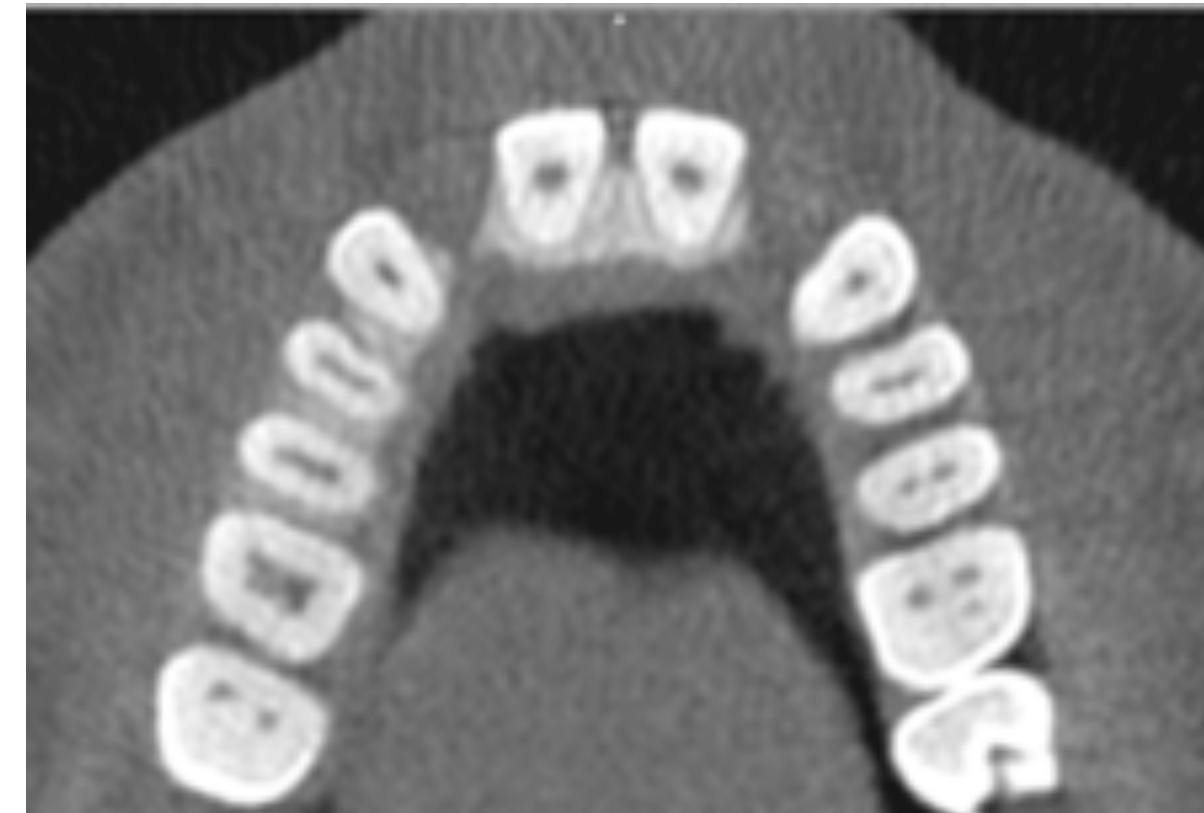


Lecture Outline

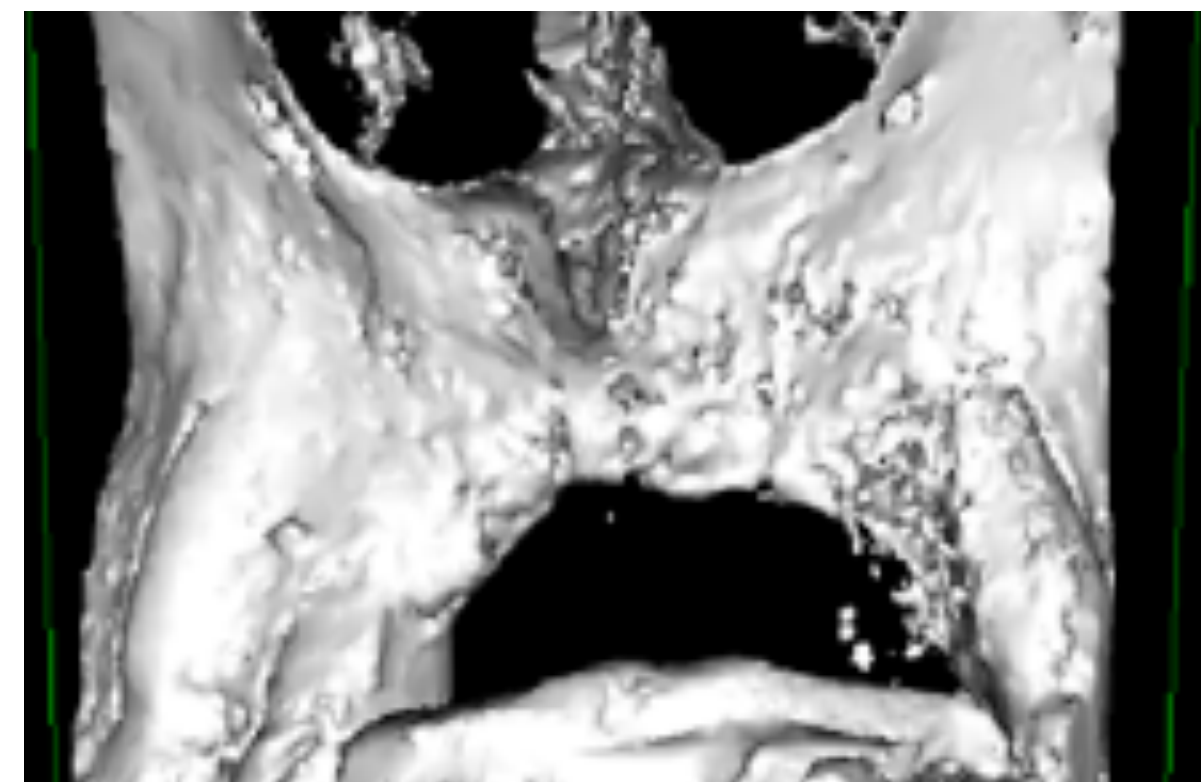
-  Introduction and potential problems in the treatment of the partially edentulous and atrophic anterior maxilla
-  The concept of P.G.R. (Prosthetically Guided Regeneration)
-  Ridge and soft tissue augmentation materials and procedures (GBR and bone grafts)
-  Personal data and literature review

Scenarios - The Esthetic Area

● Horizontal Defects



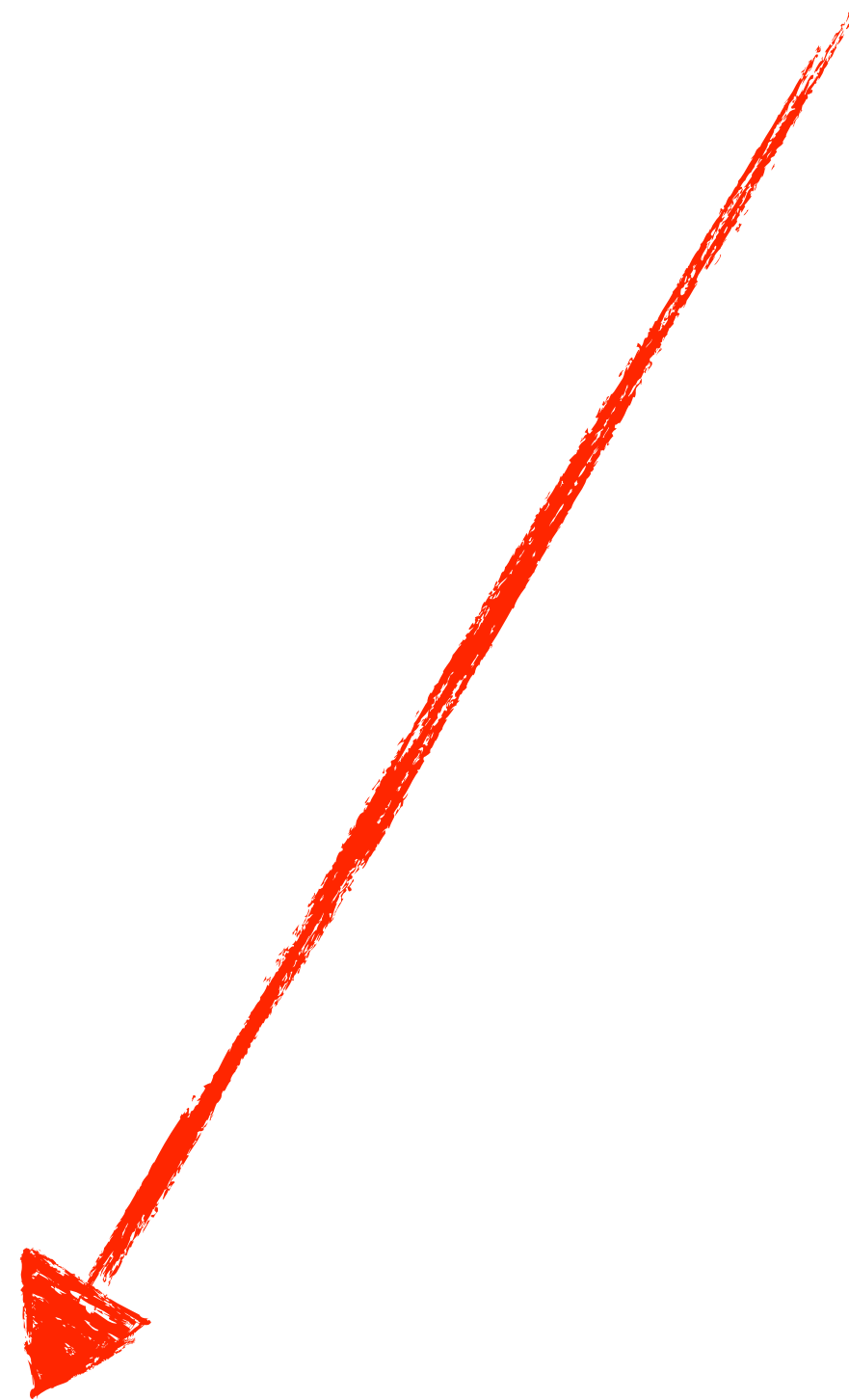
● Vertical Defects



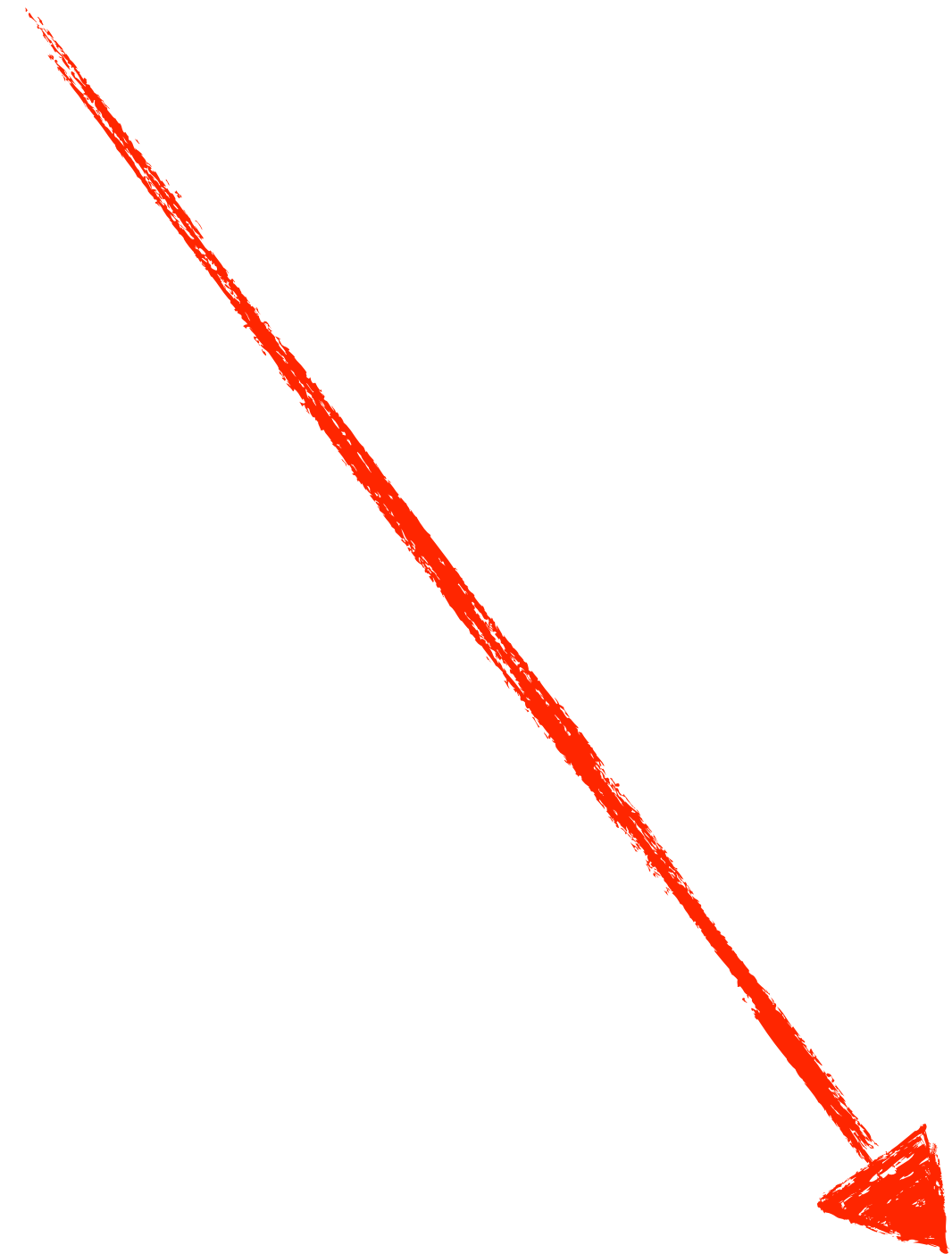
● Combination Defects



BONE / SOFT TISSUE DEFECTS



● **Implants with reduced dimensions**



● **Prosthetically Guided Regeneration**

Can we solve any problem with narrow/short implants???

▶ **NO** if residual bone volume is insufficient to host even short/narrow implants

▶ **NO** if patient does not accept esthetic compromises (longer teeth, pink porcelain, et cetera)

The partially edentulous anterior maxilla (the esthetic zone) is a challenging area in implant dentistry, in particular in young patients, gummy smilers, or whenever esthetic expectations are high, if rational protocols are not followed.



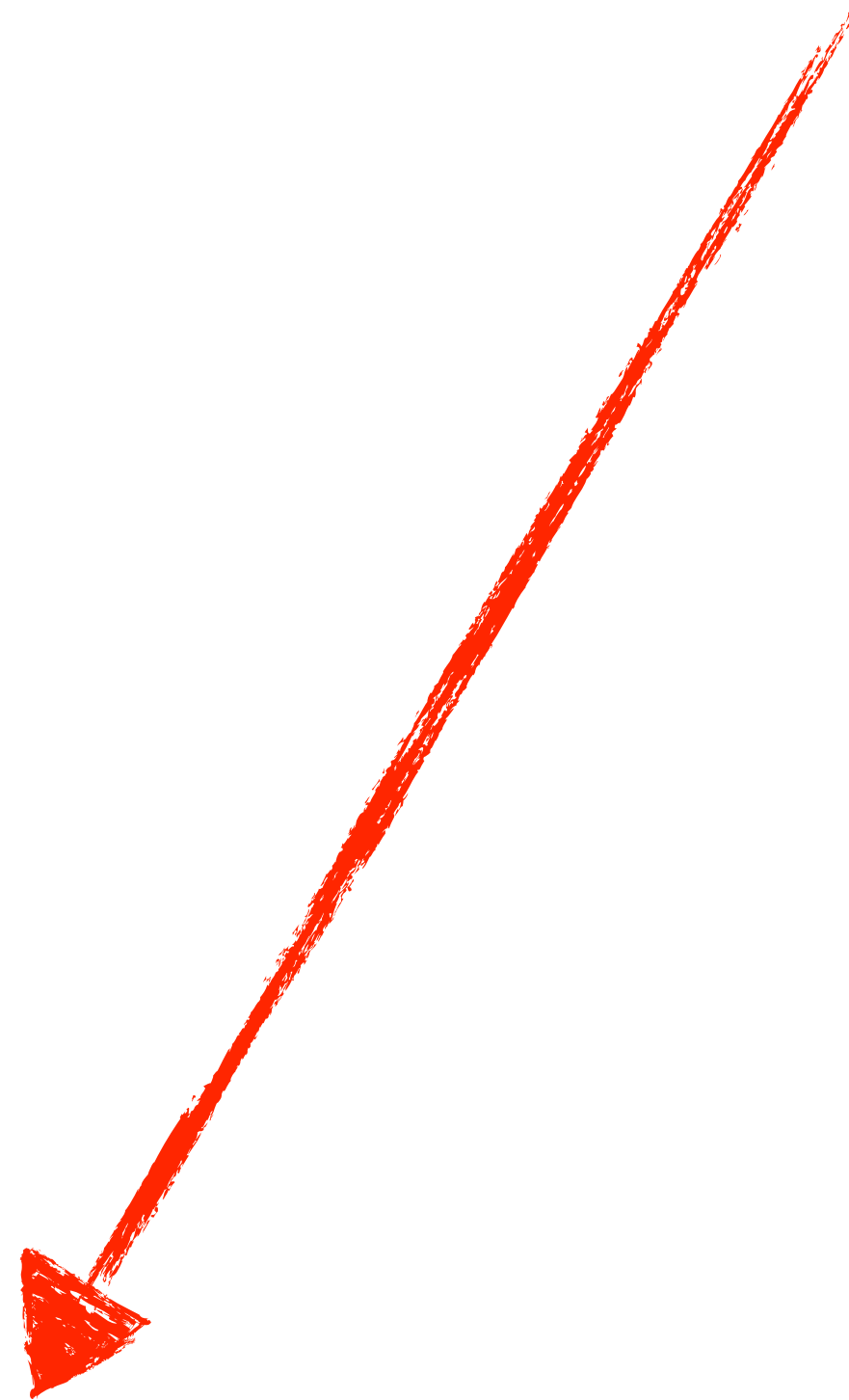


**Such compromises can
be hardly accepted by
patients !!!!!**

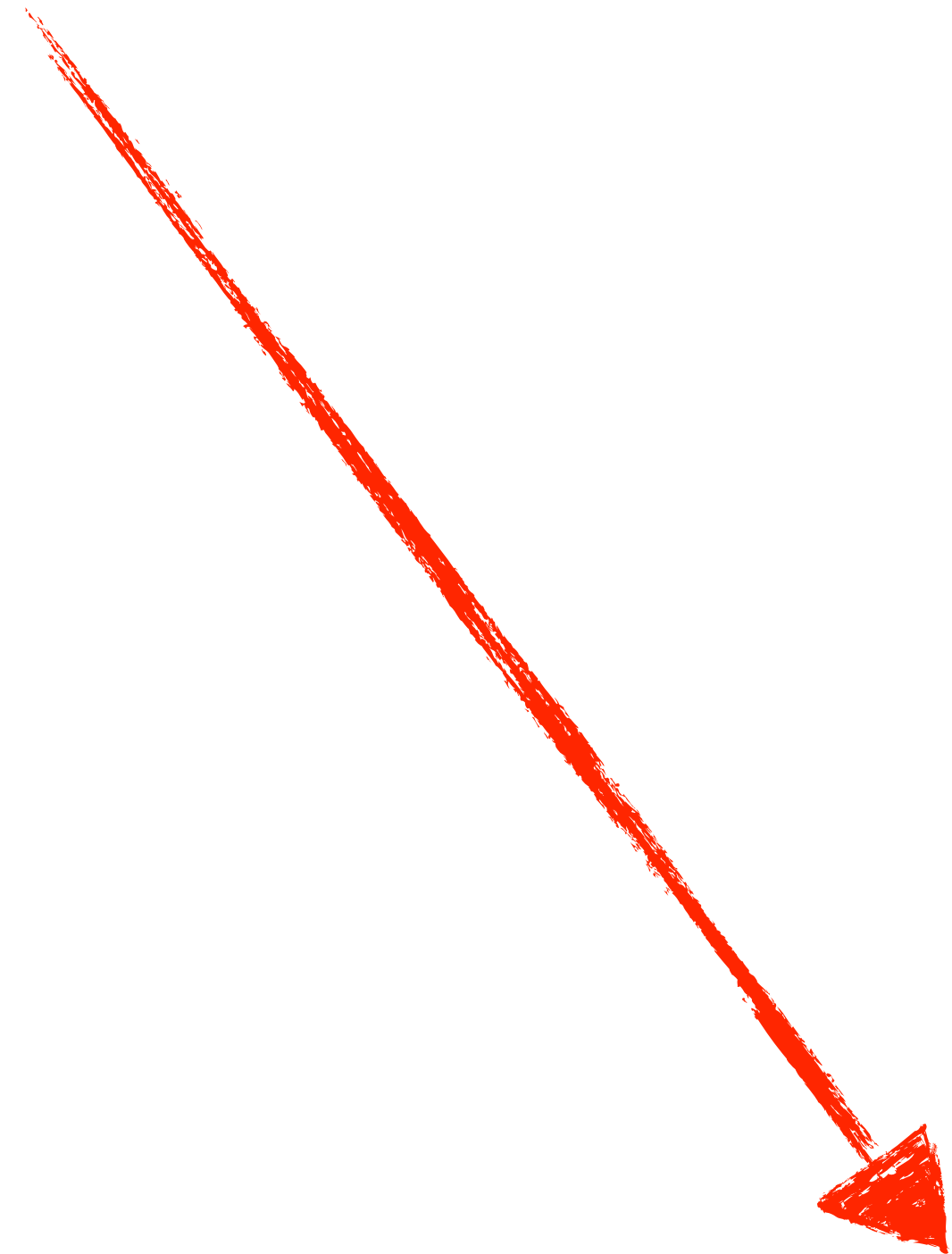
Lecture Outline

- 📌 Introduction and potential problems in the treatment of the partially edentulous and atrophic anterior maxilla
- 📌 The concept of P.G.R. (Prosthetically Guided Regeneration)
- 📌 Ridge and soft tissue augmentation materials and procedures (GBR and bone grafts)
- 📌 Personal data and literature review

BONE / SOFT TISSUE DEFECTS



● **Implants with reduced dimensions**



● **Prosthetically Guided Regeneration**

Matteo Chiapasco Eugenio Romeo

La Riabilitazione Implantoprotesica nei Casi Complessi



UTET

2004

BONE AUGMENTATION IN ORAL IMPLANTOLOGY

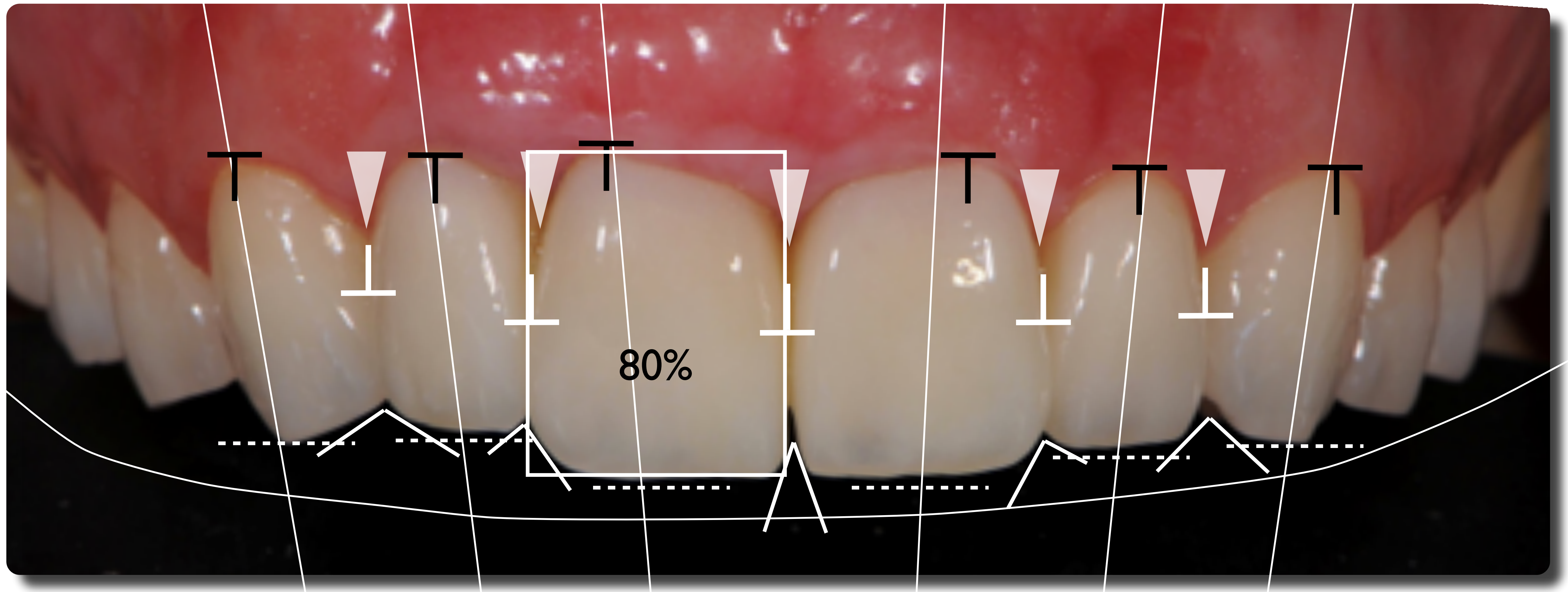
Fouad Khoury
Hadi Antoun
Patrick Missika



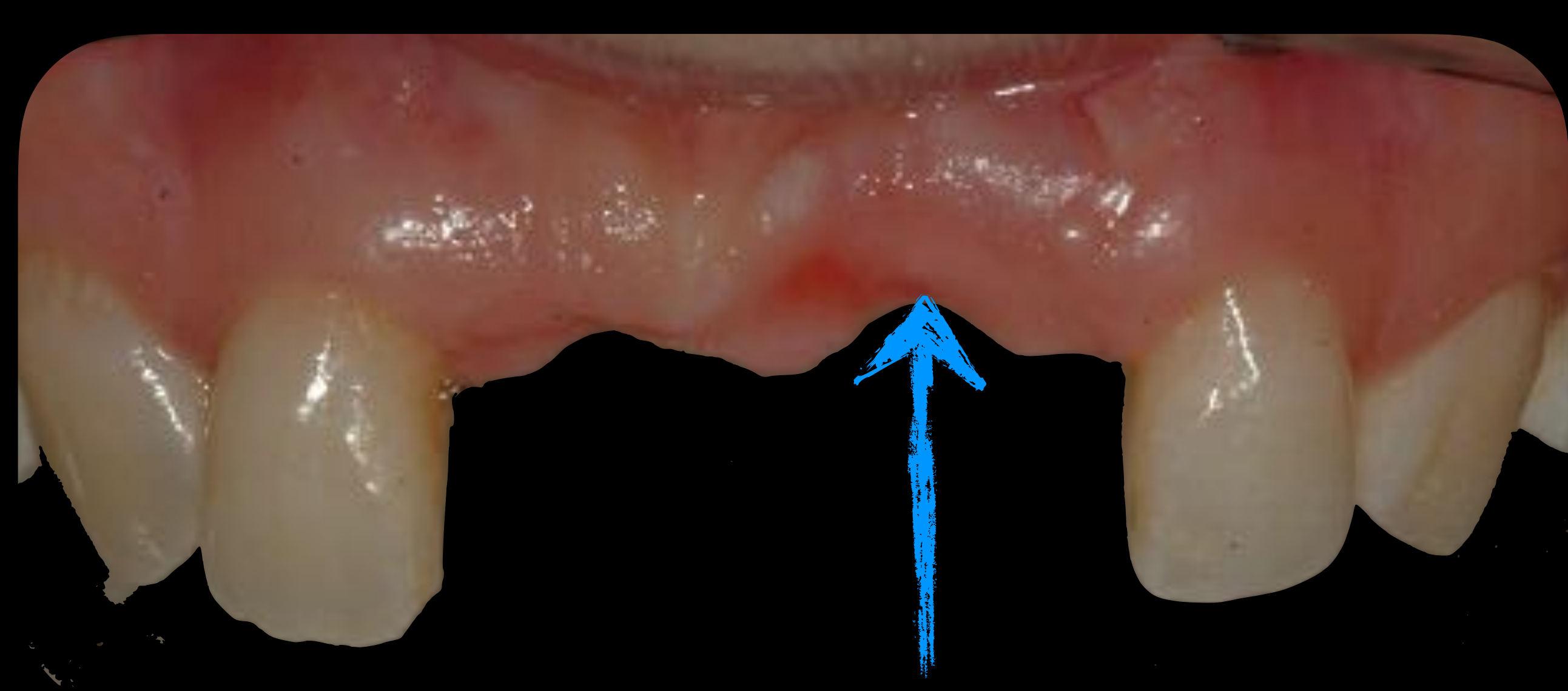
With contributions from
I. Benvenuti, M. Chiapasco,
G. Hage, A. Hage, N. Jakuć,
Ch. Khoury, A. Lujan, C. Murrina,
P. Mouton, J. R. Nelson,
J. Neugebauer, R. Vignoli, E. Zoller

2005

Prosthetically Guided Implant placement and Prosthetically Guided Regeneration (P.G.R.) are MANDATORY



Magne P. & Belser U. “Ceramic Adhesive Restorations: a Biomimetic Approach”
Quintessence International



P.G.R.







● **Prosthetically Guided Planning**

● **Prosthetically Guided Regeneration**

● **Prosthetically Guided Implant Placement**

Lecture Outline

-  Introduction and potential problems in the treatment of the partially edentulous and atrophic anterior maxilla
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Prosthetically Guided Regeneration

Periodontology 2000, Vol 12, 2018, 1-8
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PERIODONTICOLOGY 2000

Horizontal bone-augmentation procedures in implant dentistry: prosthetically guided regeneration

MATTEO CHIAPASCO & PAOLO CASENTINI

Experimental and clinical studies show osseointegration to be highly predictable and dental implants successfully represent a reliable means for restoring dental function in partially and completely edentulous patients (1, 16, 17). Although surgical and prosthetic procedures are well considered as a result of more than 30 years of clinical experience, treatment planning in oral implantology has, in recent years, undergone tremendous evolution. Implants were originally used in restoring fully edentulous patients based on the concept of 'maxillary and mandibular three-implant placement' (implant placement was primarily determined by the location of available bone, and the main goal was to allow adequate bone anchorage to provide a functionally efficient prosthetic rehabilitation. Following this concept, because osseointegration was the primary outcome of surgery, prosthetic rehabilitation did not fulfil the esthetic ideal. In these cases, dental restorations were often implant-supported overdentures or fixed implant-supported prostheses with distal cantilevers (maxillary bridge concept) and trans-mandibular compensators for occlusal space implant position using acrylic flanges (1, 16).

As oral implants have also been used for the rehabilitation of partially dentate patients, esthetic outcomes have become more important because implant-supported partial prostheses have to integrate with the adjacent natural dentition, both from a functional and an esthetic point of view (8). A good esthetic result can be achieved only if the implant is placed in a carefully planned position, as determined by the prosthetic needs. Therefore, the concept of 'restoration-driven implant placement' has been introduced to optimize both function and esthetics (8). An correct implant position is vital in order to achieve a good esthetic result (14, 15), optimal

conditions of the alveolar bone, in terms of adequate volume, as well as optimal conditions of the surrounding soft tissues, are key prerequisites to obtain a good clinical outcome. When these conditions are lacking, because of hard- and soft-tissue deficiencies (the bone loss, following atrophy, sequelae of periodontal disease, trauma or congenital malformations), the bone volume and/or the surrounding soft tissues (maxillary sinus) must be augmented.

A host of bone augmentation techniques, such as guided bone regeneration (11, 16, 17, 18), bone-grafting techniques (19, 20, 21, 41, 42, 51, 52, 66), and alveolar bone deposition (3, 11, 75), have been proposed and different systematic reviews have been published to evaluate the outcome of various bone- and soft-tissue augmentation procedures (2, 7, 27, 34, 35, 46). The aim of this article is to present a rational, evidence-based and prosthetically driven approach for the treatment of edentulous ridges affected by horizontal defects, using augmentation procedures and dental implants. A diagnostic protocol, a classification of bone defects and the main augmentation techniques will be described in detail. The selection criteria for different surgical techniques for different classes of bone defects will also be discussed.

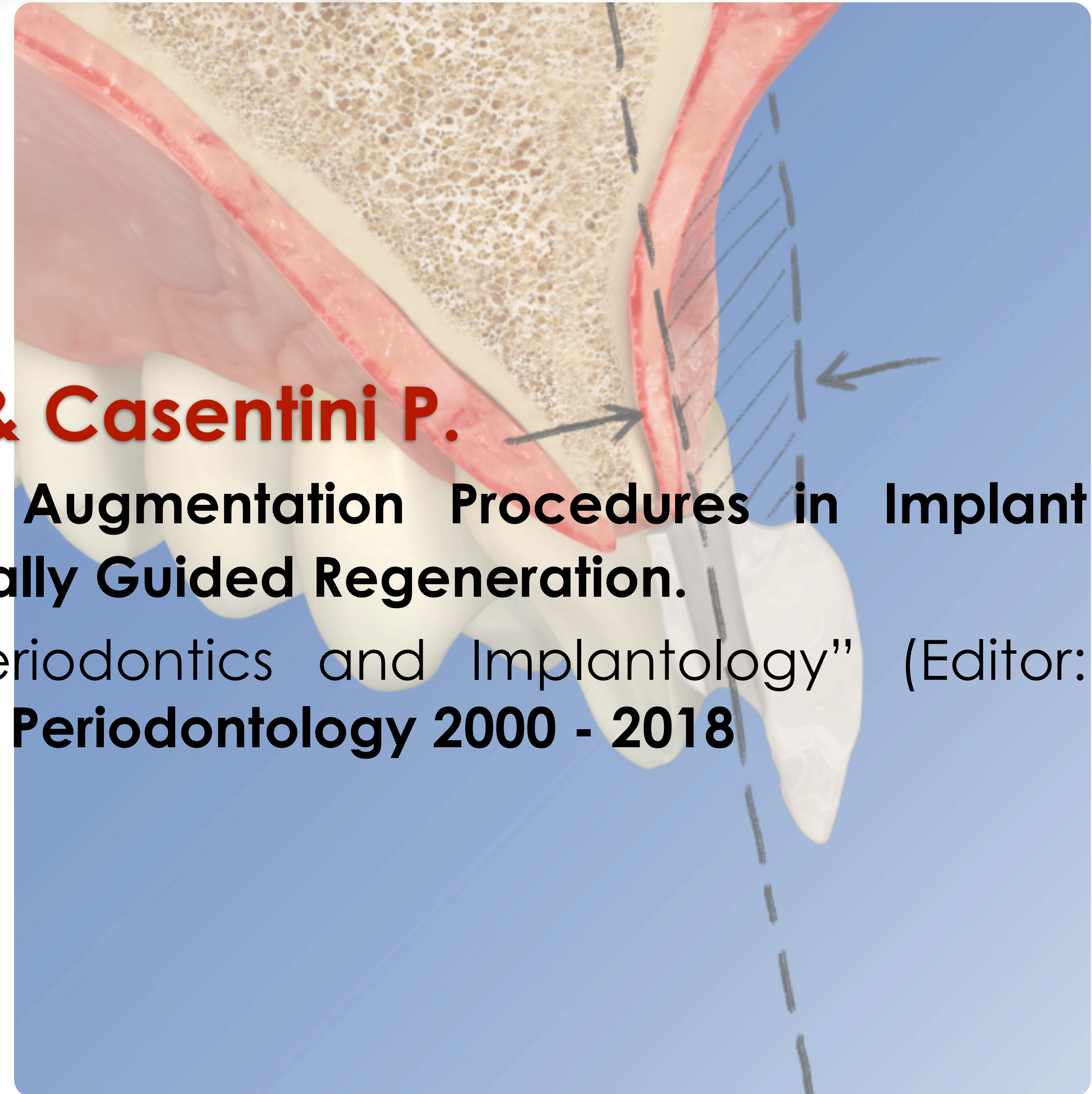
Diagnosis and treatment planning for partially dentate patients with compromised alveolar ridges, following a prosthetically driven diagnostic protocol

As the rehabilitation with implant-supported prostheses of partially dentate patients affected by

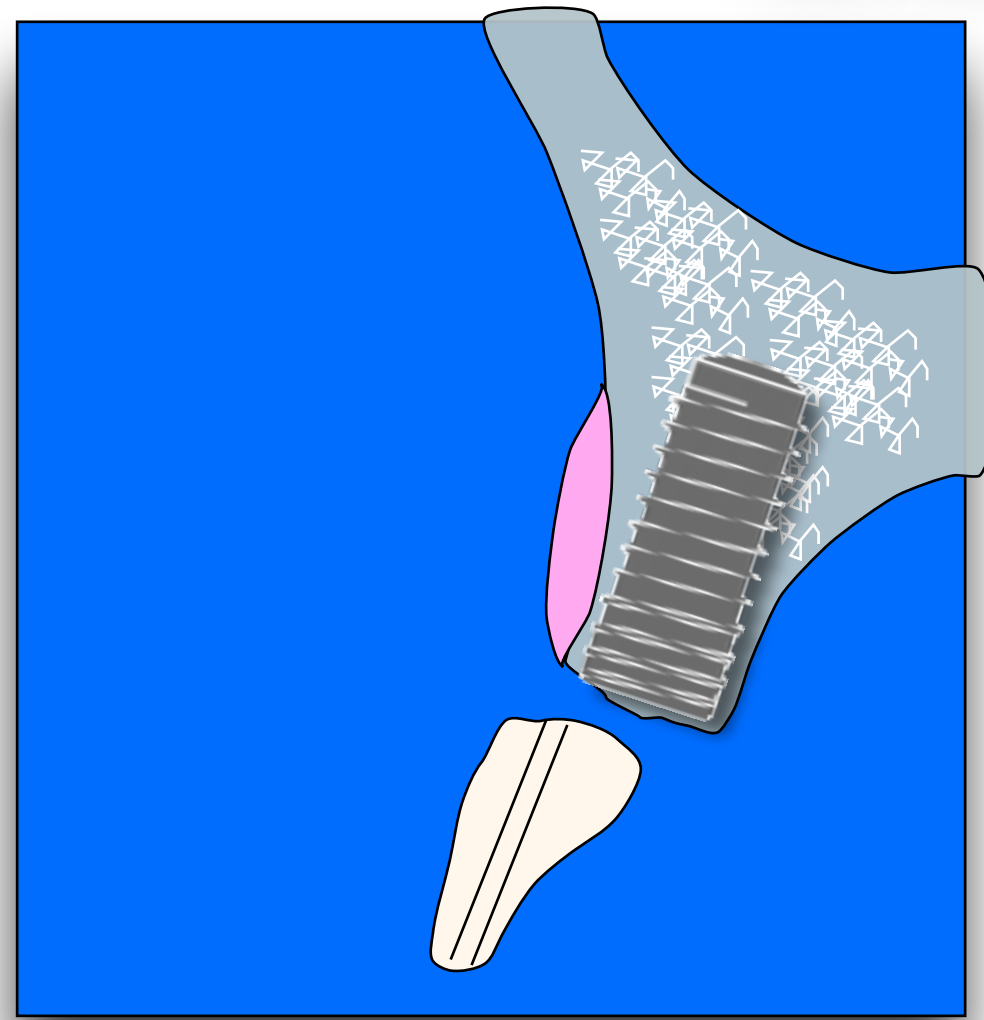
Chiapasco M & Casentini P.

Horizontal Bone Augmentation Procedures in Implant Dentistry: Prosthetically Guided Regeneration.

in "Esthetics in Periodontics and Implantology" (Editor: Giovanni Zucchelli) **Periodontology 2000 - 2018**

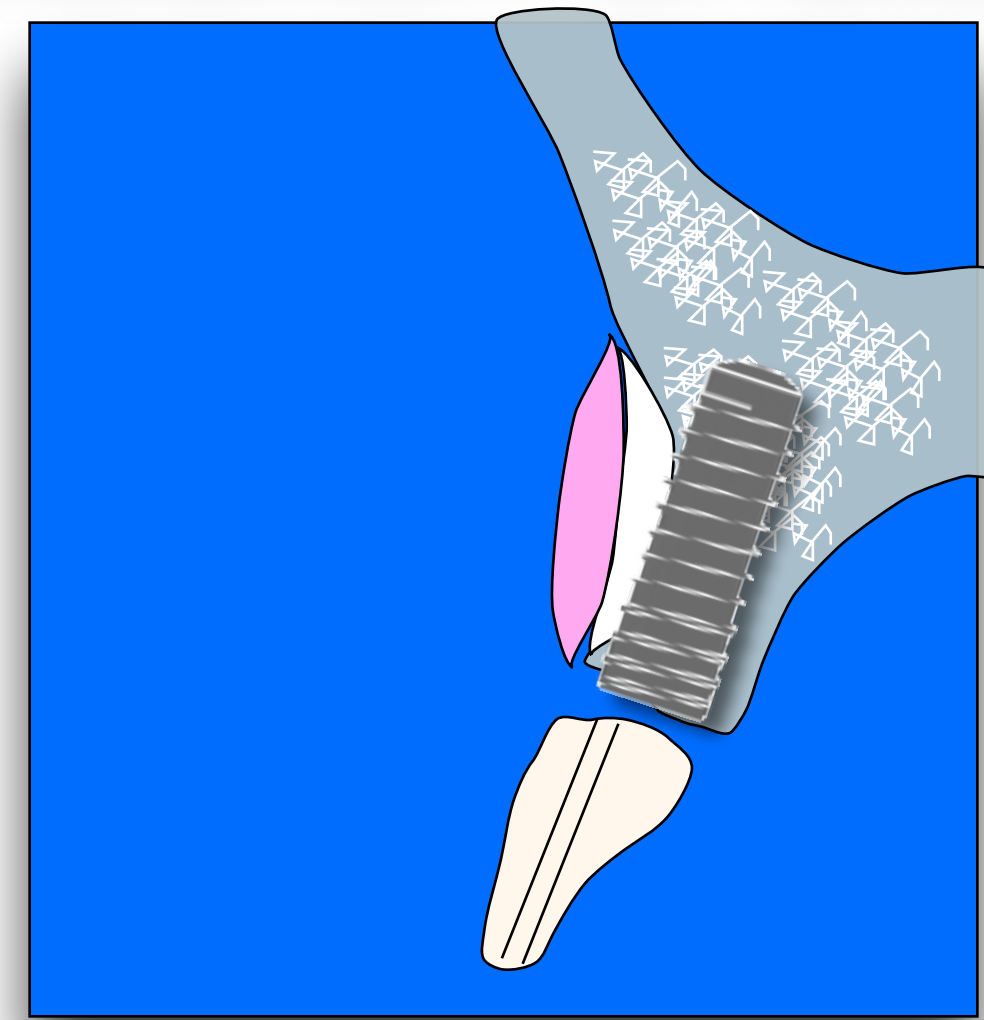


Classification of Defects in Different Classes



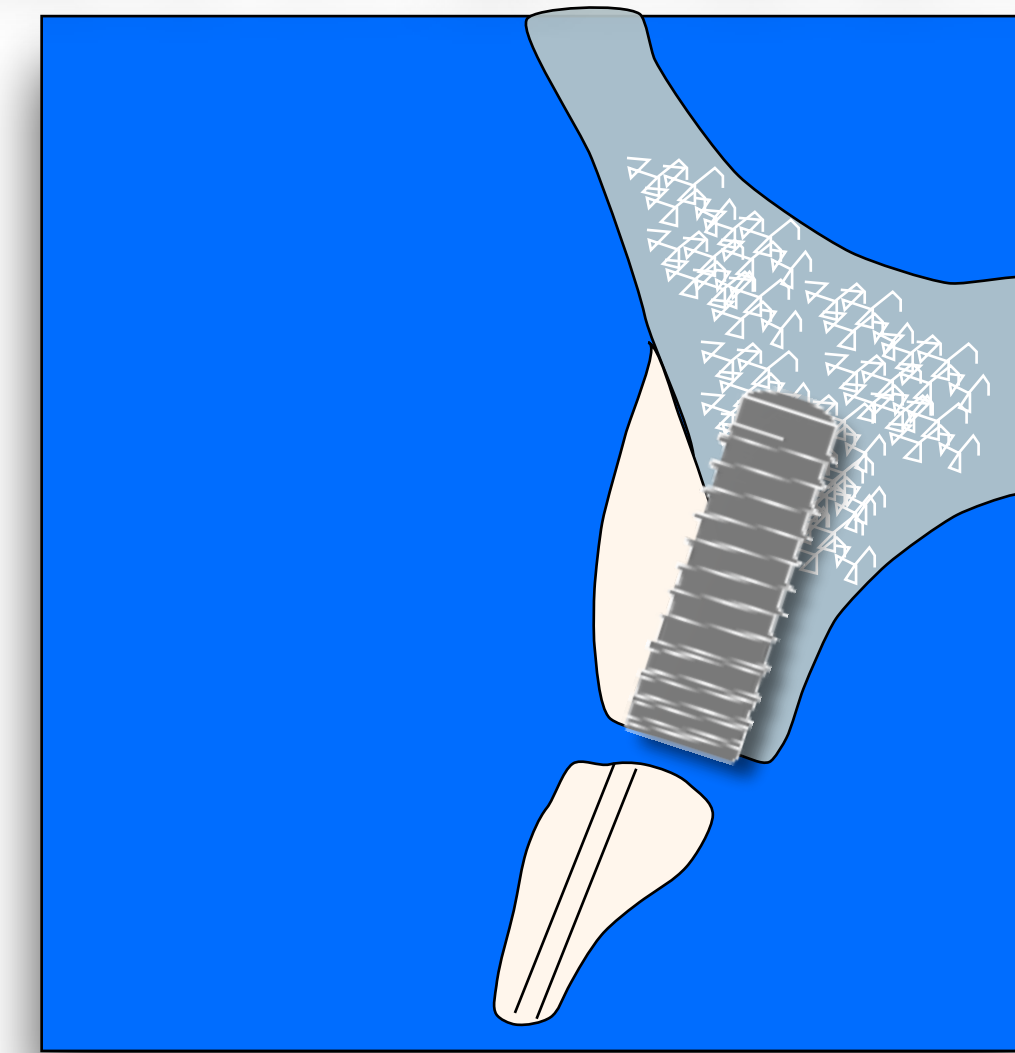
CLASS I

Implant completely embedded in bone - only "esthetic" needs



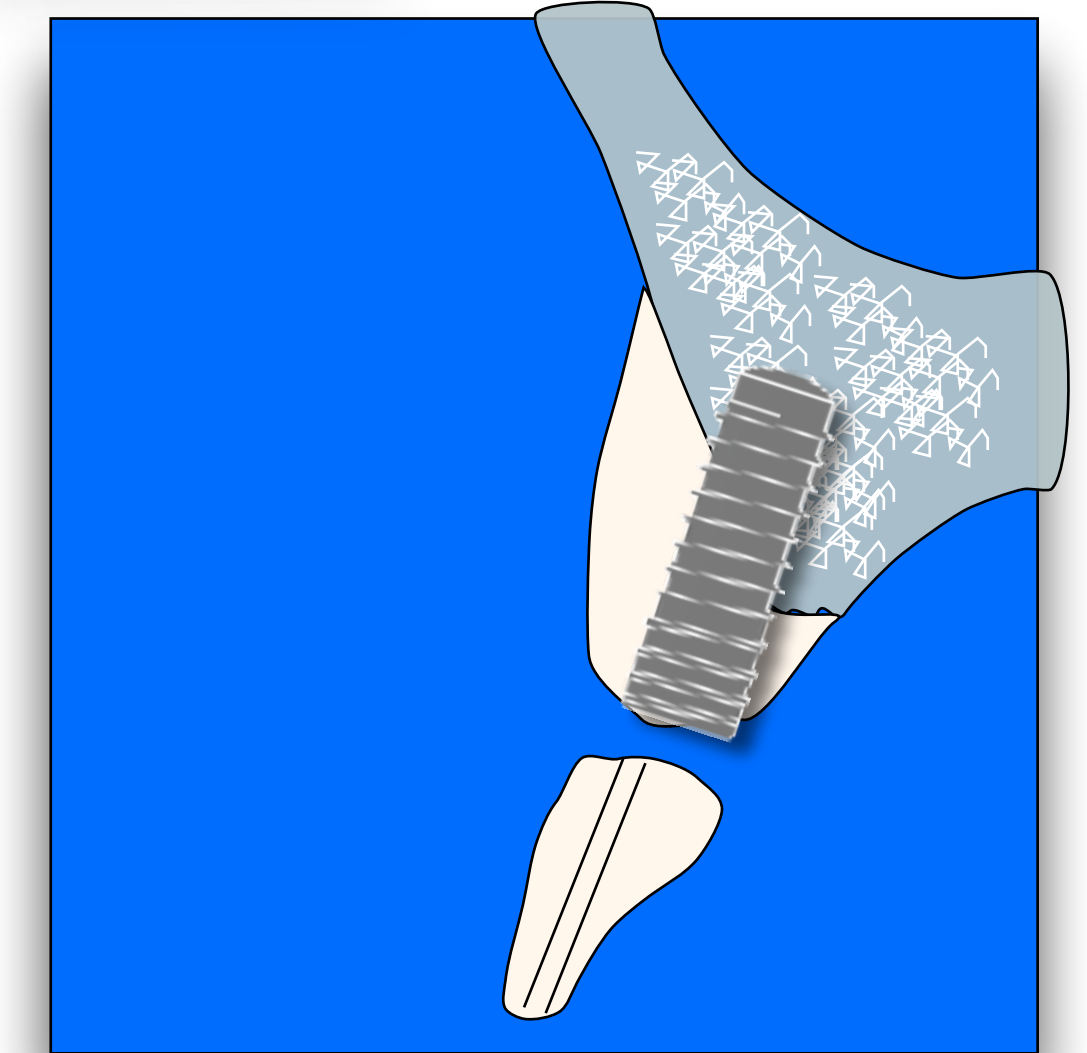
CLASS II

Implant partially exposed, but with possible placement - grafting needed



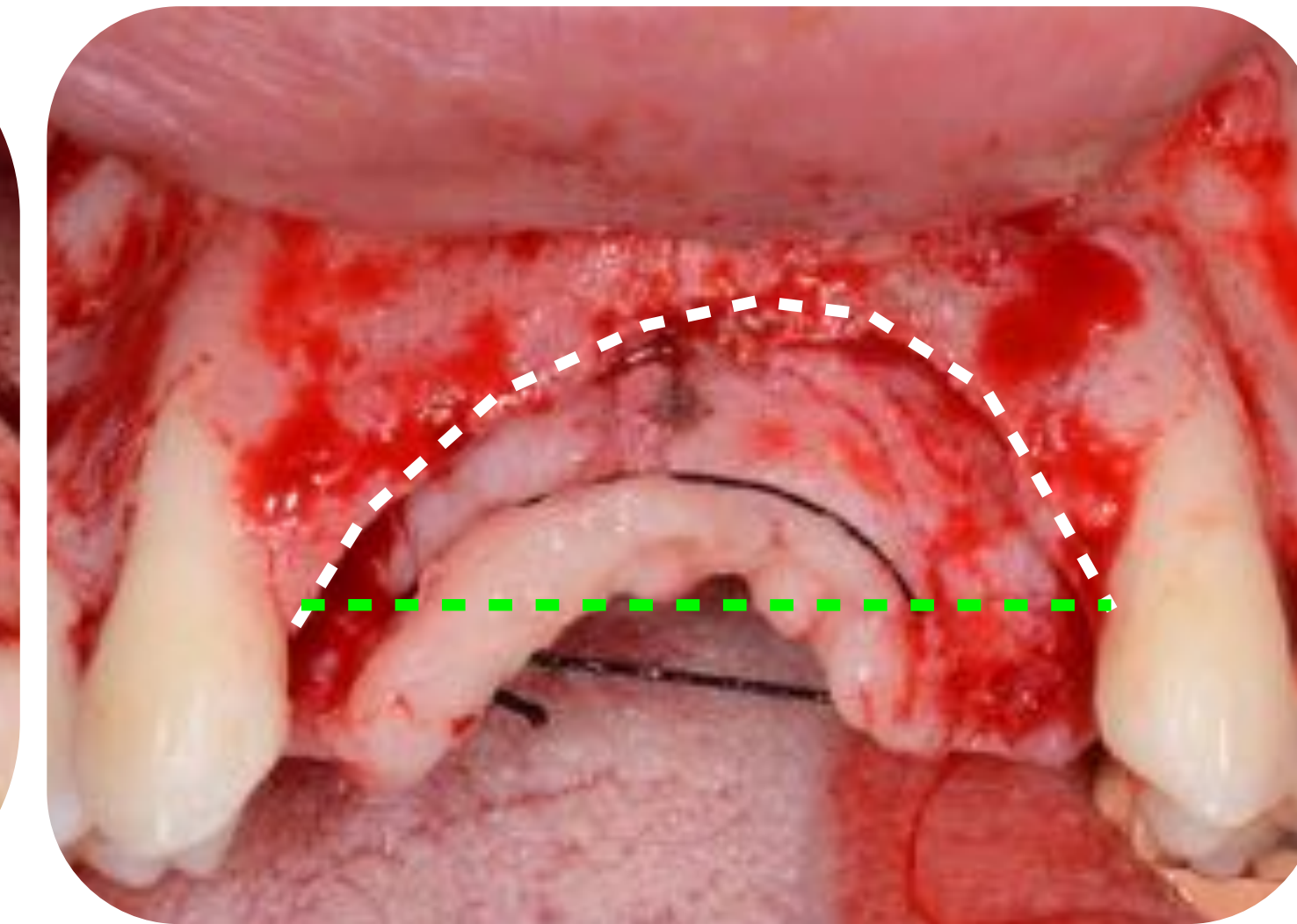
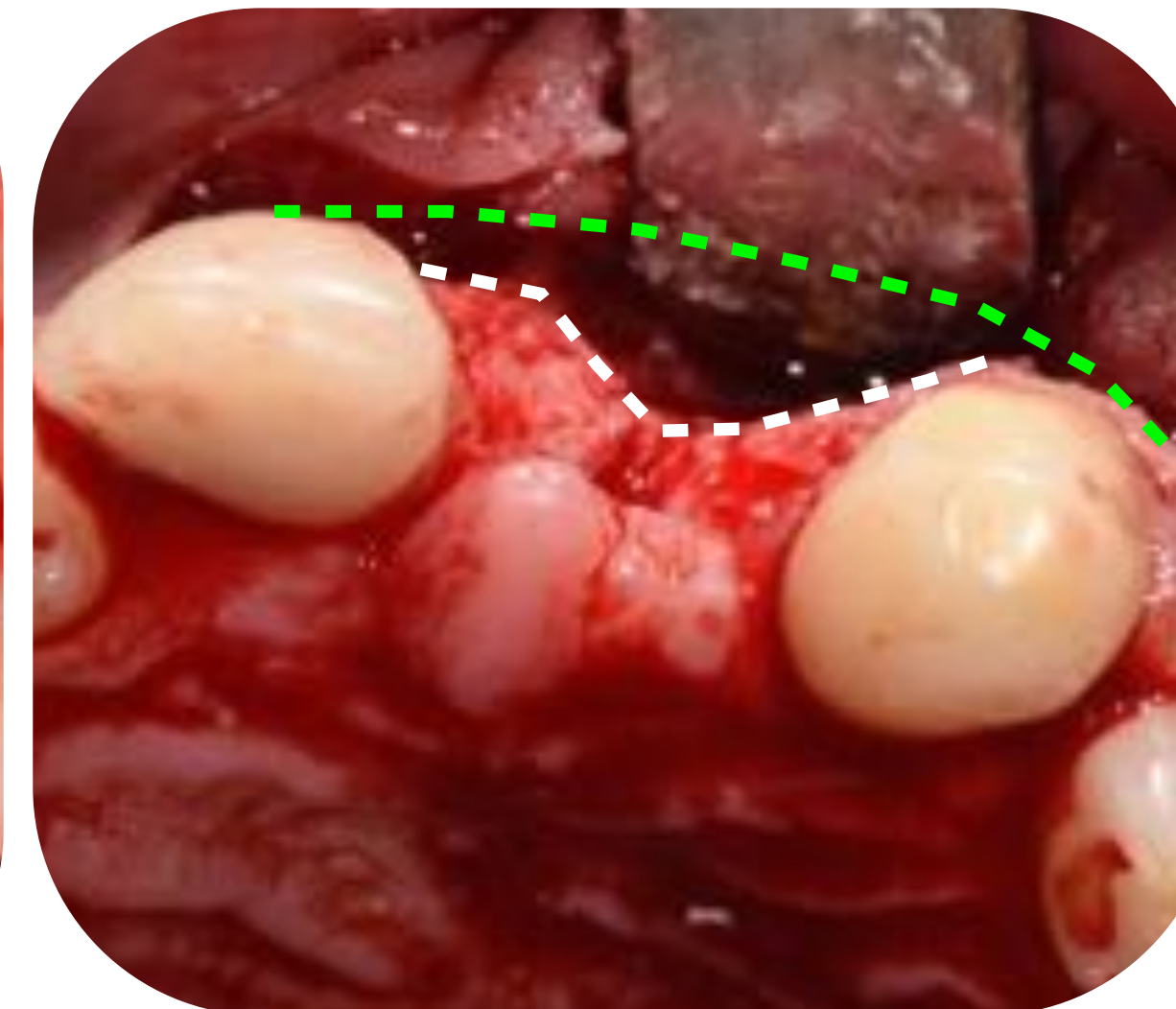
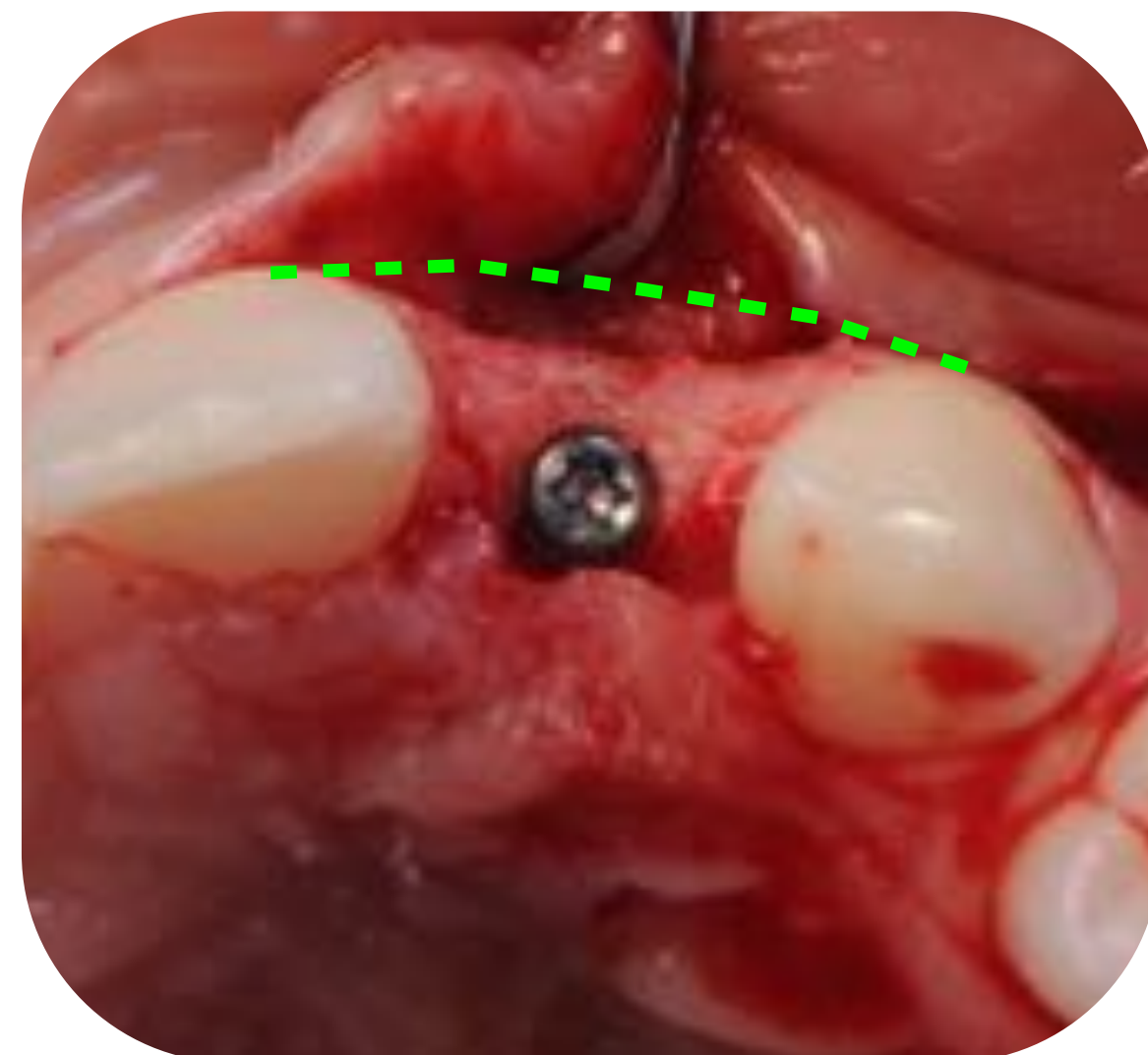
CLASS III

Relevant horizontal resorption - grafting needed with delayed implant placement

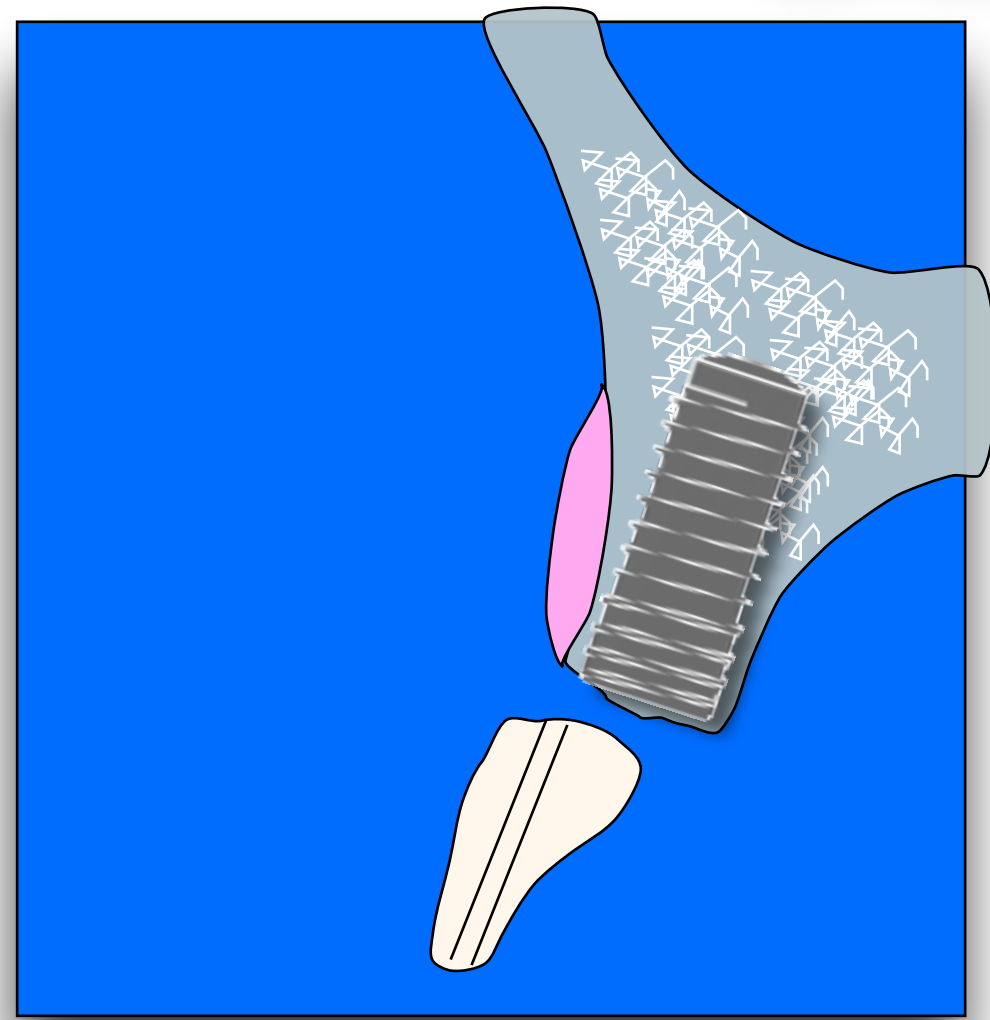


CLASS IV

Relevant horizontal and vertical resorption - grafting needed with delayed implant placement

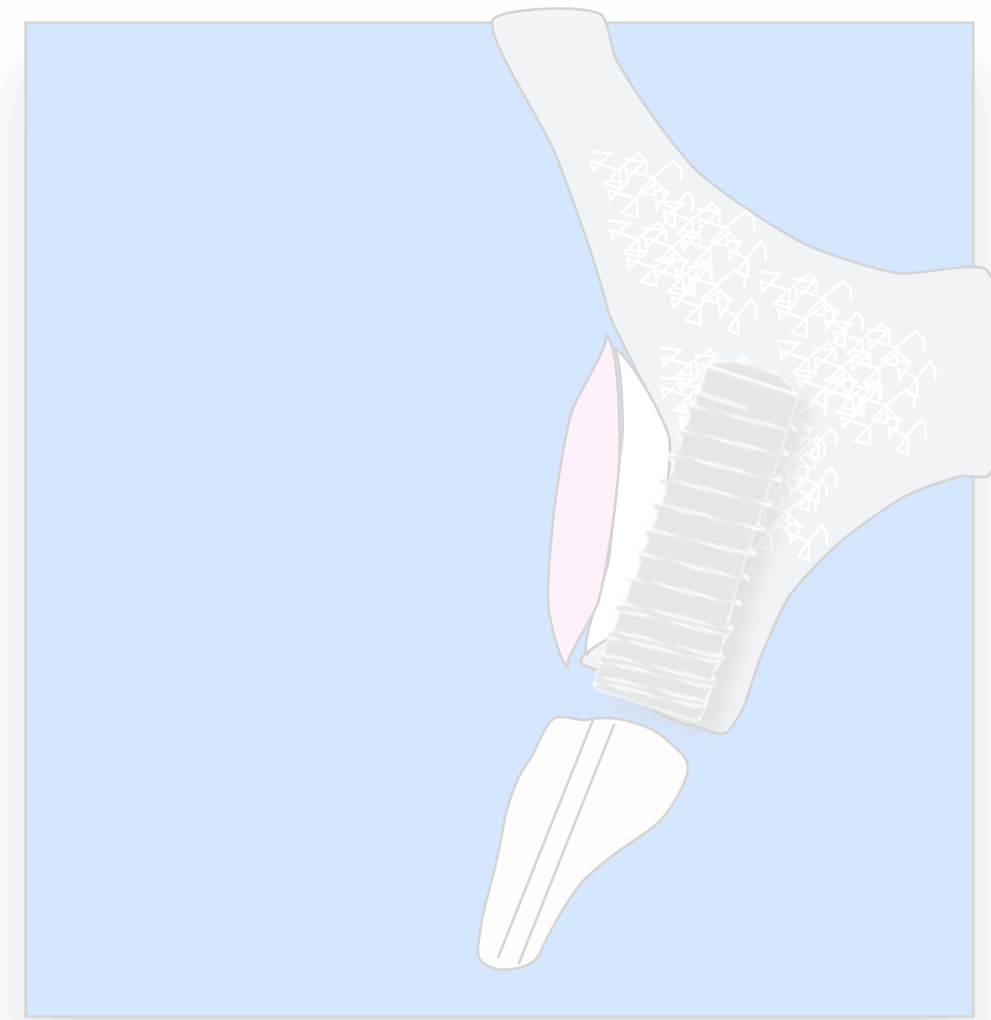


Classification of Defects in Different Classes



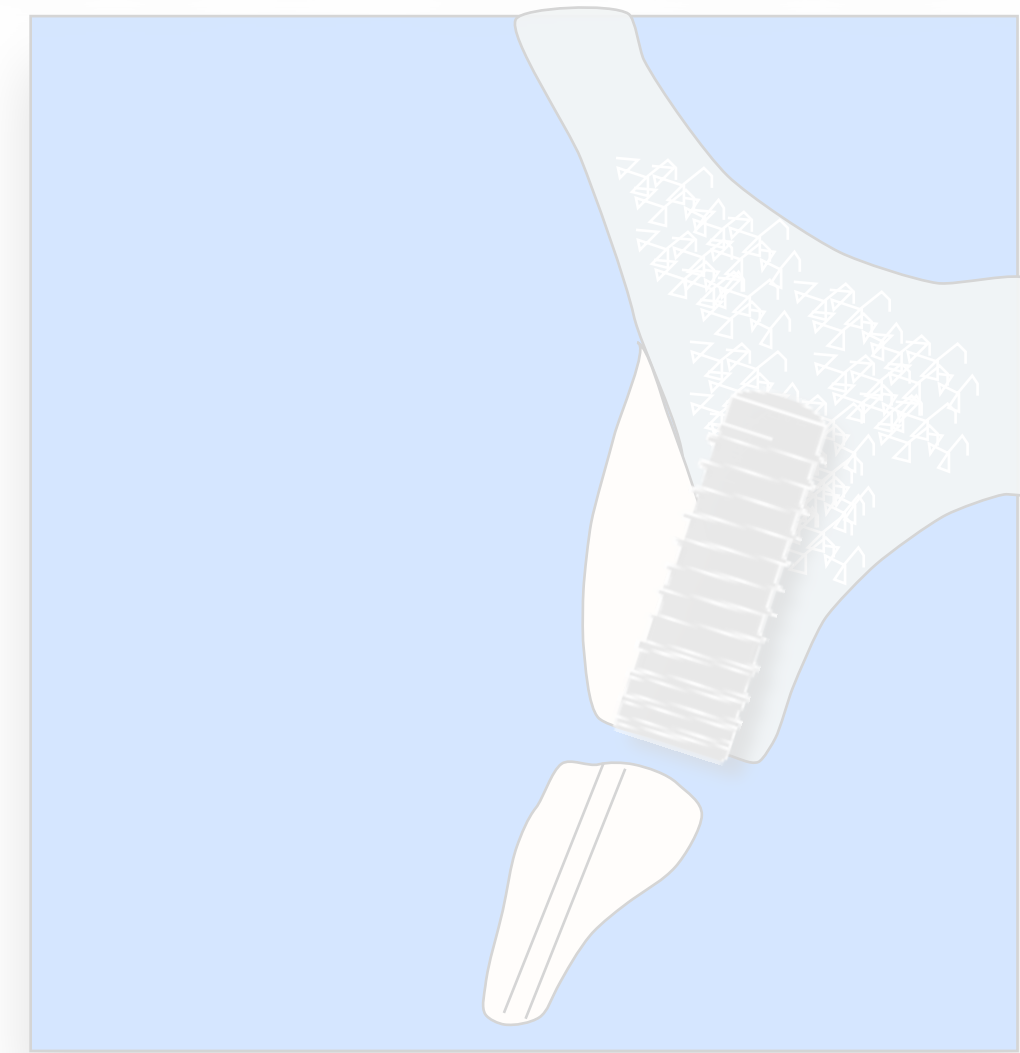
CLASS I

Implant completely embedded in bone - only "esthetic" needs



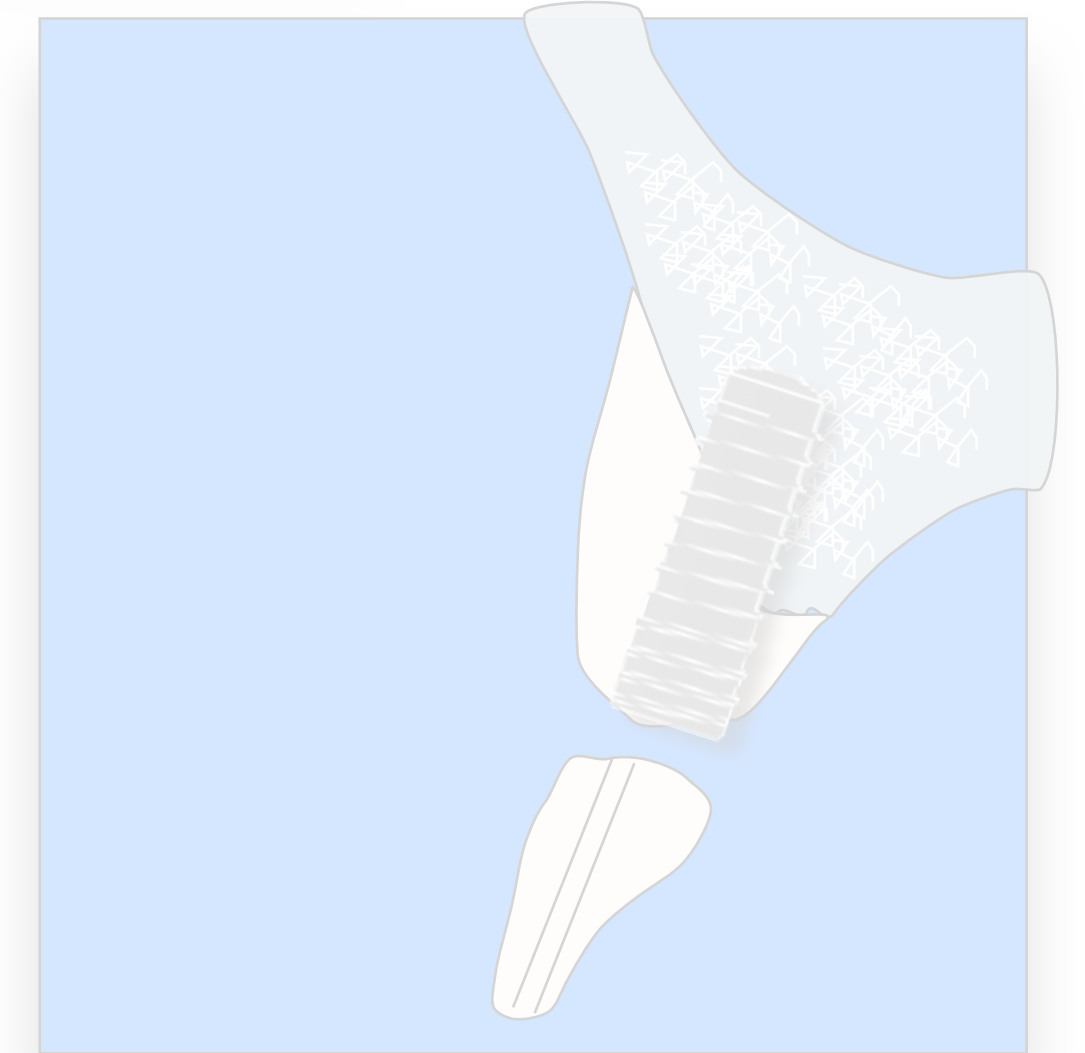
CLASS II

Implant partially exposed, but with possible placement - grafting needed



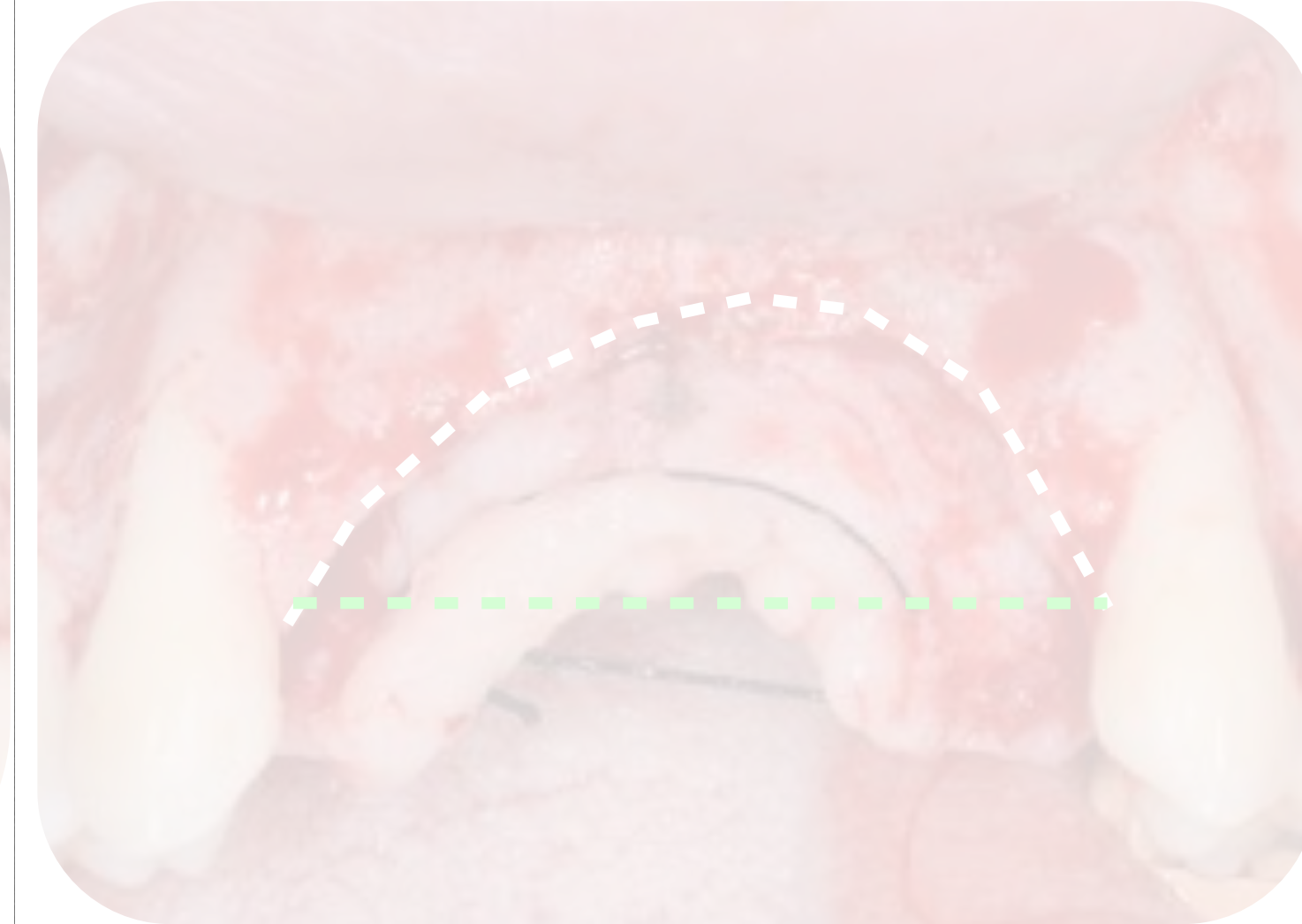
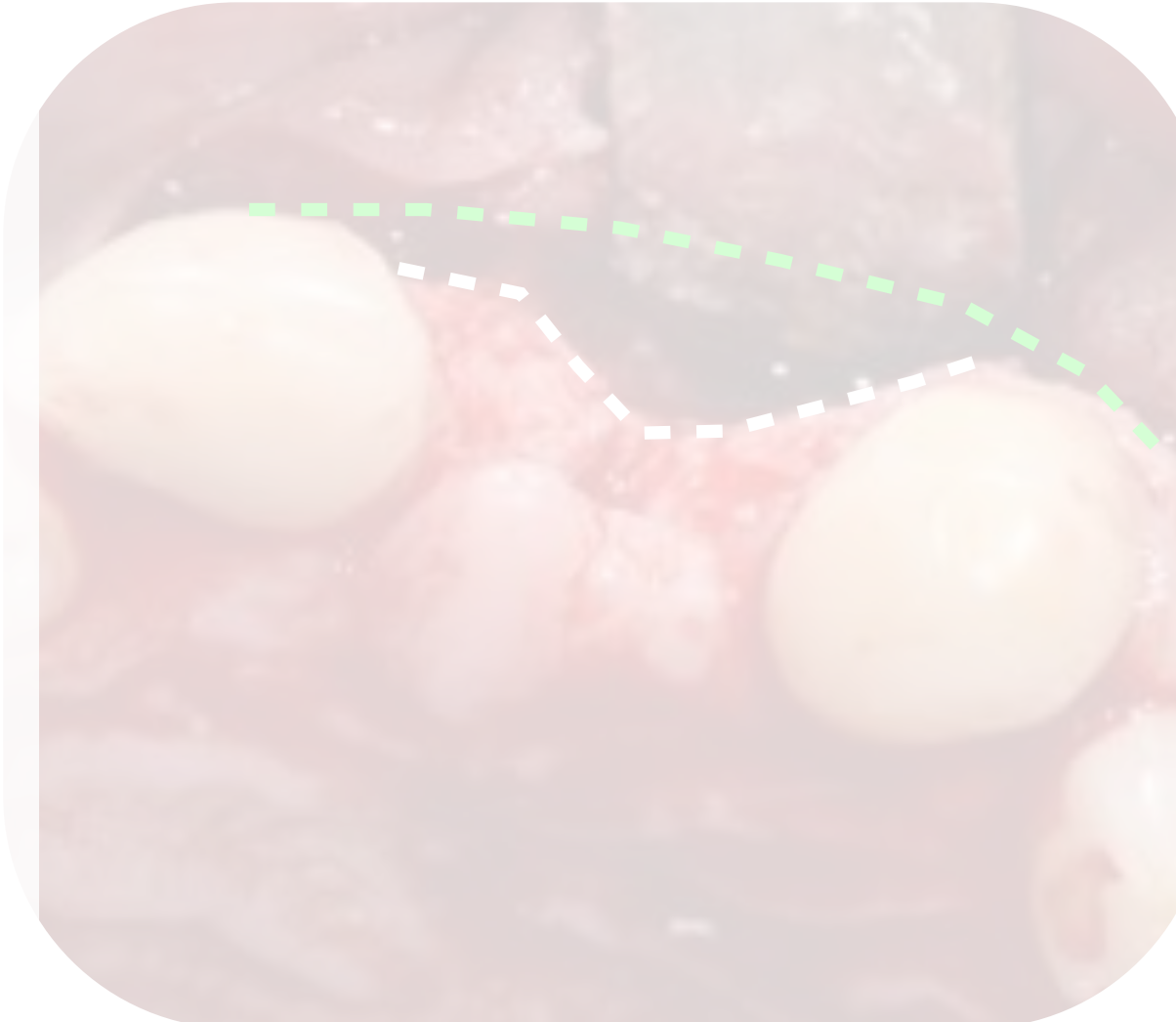
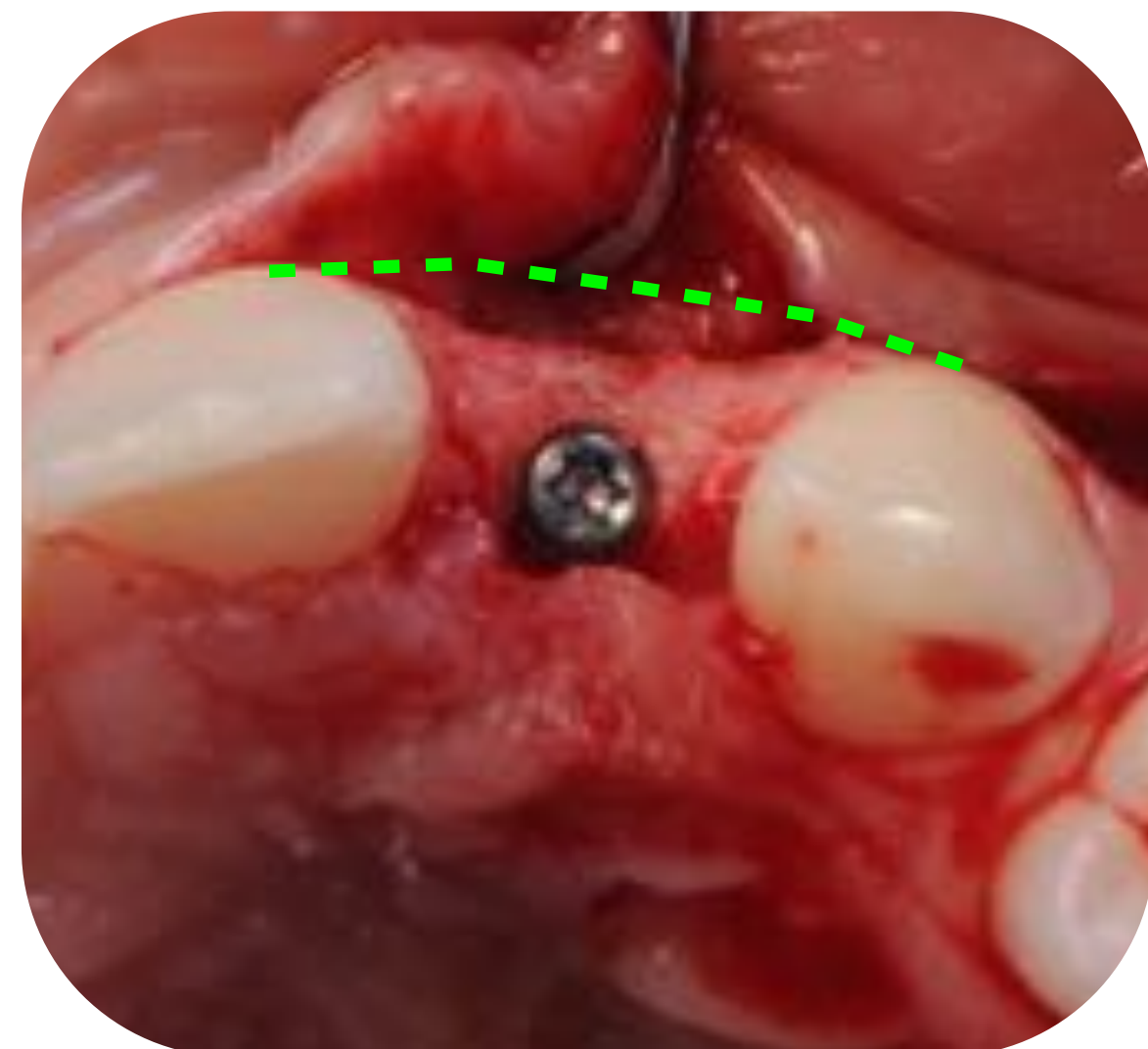
CLASS III

Relevant horizontal resorption - grafting needed with delayed implant placement

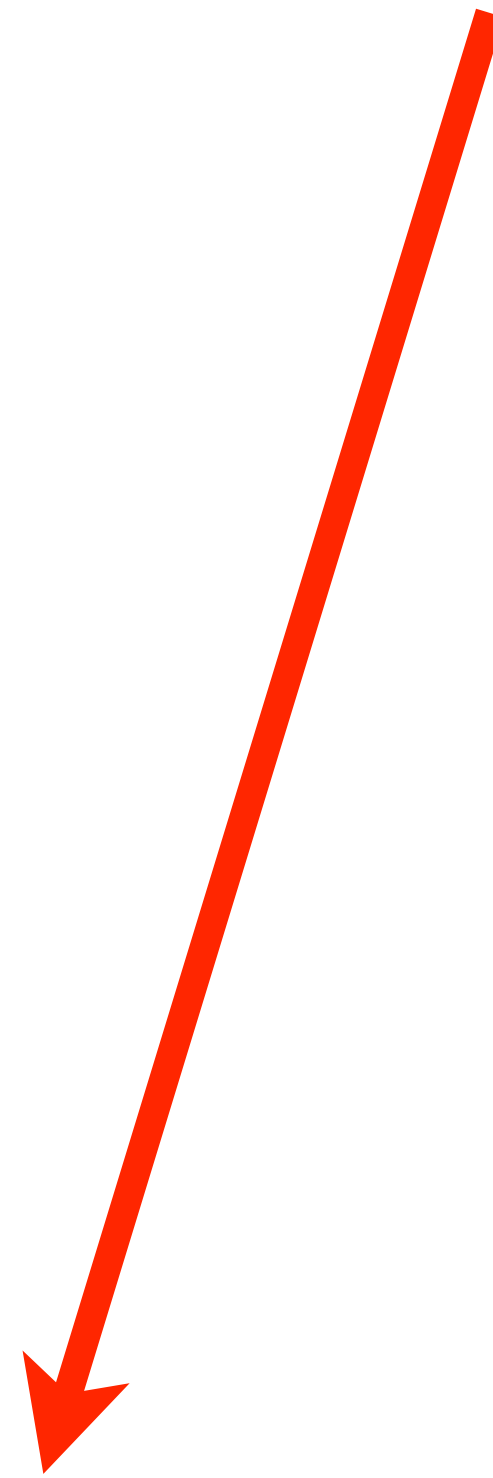


CLASS IV

Relevant horizontal and vertical resorption - grafting needed with delayed implant placement



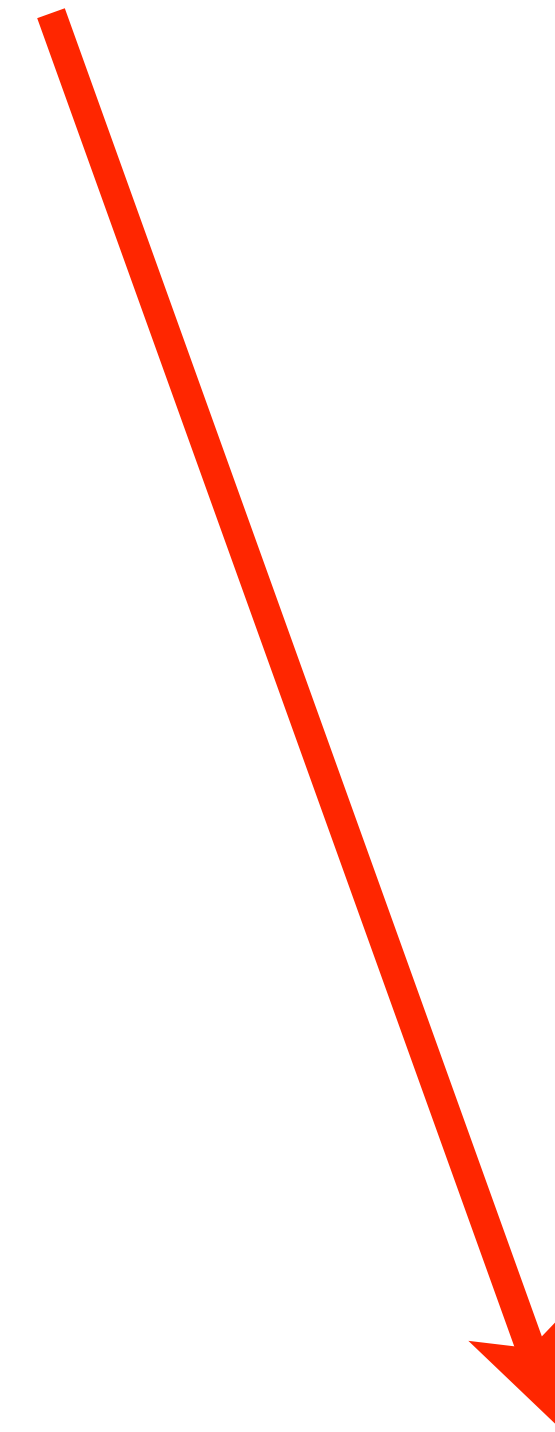
BONE / SOFT TISSUE DEFECT



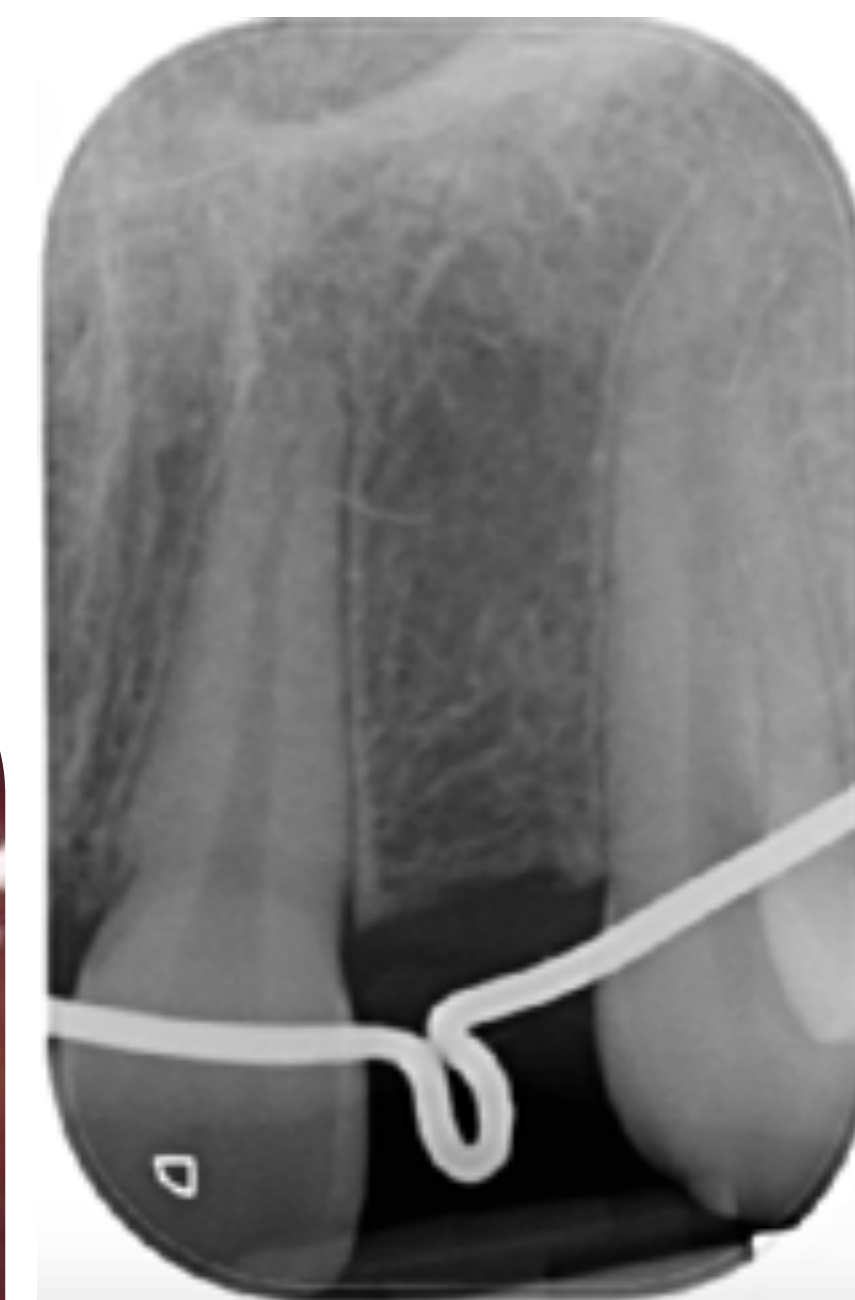
● **Guided Bone
Regeneration**



● **Soft tissue
reconstruction**



● **Bone
blocks**

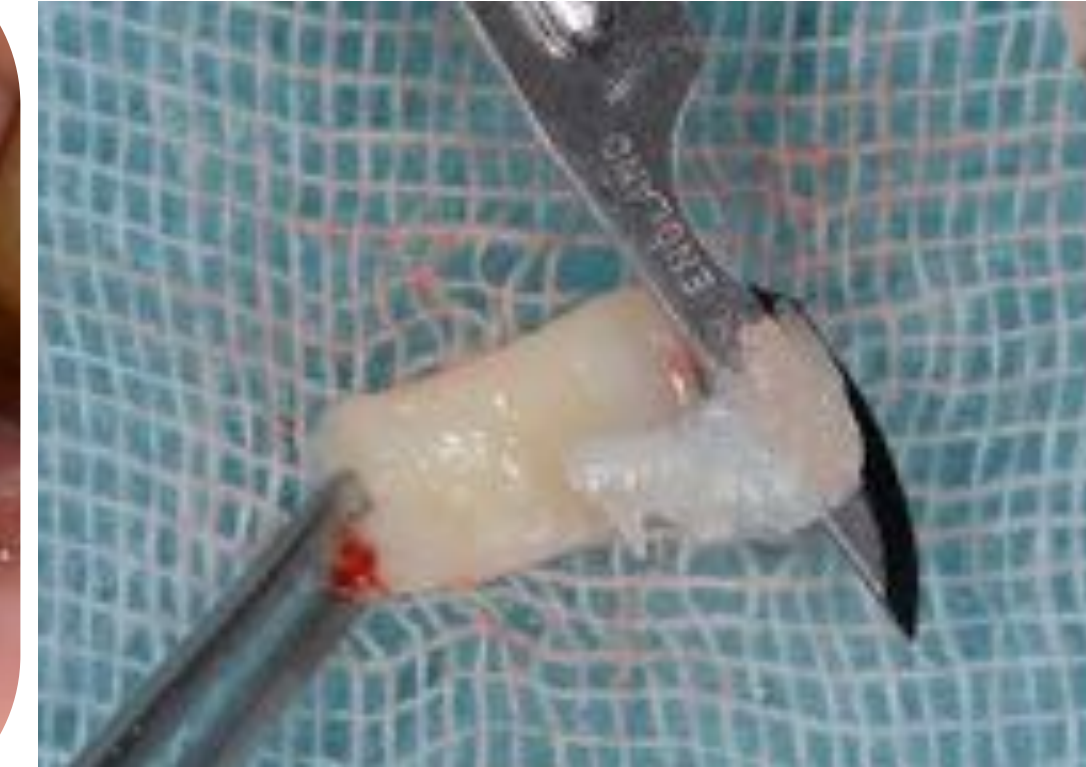




How to increase peri-implant soft tissue thickness

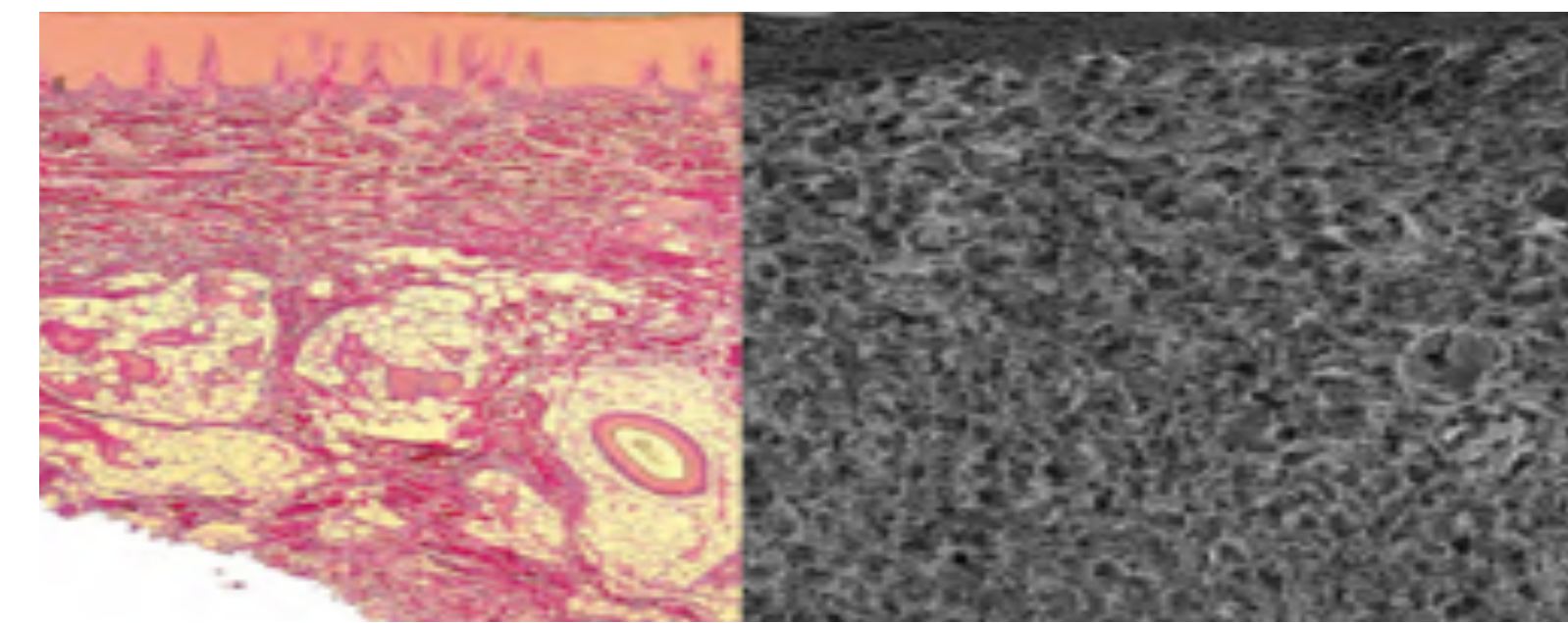
1. Autogenous connective tissue grafts taken from the palate

- **Thoma et al.** Efficacy of soft tissue augmentation around dental implants and in partially edentulous areas: A systematic review. J Clin Periodontol 2014; 41: 77–91
- **De Bruyckere et al.** Horizontal stability of connective tissue grafts at the buccal aspect of single implants: a 1-year prospective case series. J Clin Periodontol 2015; 42: 876–882.



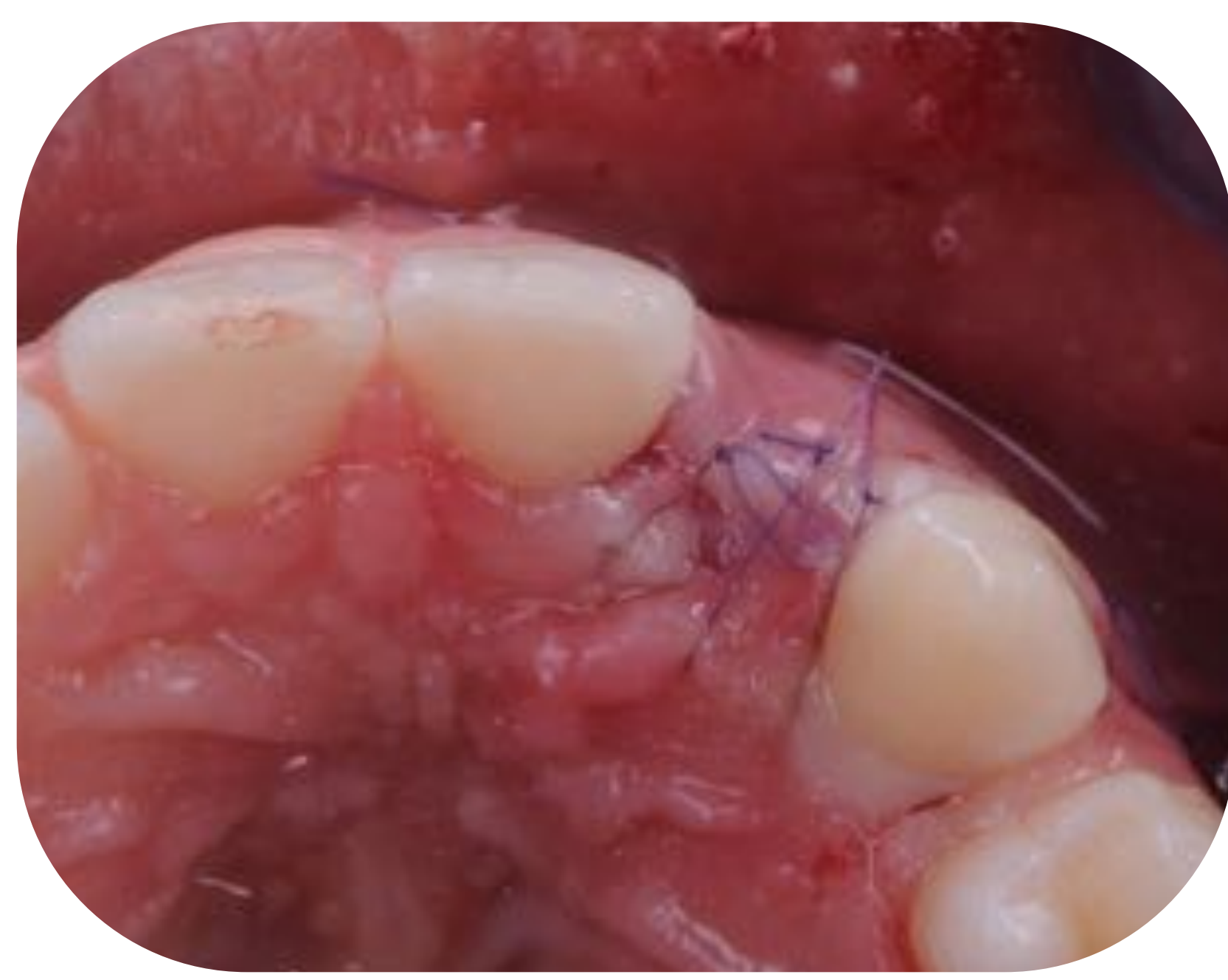
2. Xenogenic thick collagen matrices

- **Thoma et al.** Randomized controlled clinical study evaluating effectiveness and safety of a volume-stable collagen matrix compared to autogenous connective tissue grafts for soft tissue augmentation at implant sites. J Clin Perio 2016: 1-12
- **Zeltner et al.** Randomized controlled clinical study comparing a volume-stable collagen matrix to autogenous connective tissue grafts for soft tissue augmentation at implant sites: linear volumetric soft tissue changes up to 3 months. J Clin Perio 2017: 44; 446-453



Thoma et al. Efficacy of soft tissue augmentation around dental implants and in partially edentulous areas: A systematic review. *J Clin Periodontol* 2014; 41: 77–91

Results: Nine (KM) and eleven (volume) studies met the inclusion criteria. An apically positioned flap/ vestibuloplasty (APF/V) plus a graft material [free gingival graft (FGG)/subepithelial connective tissue graft (SCTG)/collagen matrix (CM)] resulted in an increase of keratinized tissue (1.4–3.3 mm). Statistically significantly better outcomes were obtained for APF/V plus FGG/SCTG compared with controls (APF/V alone; no treatment) ($p < 0.05$). SCTGs were the best-documented method for gain of soft tissue volume at implant sites and partially edentulous sites. **Aesthetically at immediate implant sites, better papilla fill and higher marginal mucosal levels were obtained using SCTGs compared to non-grafted sites.**



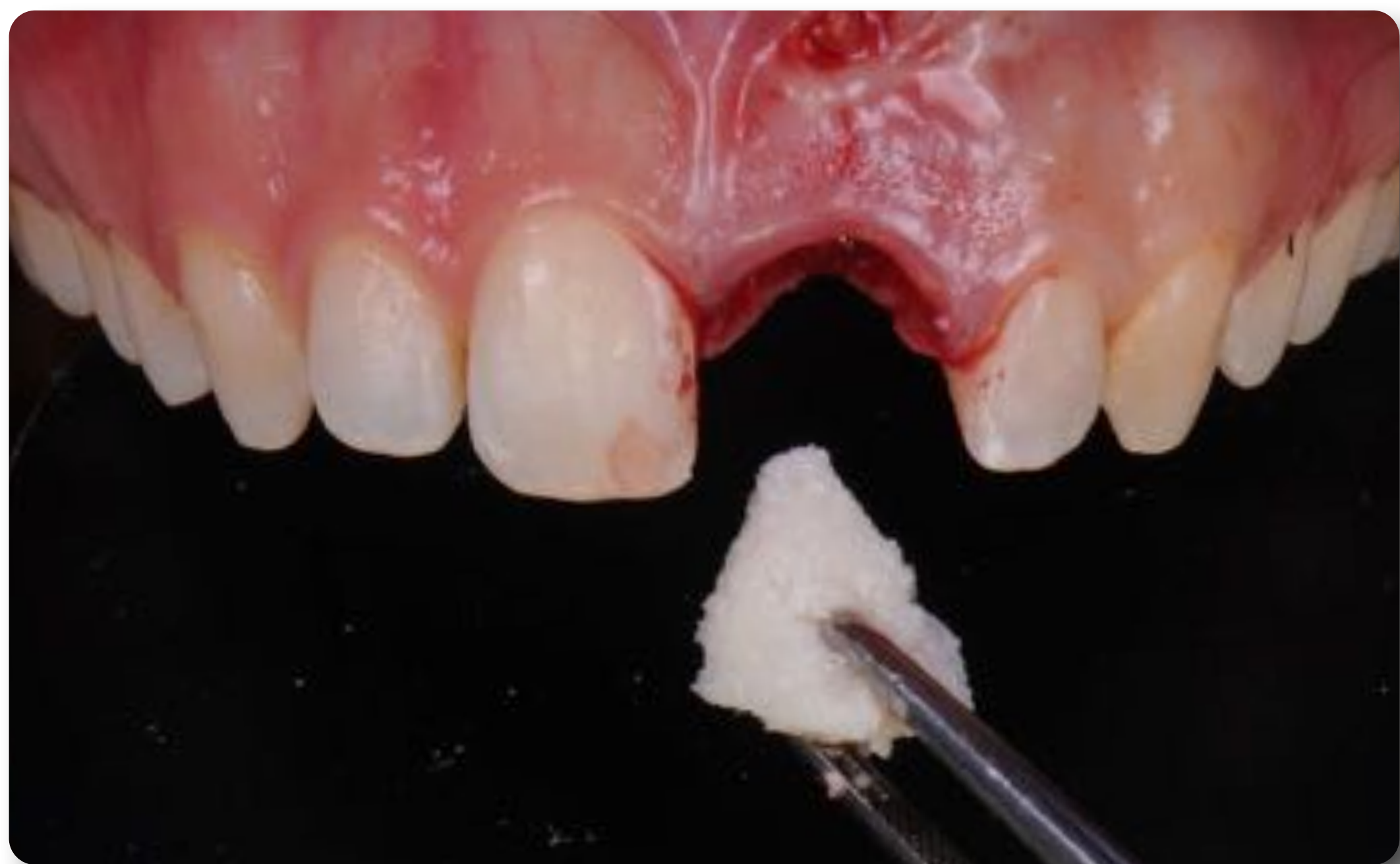
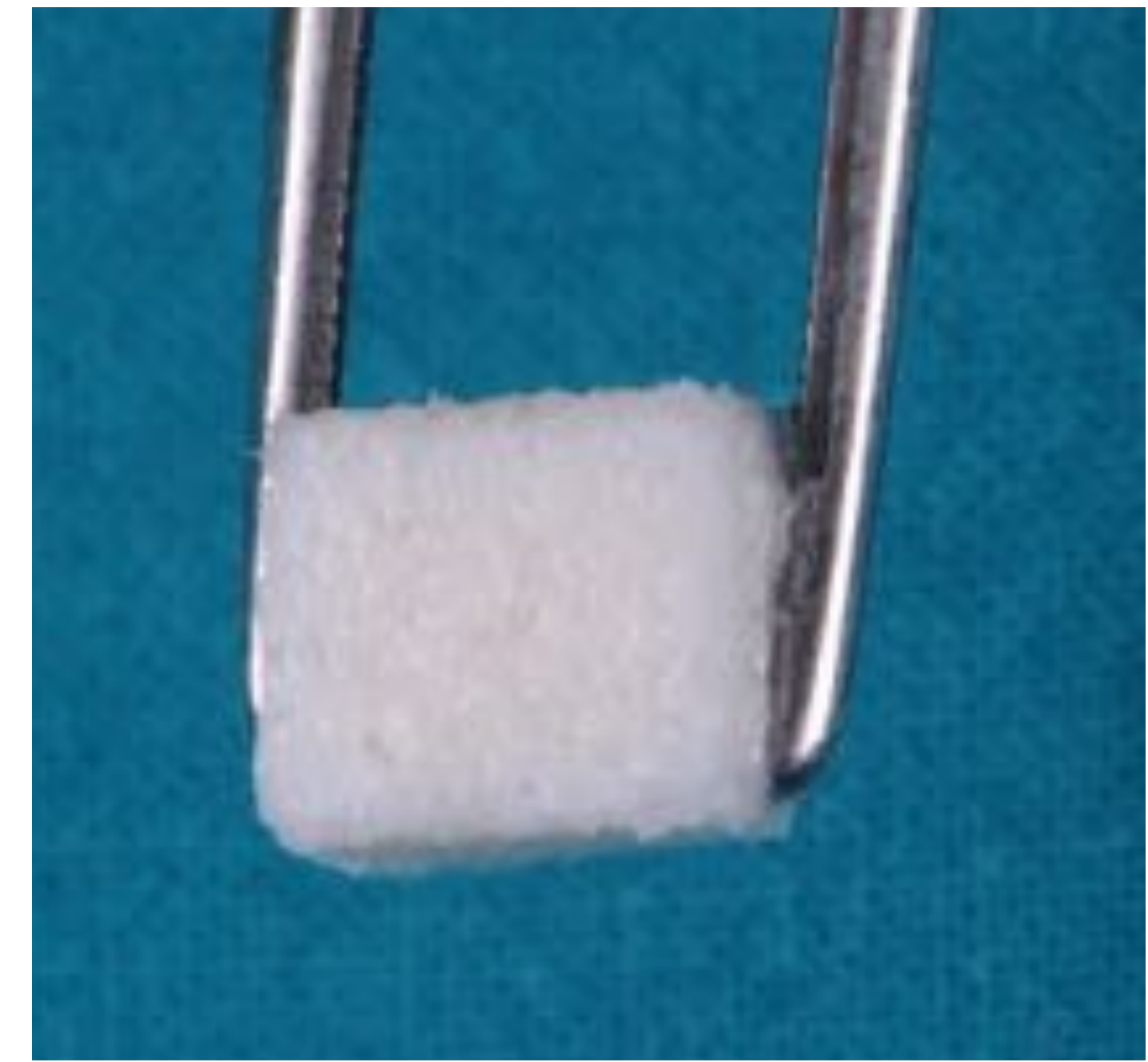
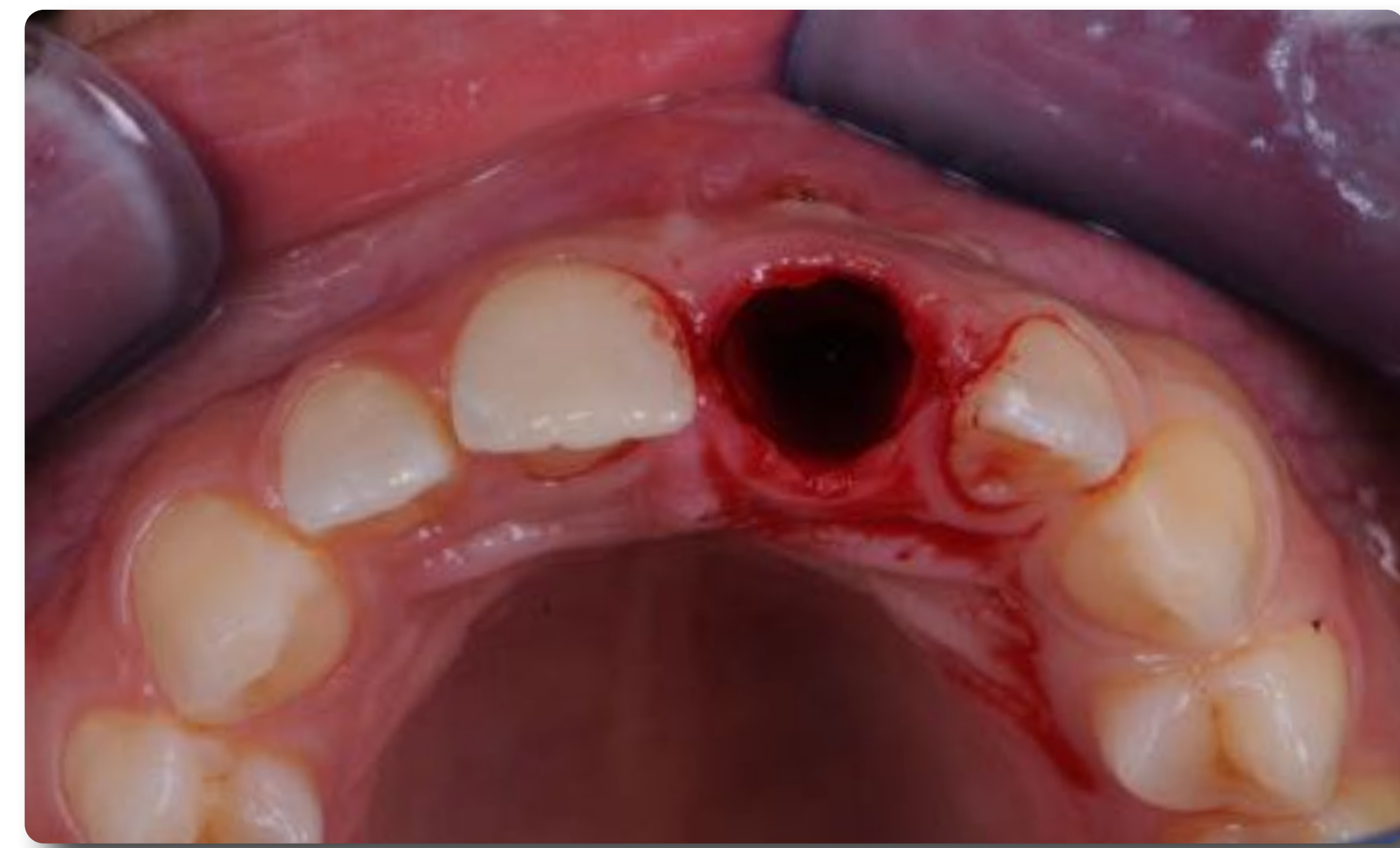


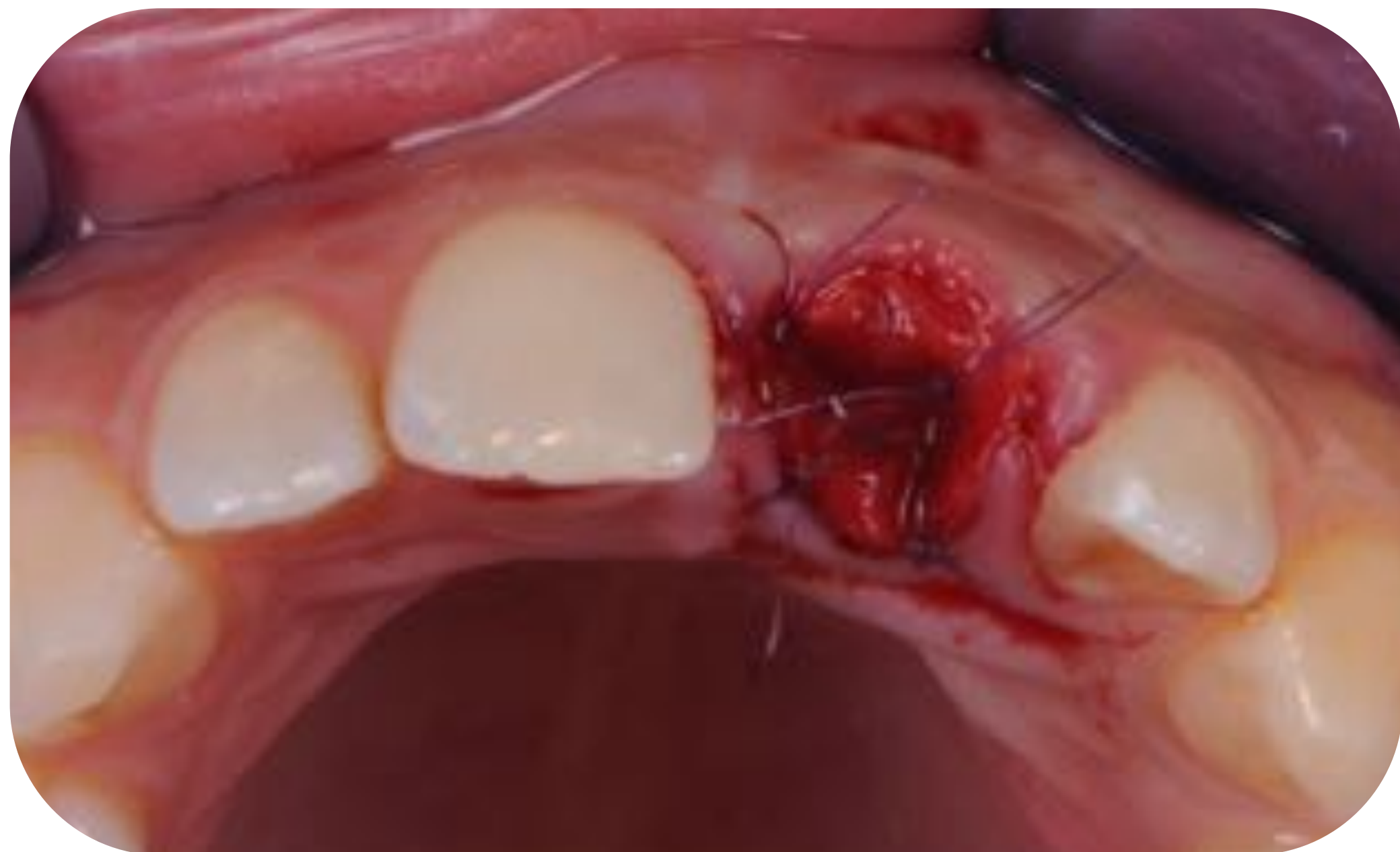
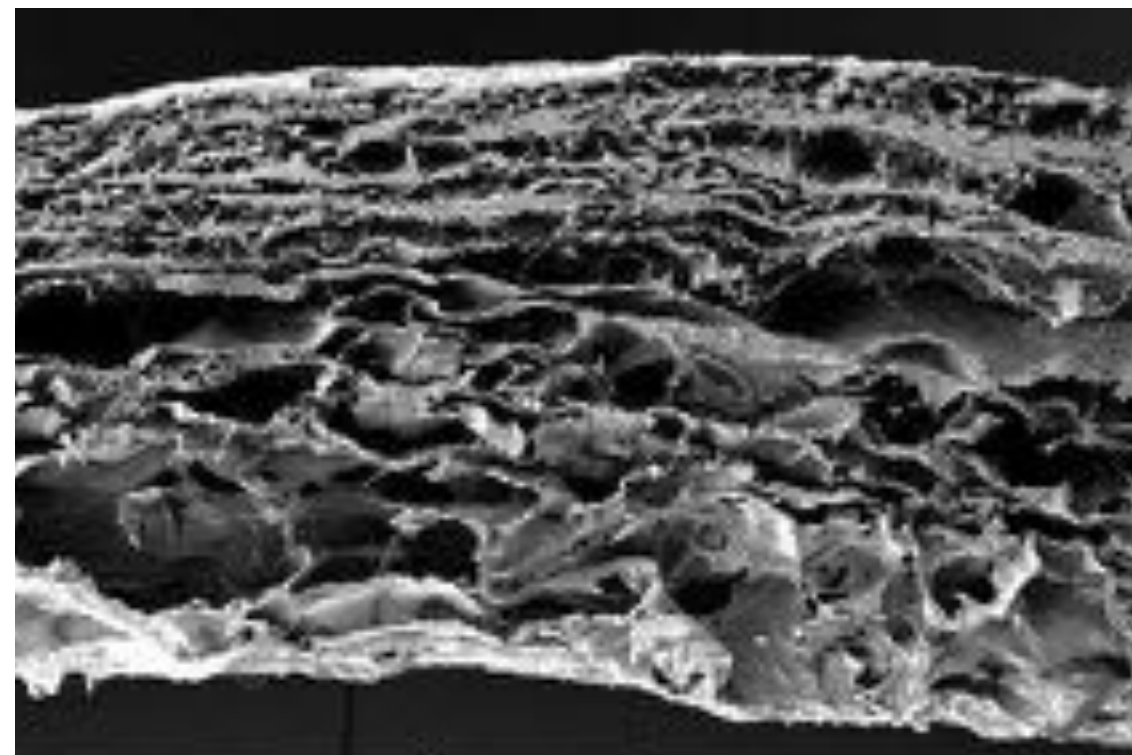
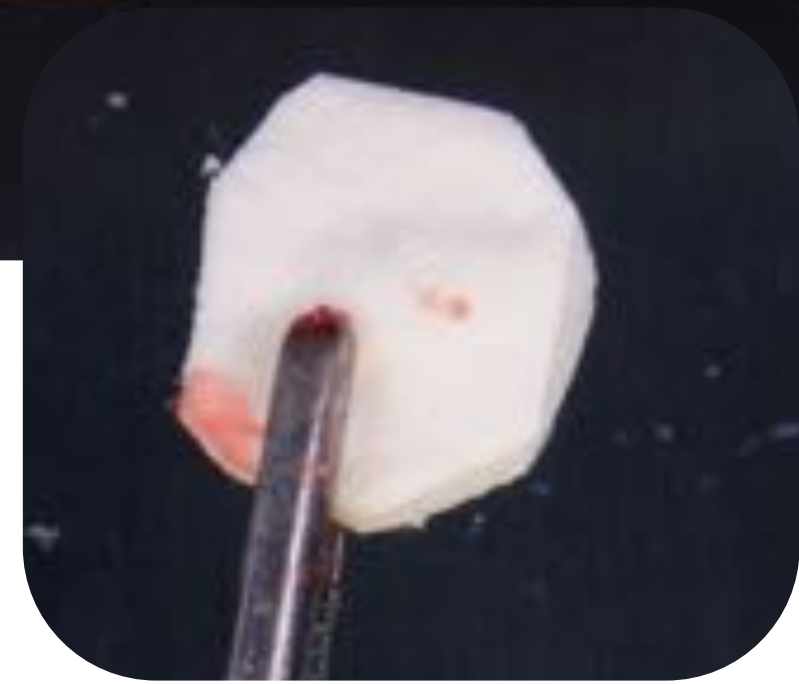
Prosthetics by dr. Casentini, Milan, Italy

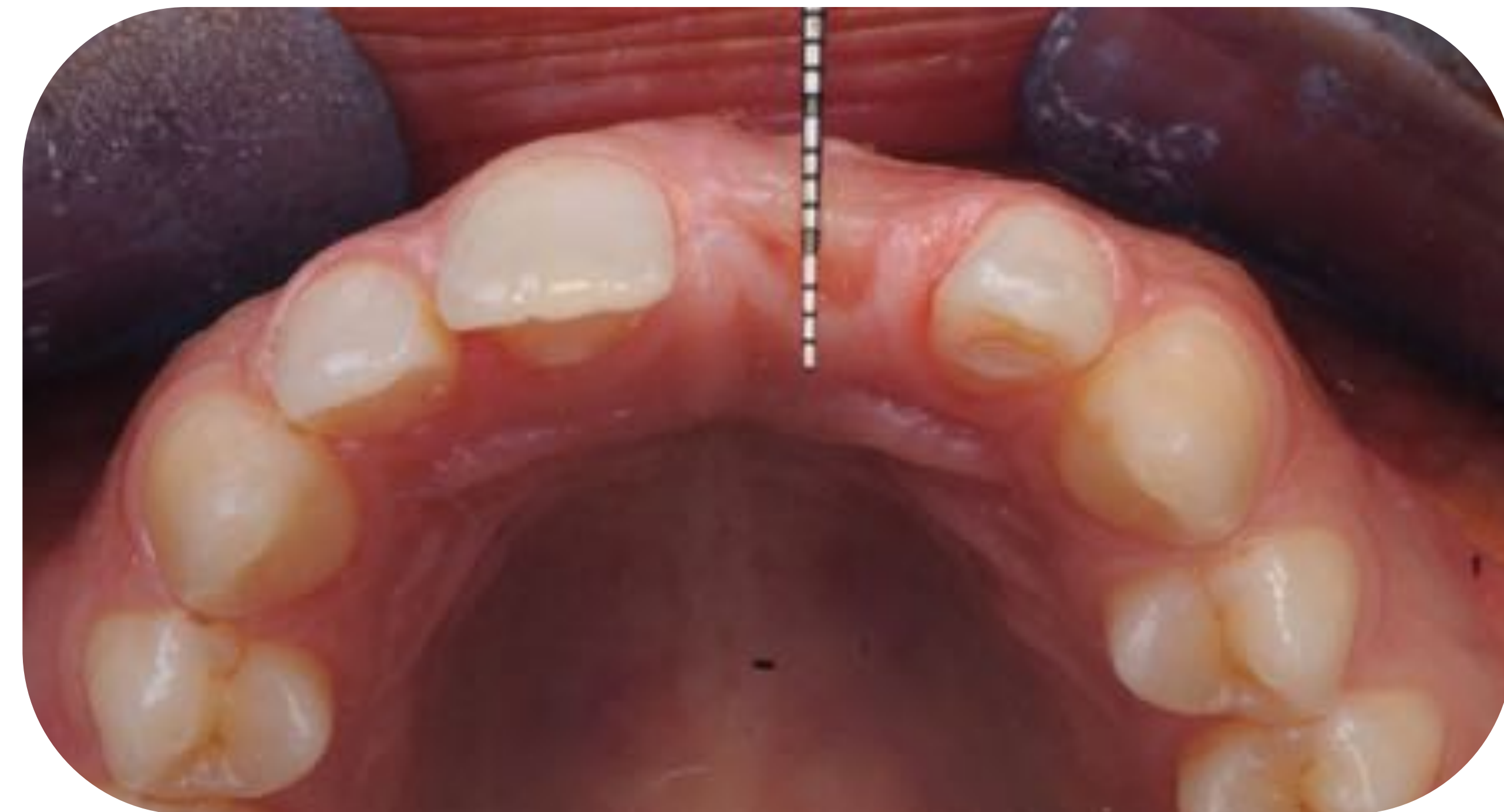
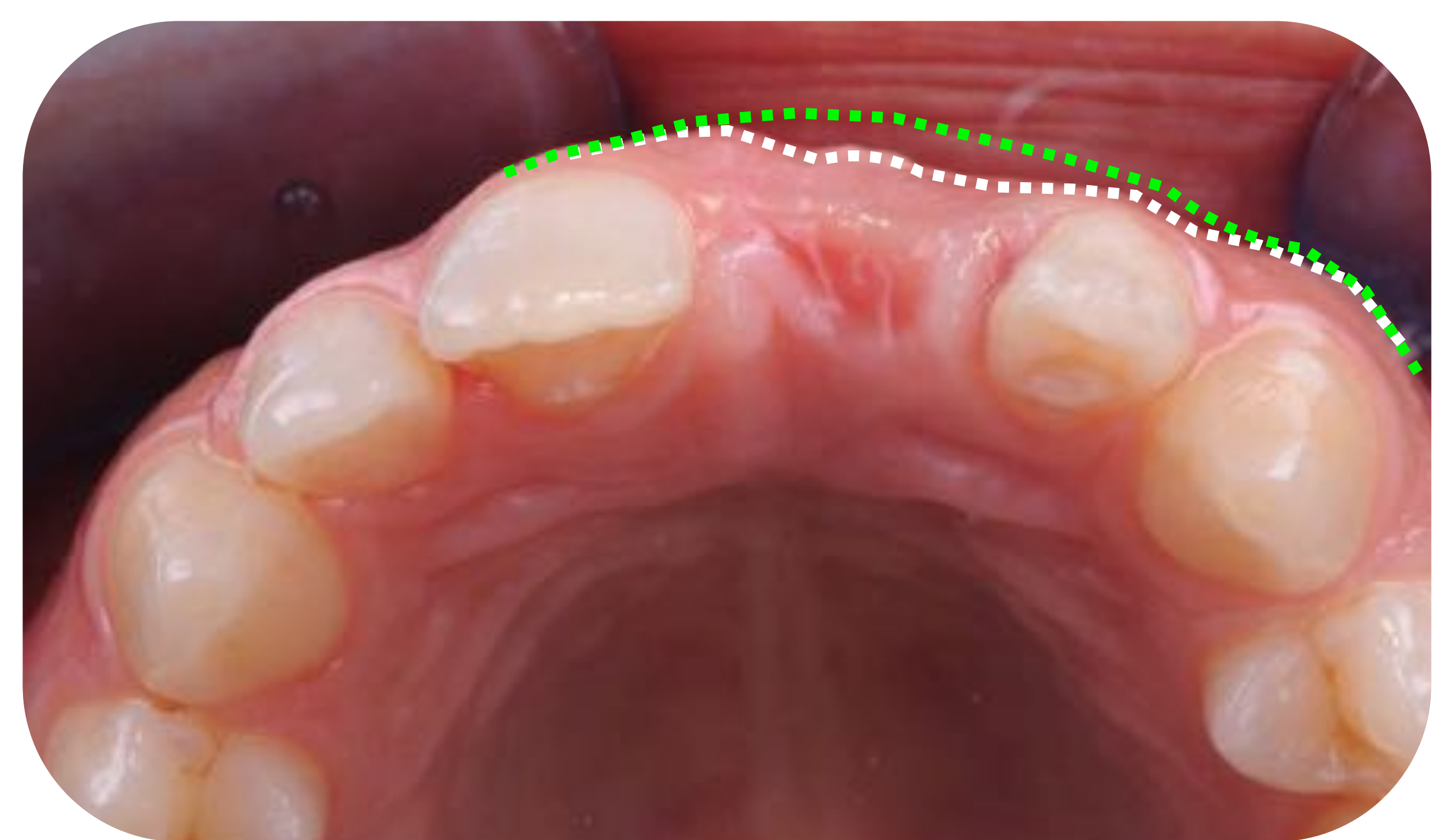
Clinical Studies on Collagen Matrices

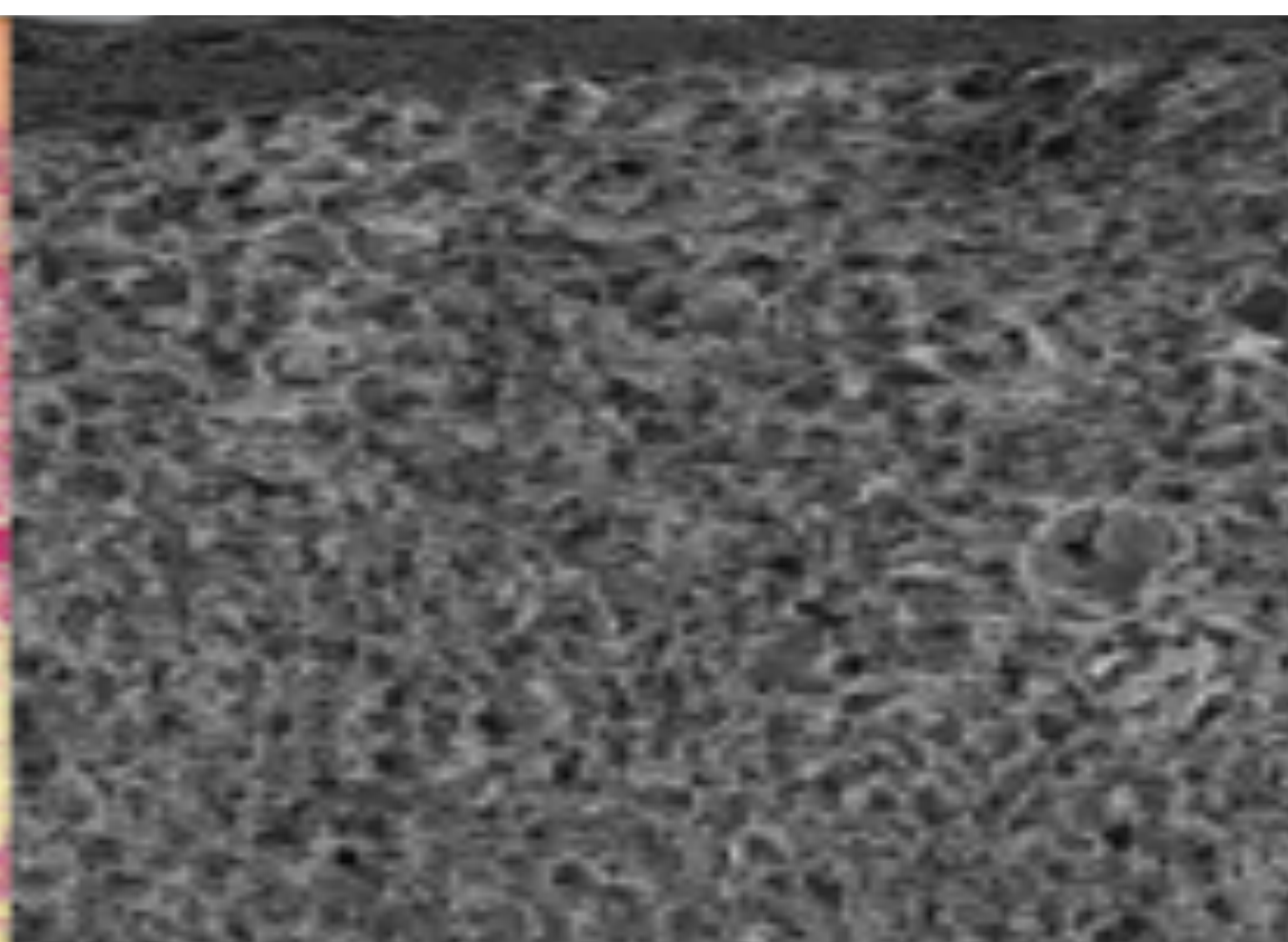
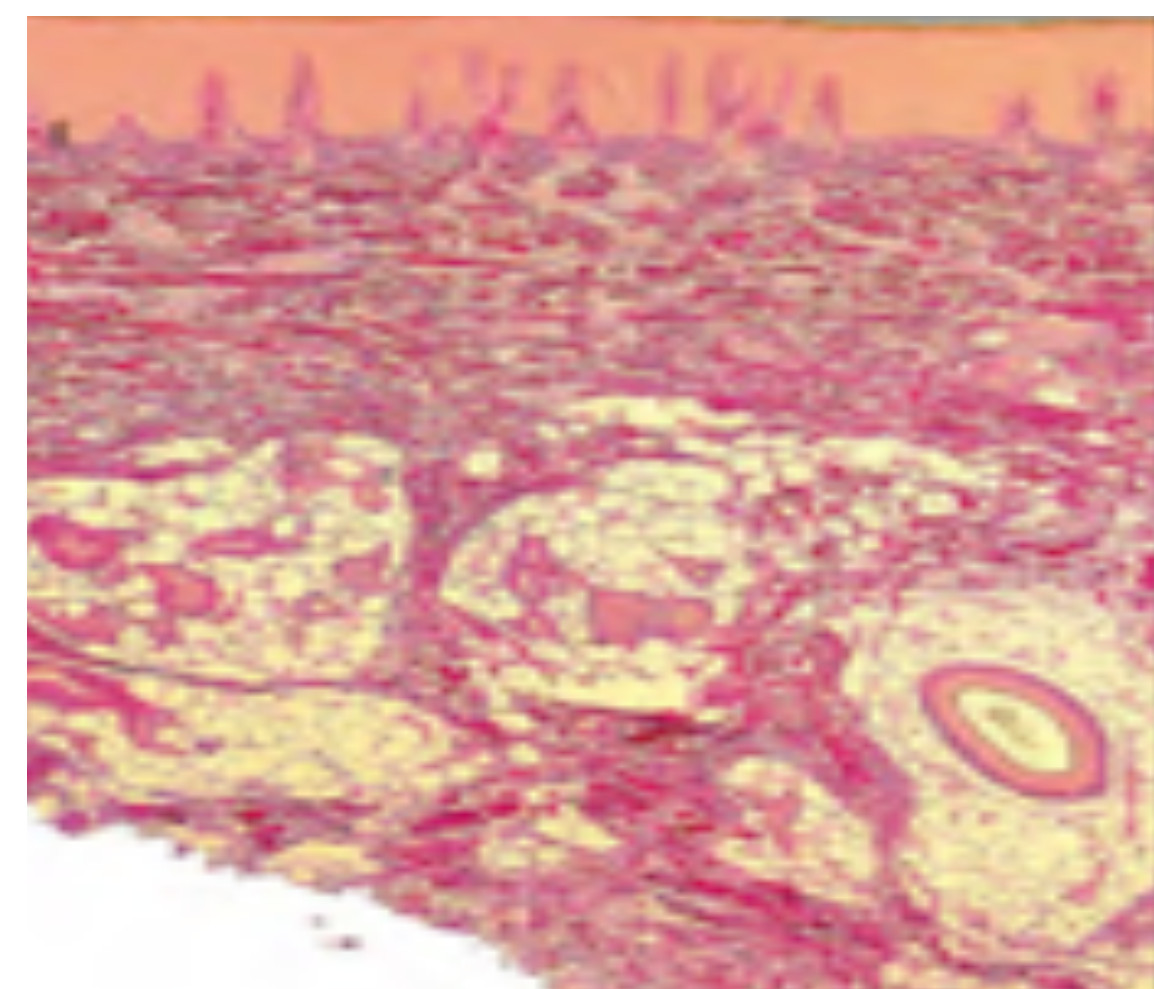
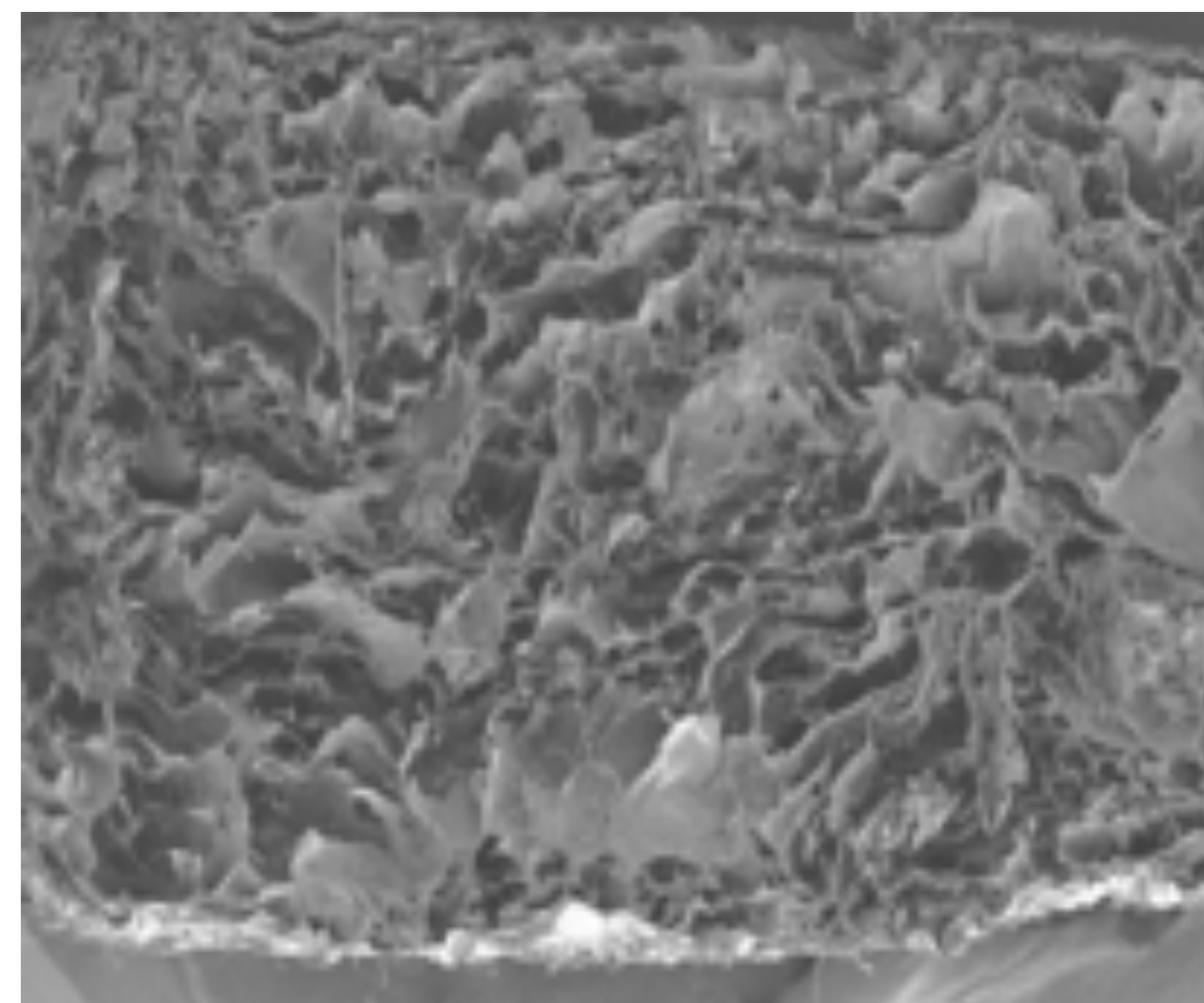
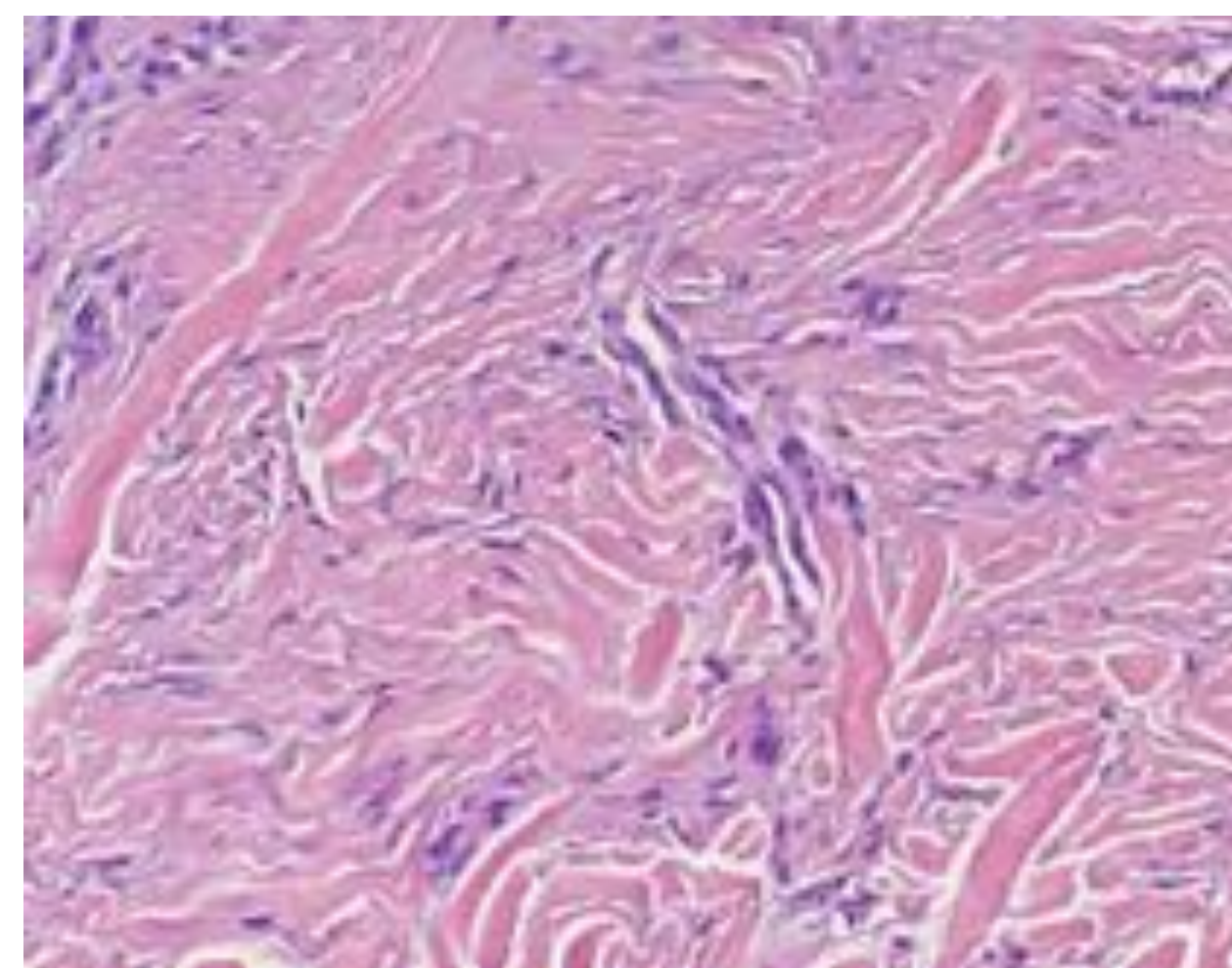
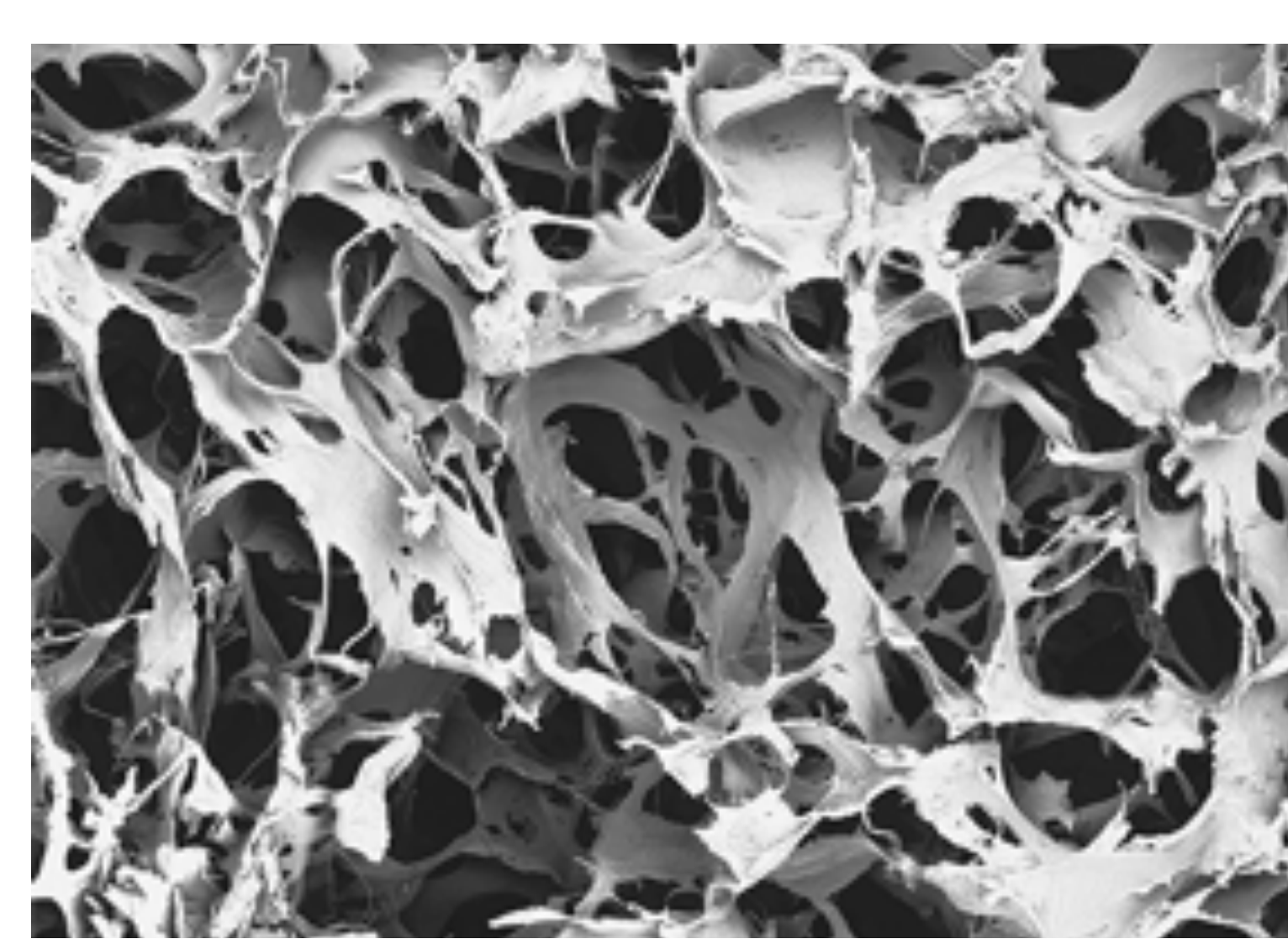
- **Thoma et al.** Randomized controlled clinical study evaluating effectiveness and safety of a volume-stable collagen matrix compared to autogenous connective tissue grafts for soft tissue augmentation at implant sites. J Clin Perio 2016: 1-12
- **Zeltner et al.** Randomized controlled clinical study comparing a volume-stable collagen matrix to autogenous connective tissue grafts for soft tissue augmentation at implant sites: linear volumetric soft tissue changes up to 3 months. J Clin Perio 2017: 44; 446-453
- **Chappuis et al.** Novel collagen matrix to increase tissue thickness simultaneous with guided bone regeneration and implant placement in esthetic implant sites: a feasibility study. Int J perio and Rest Dent 2018: 38:575-582
- **Huber et al.** Non-interventional 1-year follow-up study of peri-implant soft tissues following previous soft tissue augmentation and crown insertion in single tooth gaps. J Clin Perio 2018: 1-19











● **Thoma et al.** Randomized controlled clinical study evaluating effectiveness and safety of a volume-stable collagen matrix compared to autogenous connective tissue grafts for soft tissue augmentation at implant sites. *J Clin Perio* 2016: 1-12

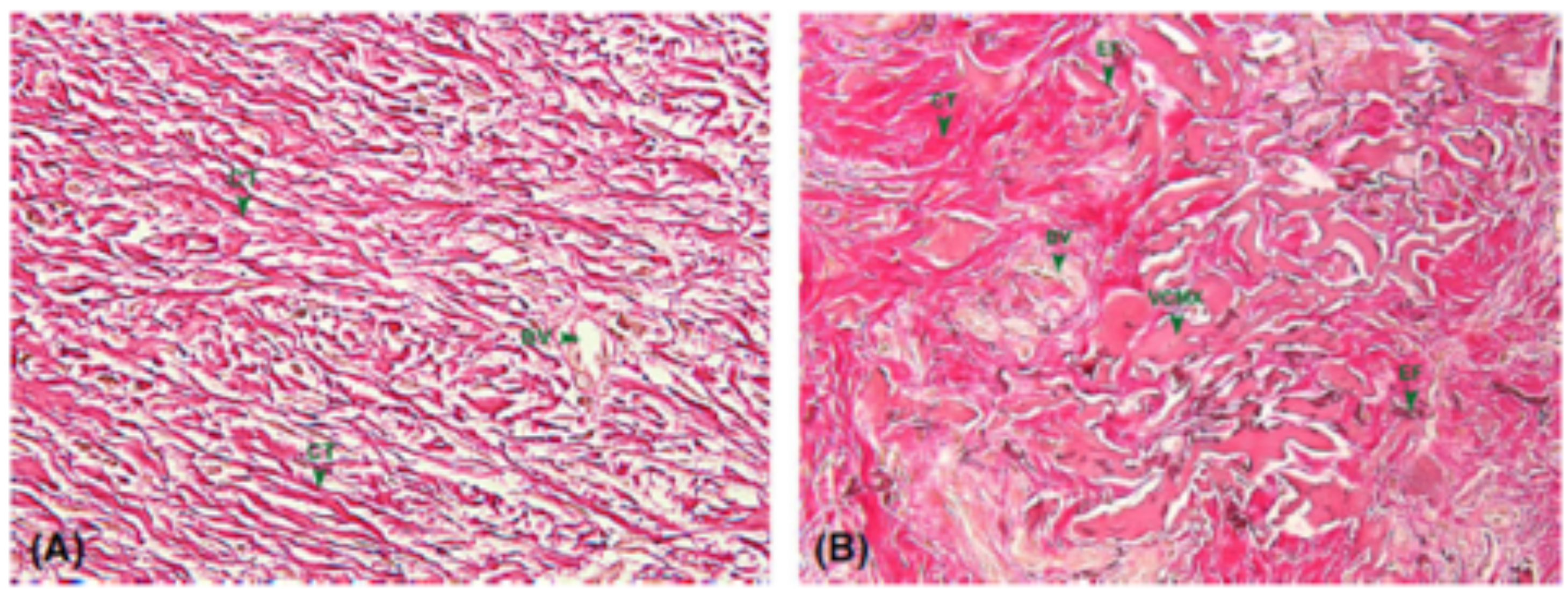
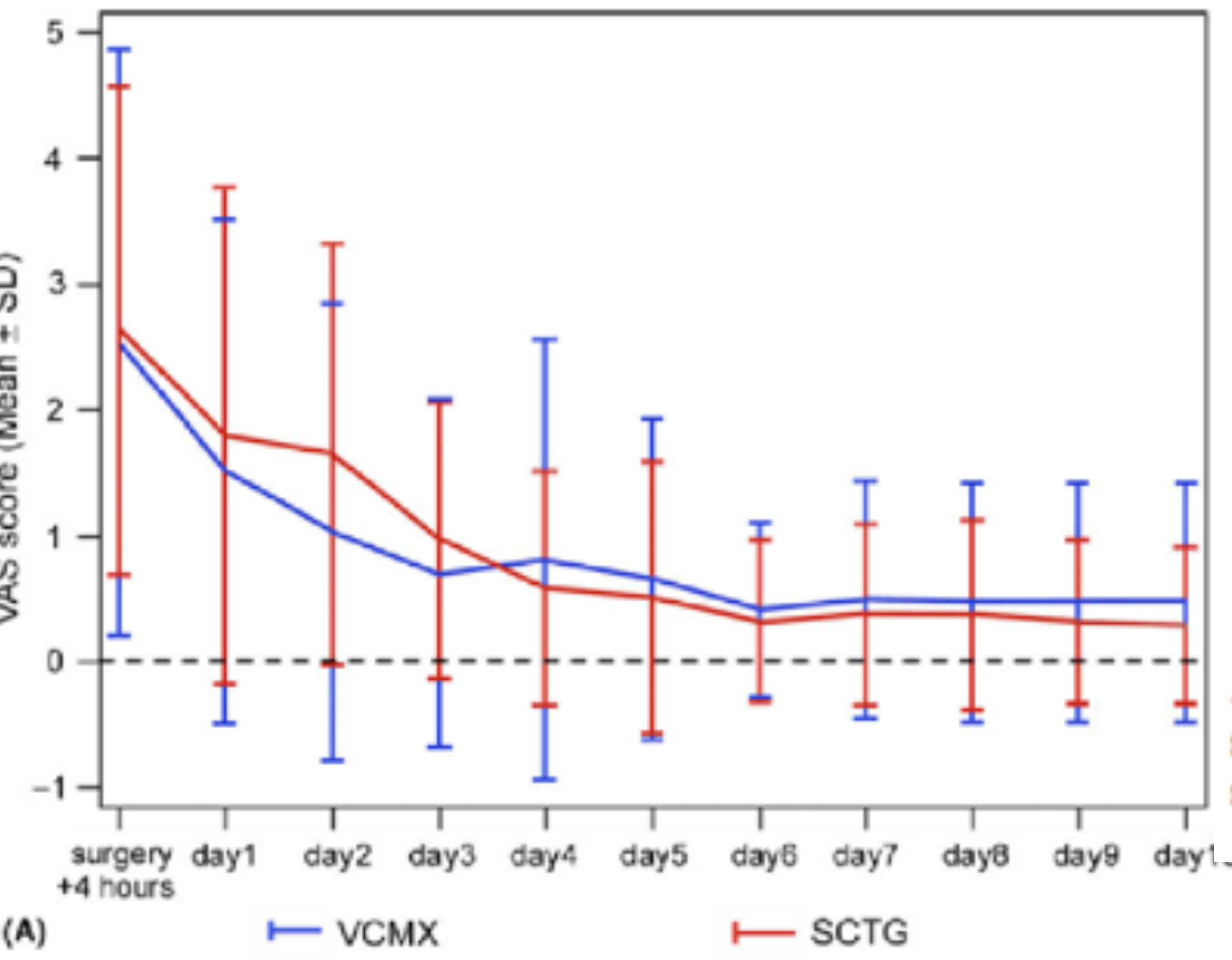
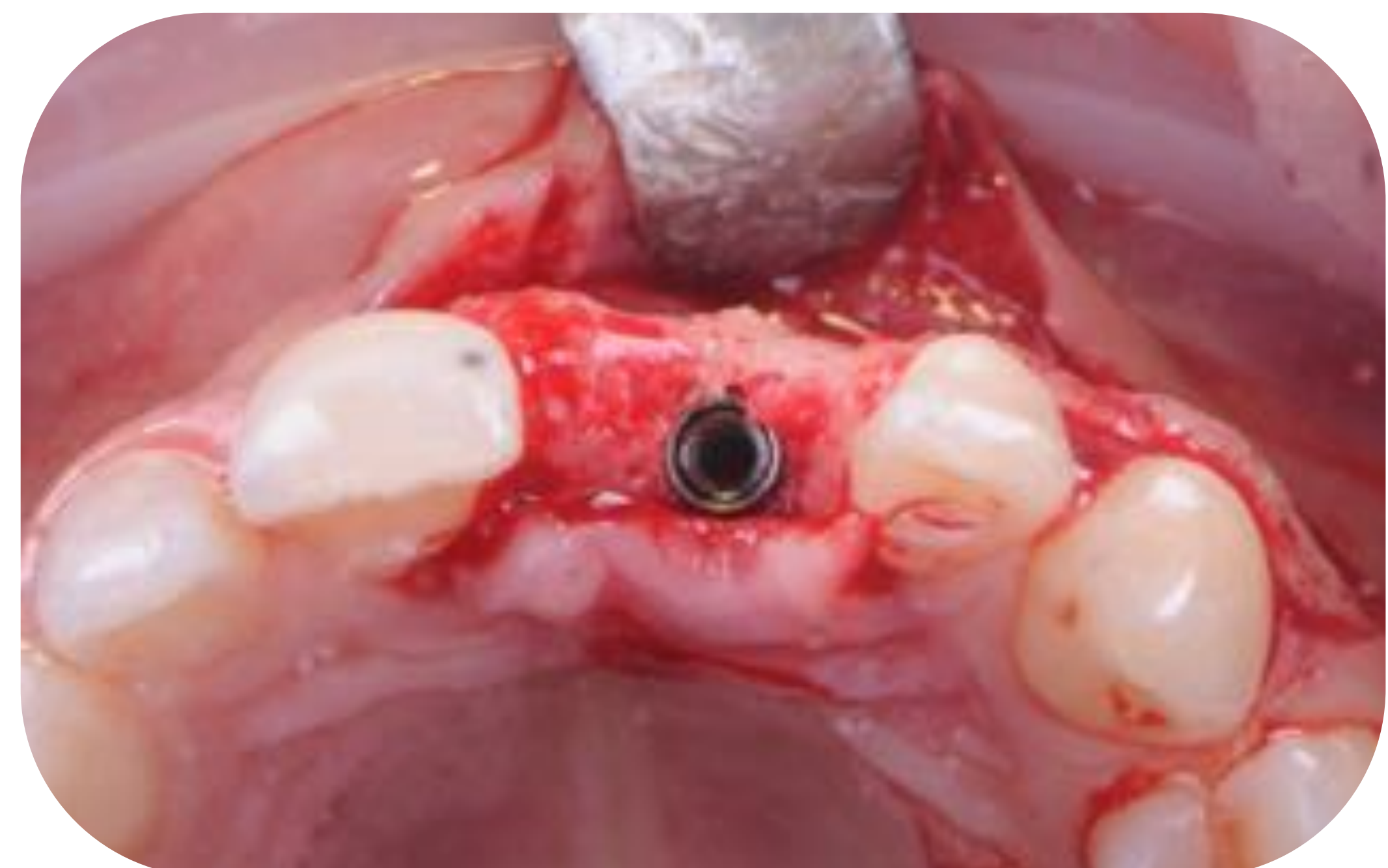
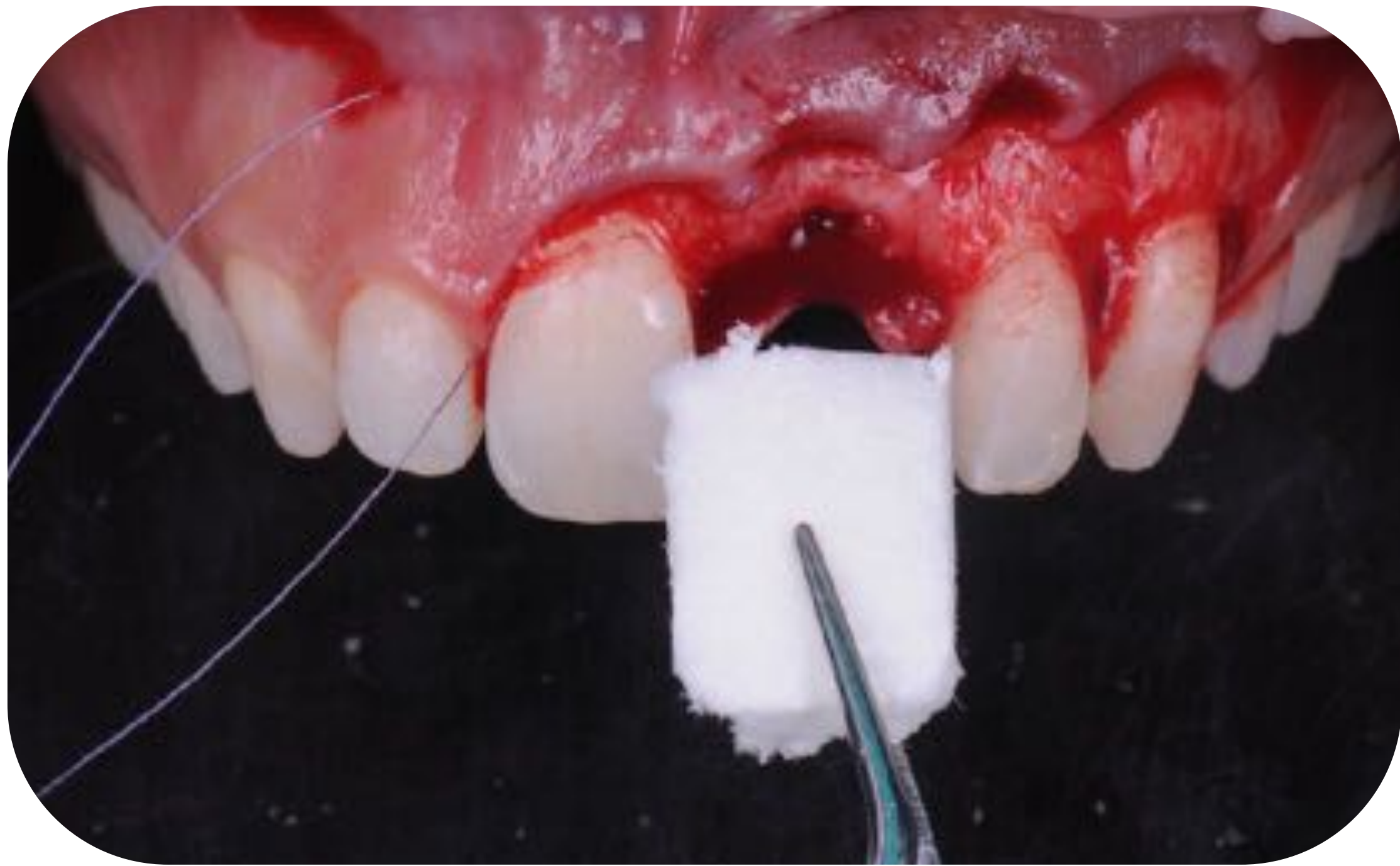


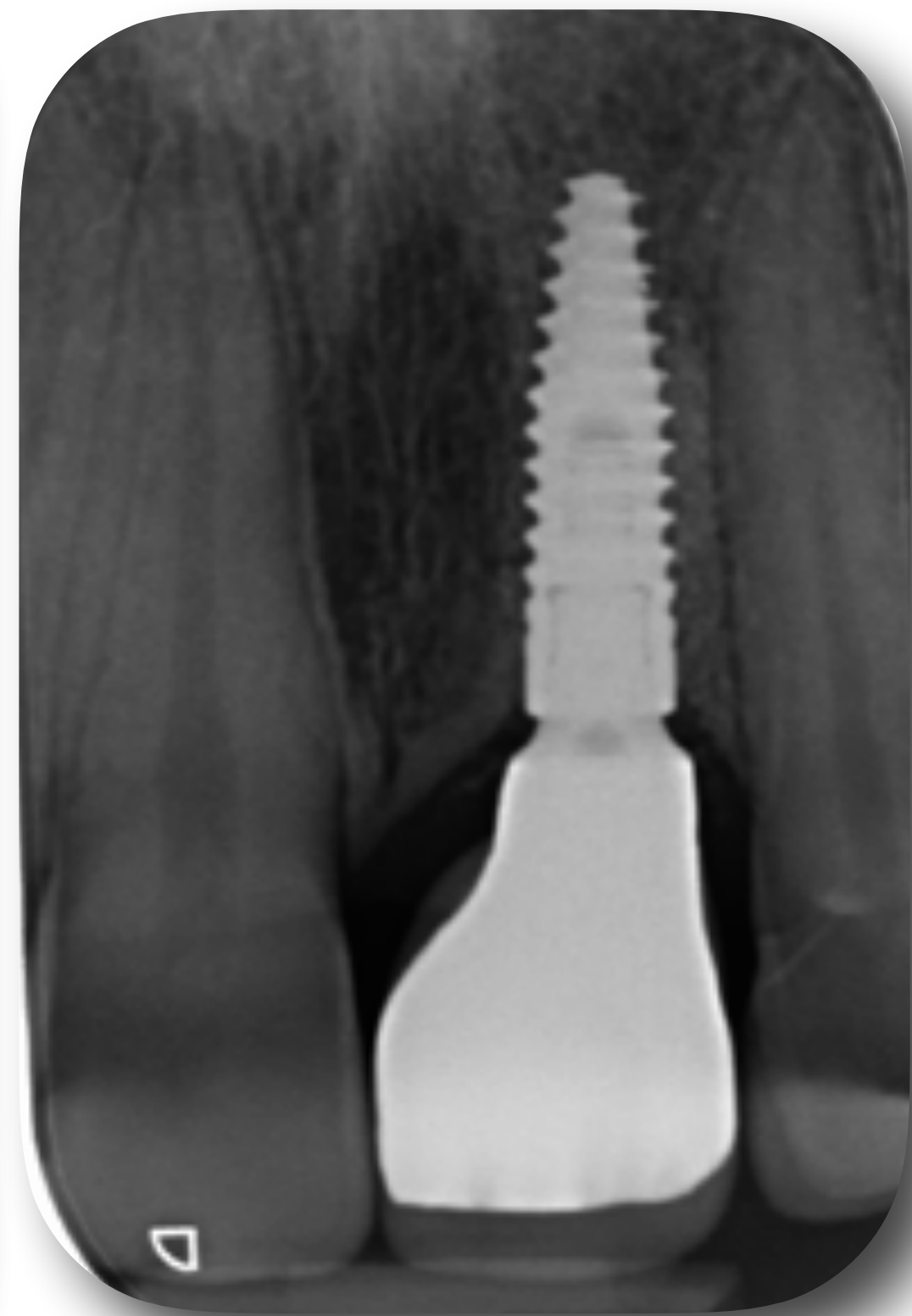
Fig. 5. Histological section (Van Gieson-Elastica, ×500 magnification). (A) SCTG, subepithelial connective tissue graft; (B) VCMX, collagen matrix; CT, connective tissue; EF, elastic fibre; BV, blood vessel.

The use of the 3-D stable collagen matrix and the sub-epithelial connective tissue graft for soft tissue augmentation at implant sites rendered a similar gain in soft tissue volume.

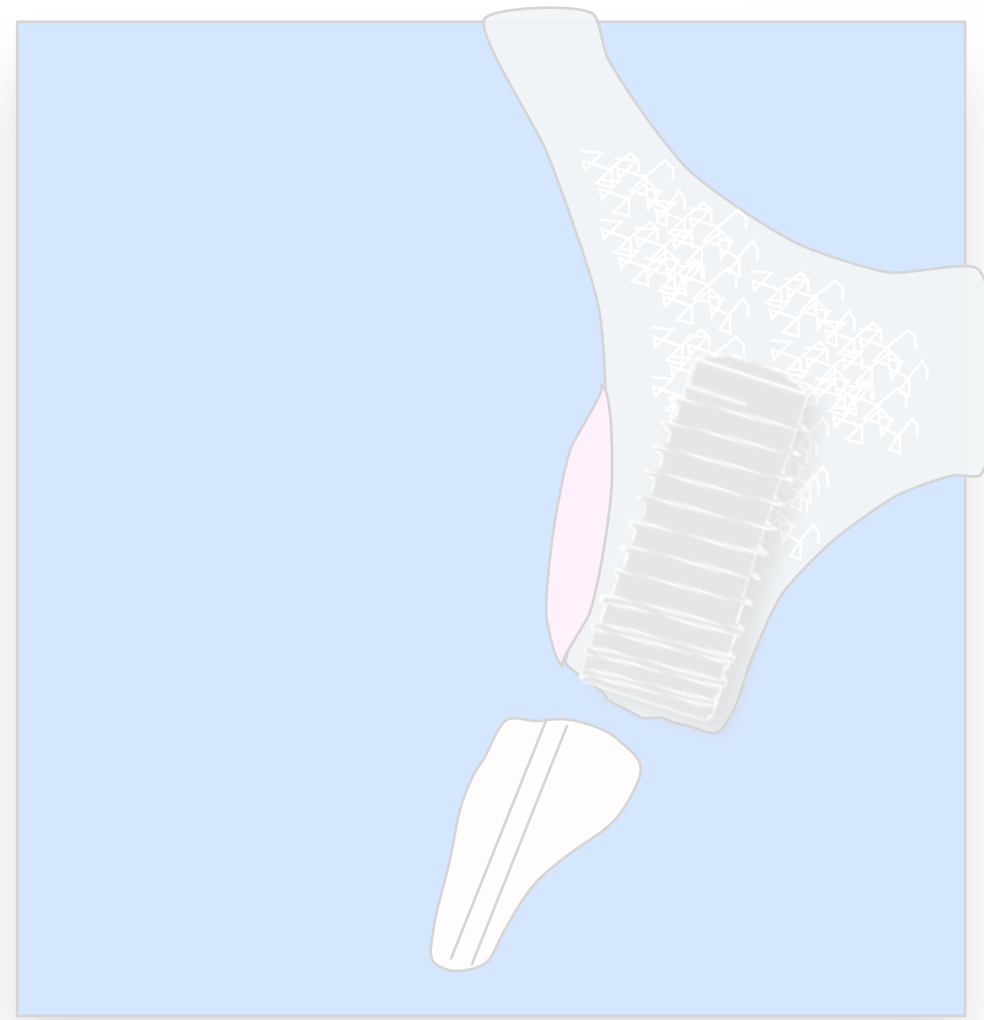






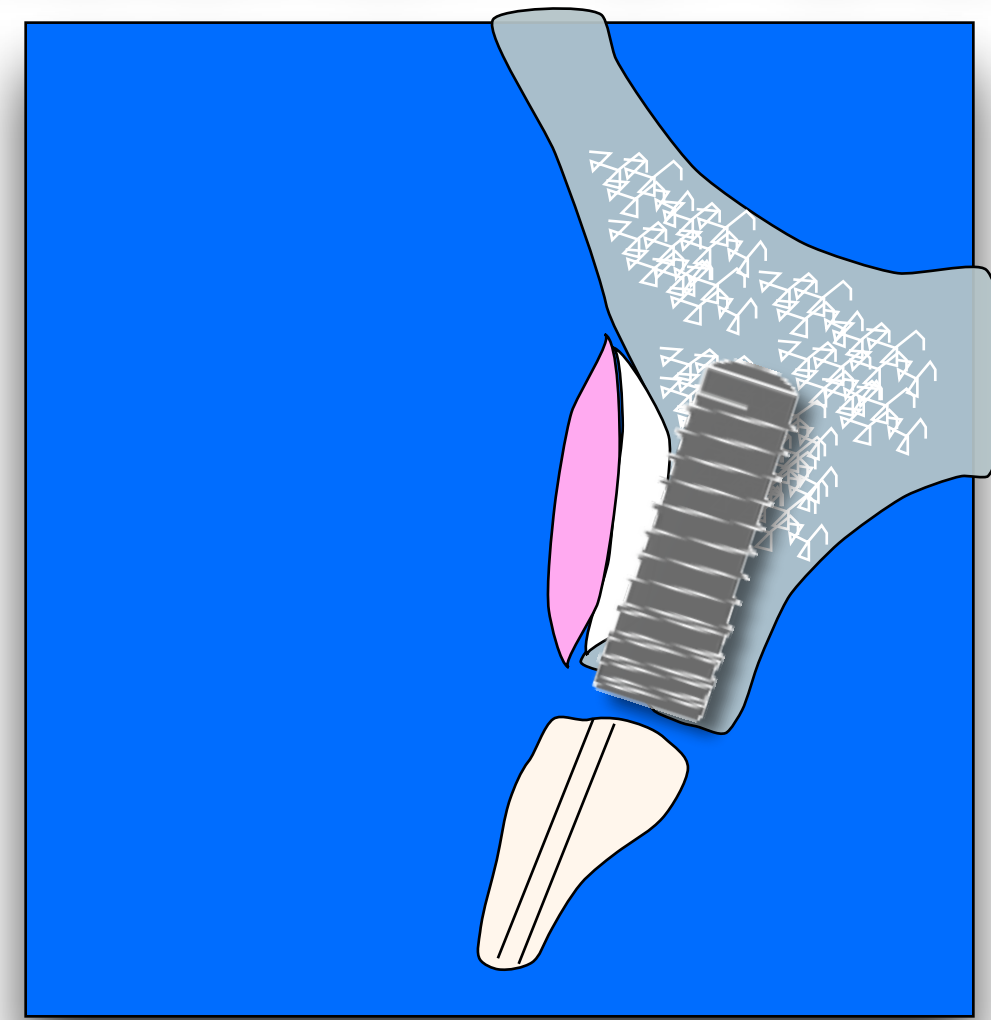


Classification of Defects in Different Classes



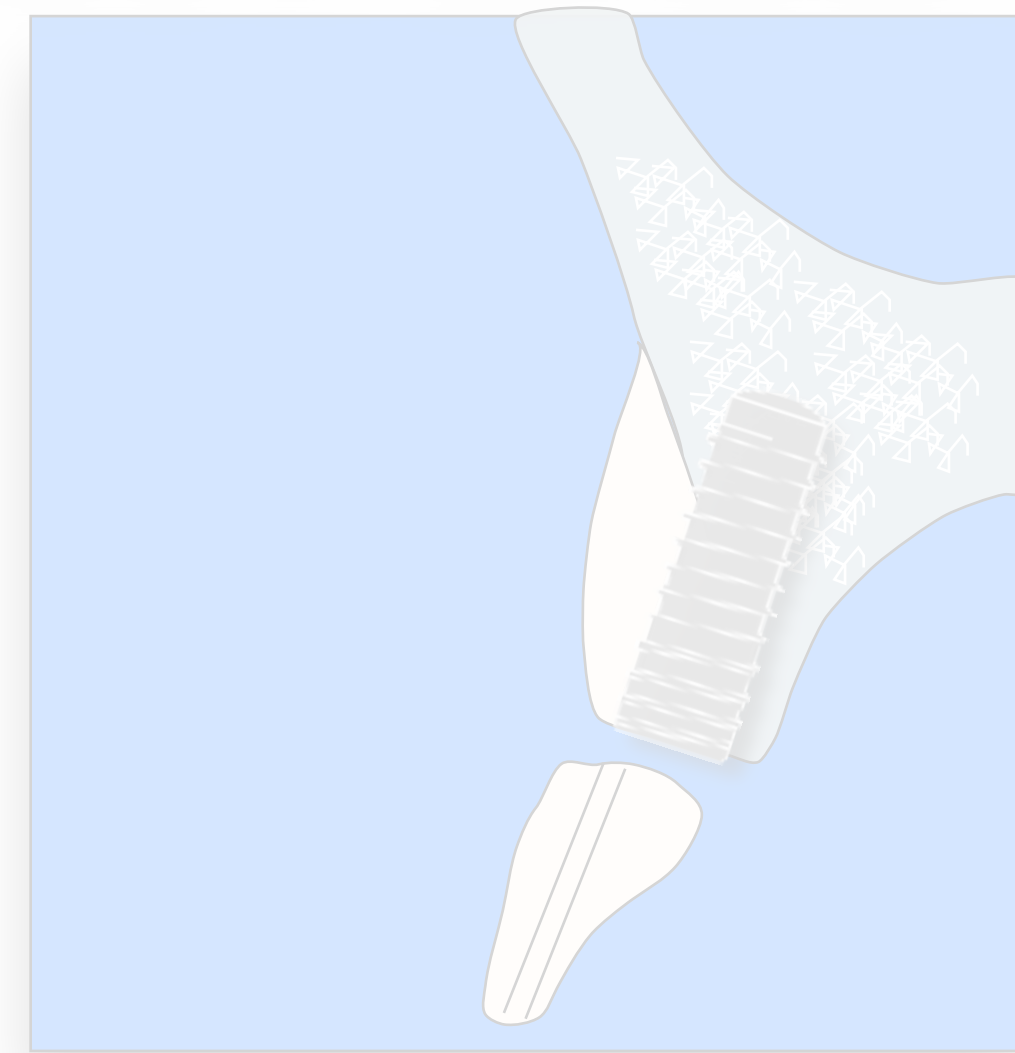
CLASS I

Implant completely embedded in bone - only "esthetic" needs



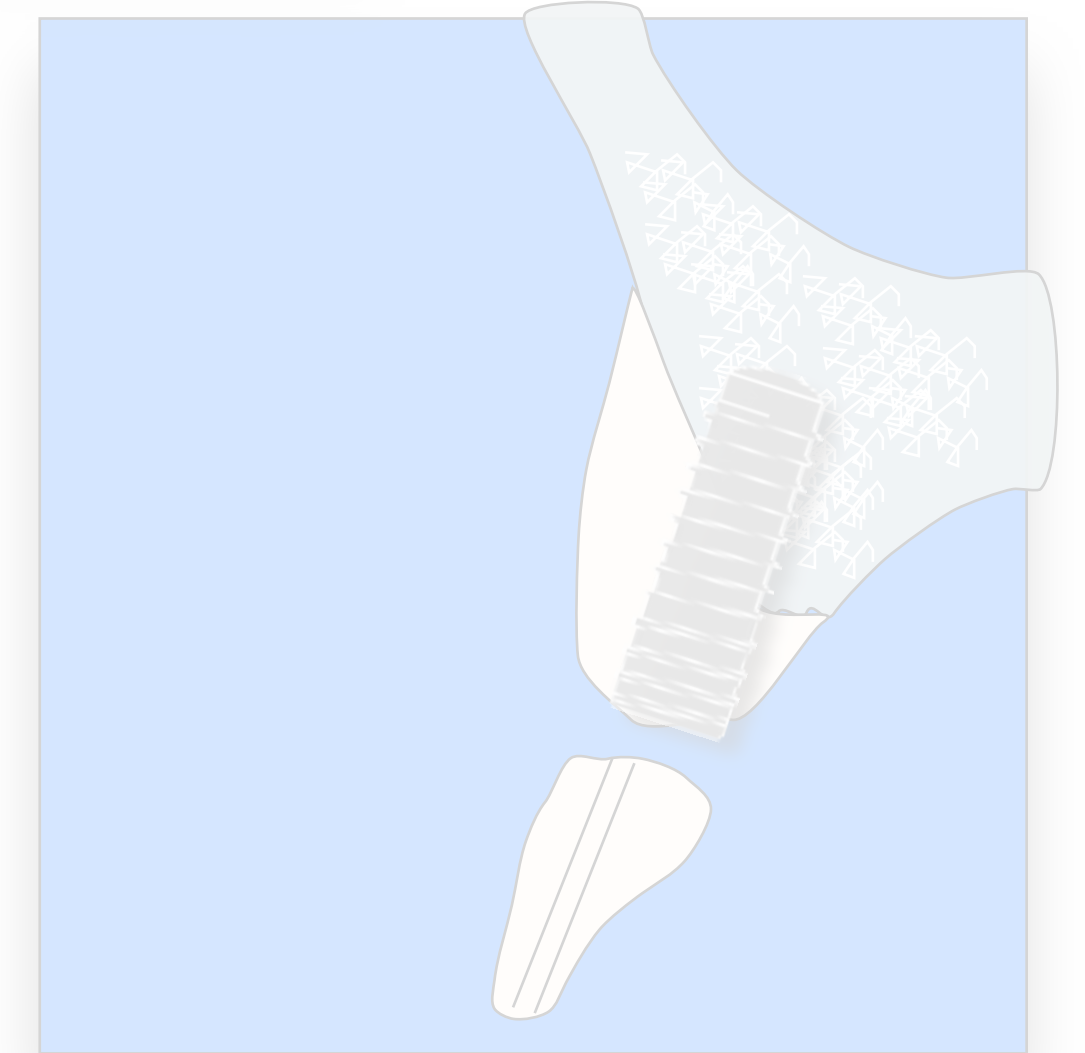
CLASS II

Implant partially exposed, but with possible placement - grafting needed



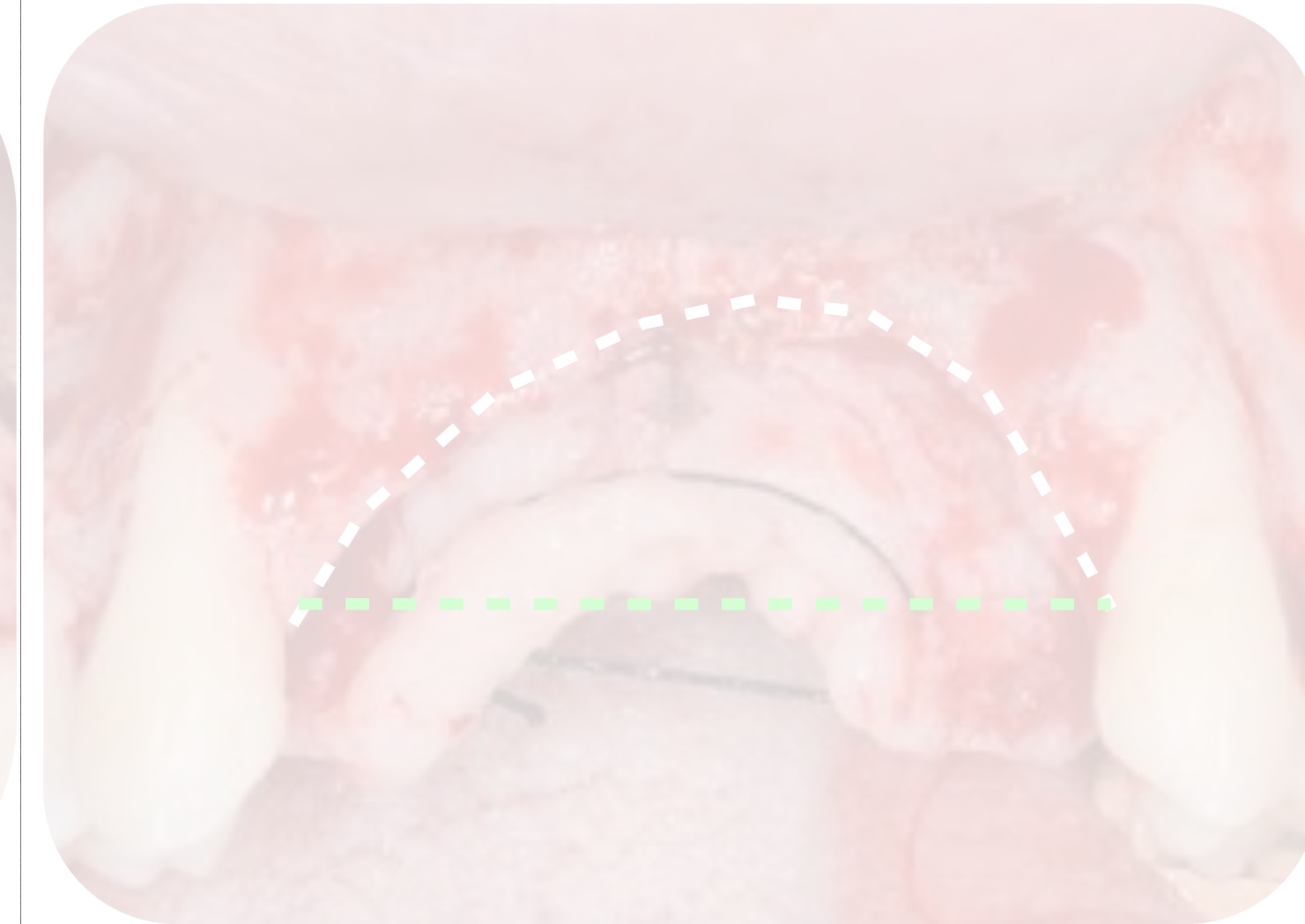
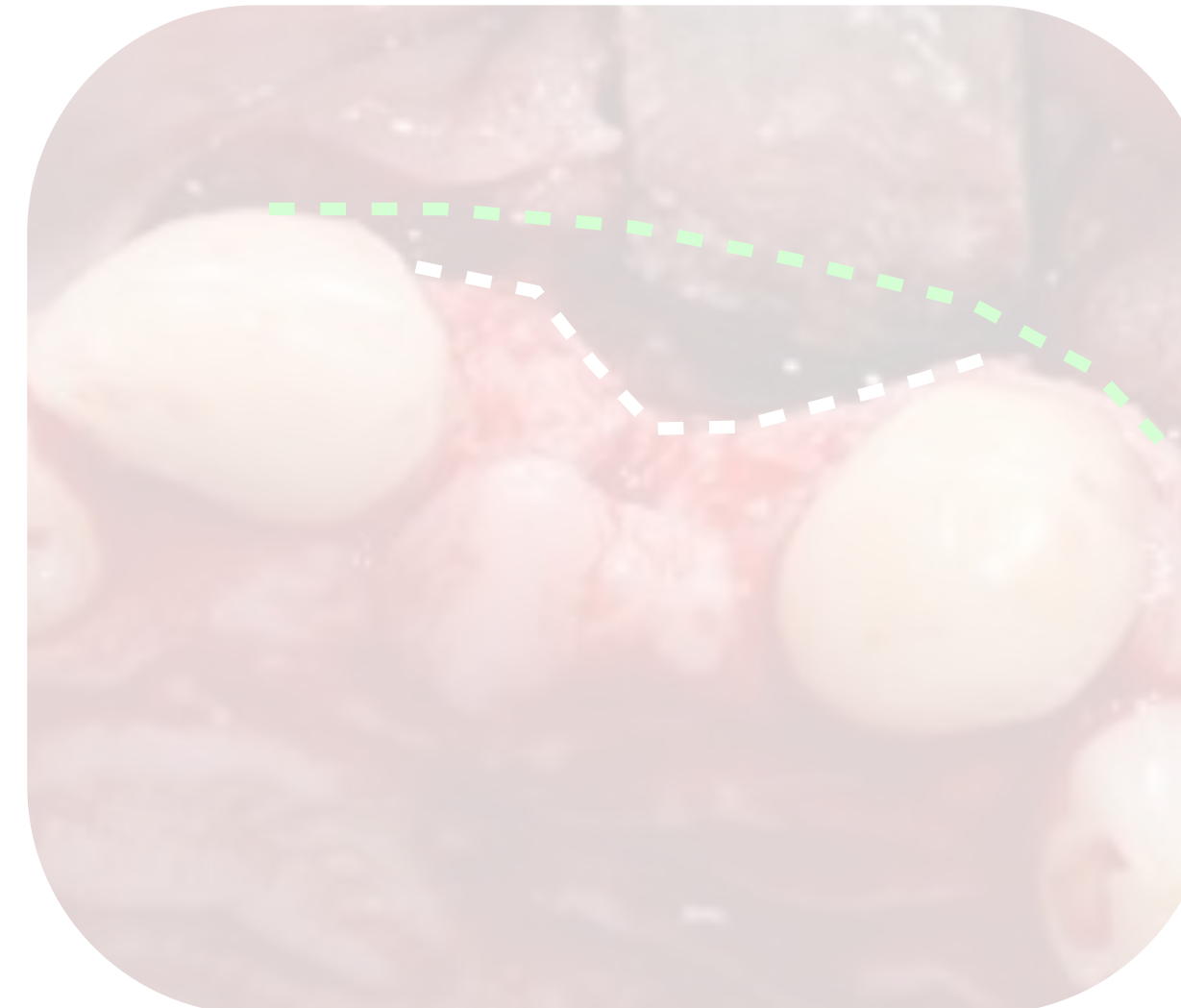
CLASS III

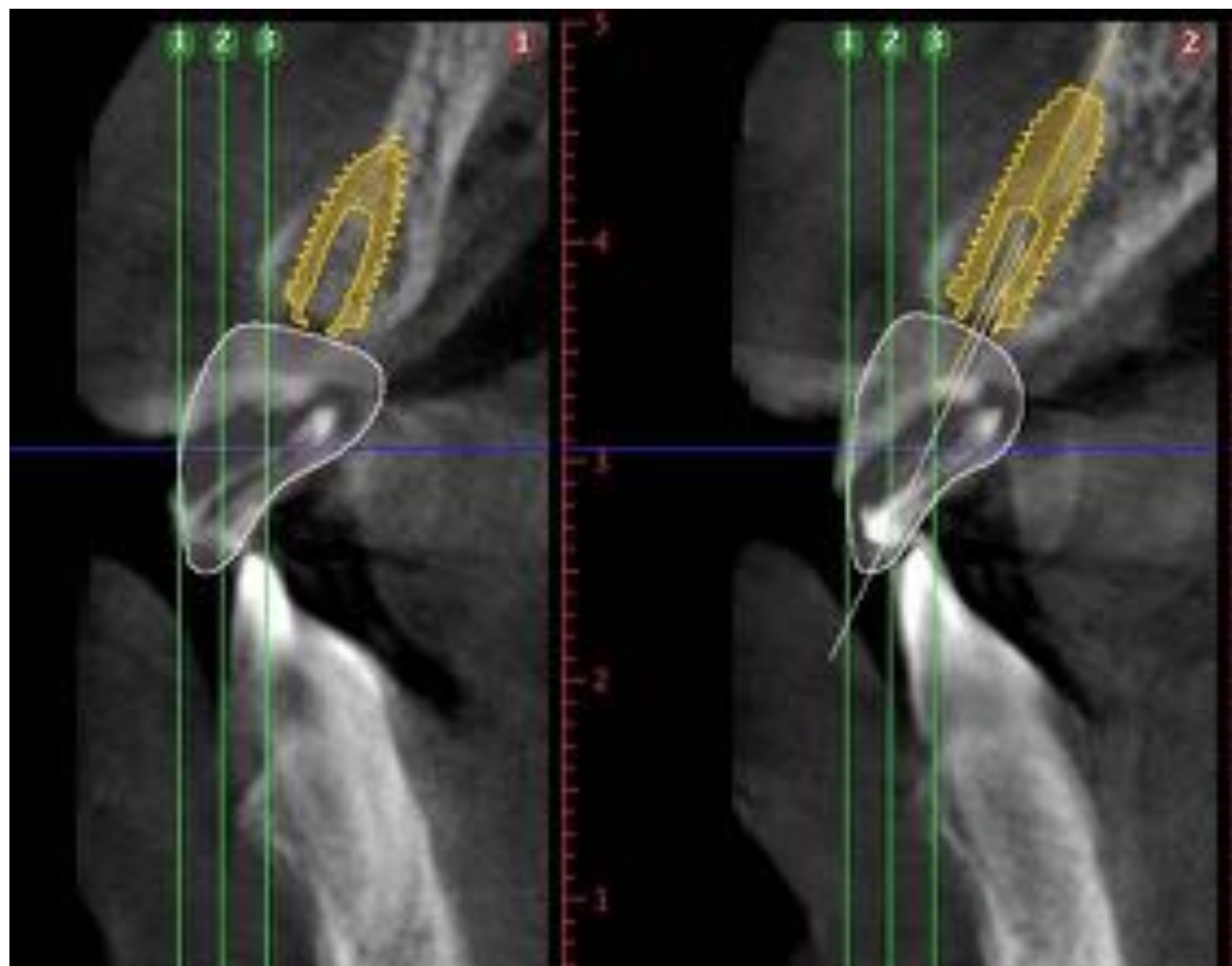
Relevant horizontal resorption - grafting needed with delayed implant placement



CLASS IV

Relevant horizontal and vertical resorption - grafting needed with delayed implant placement





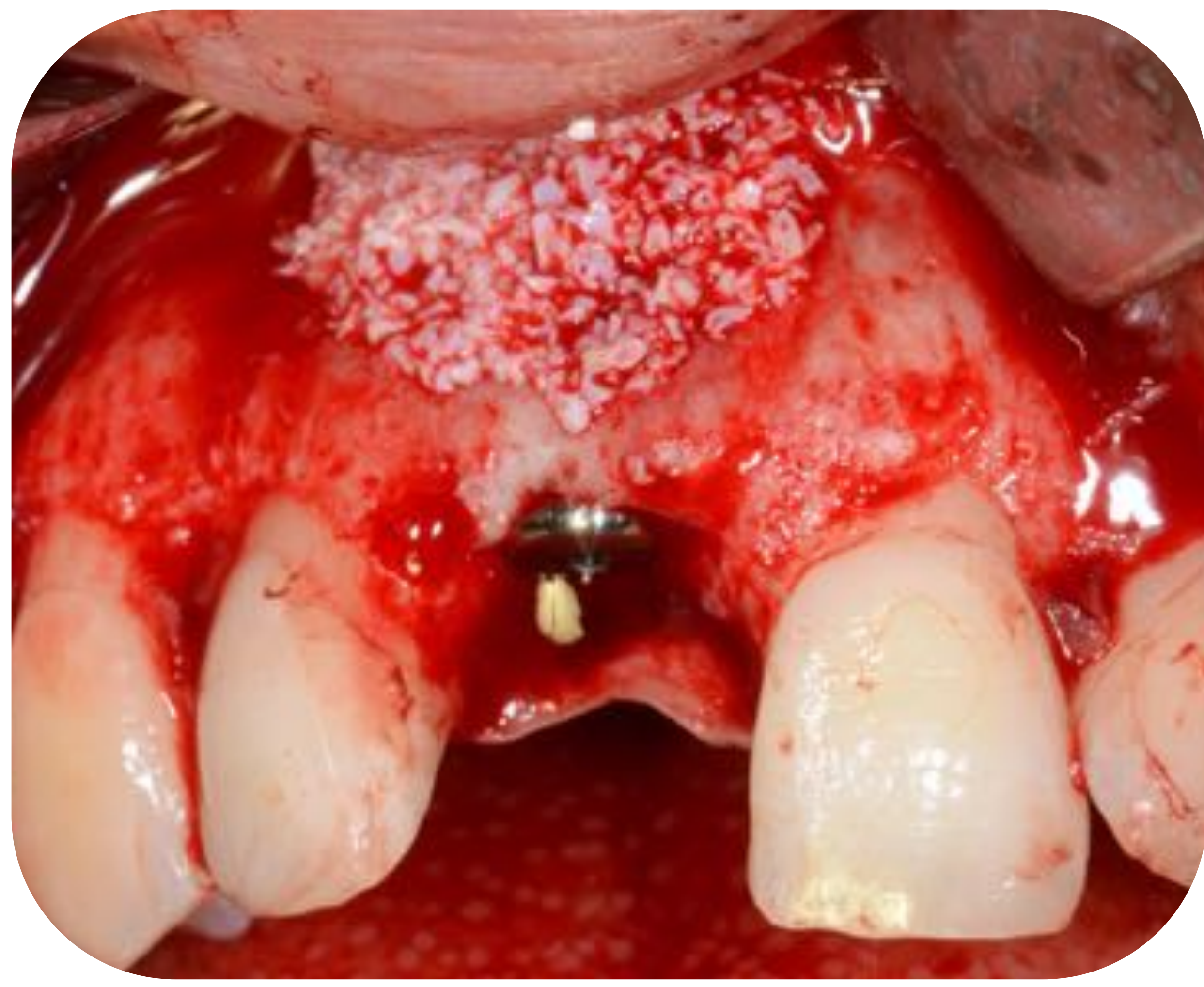
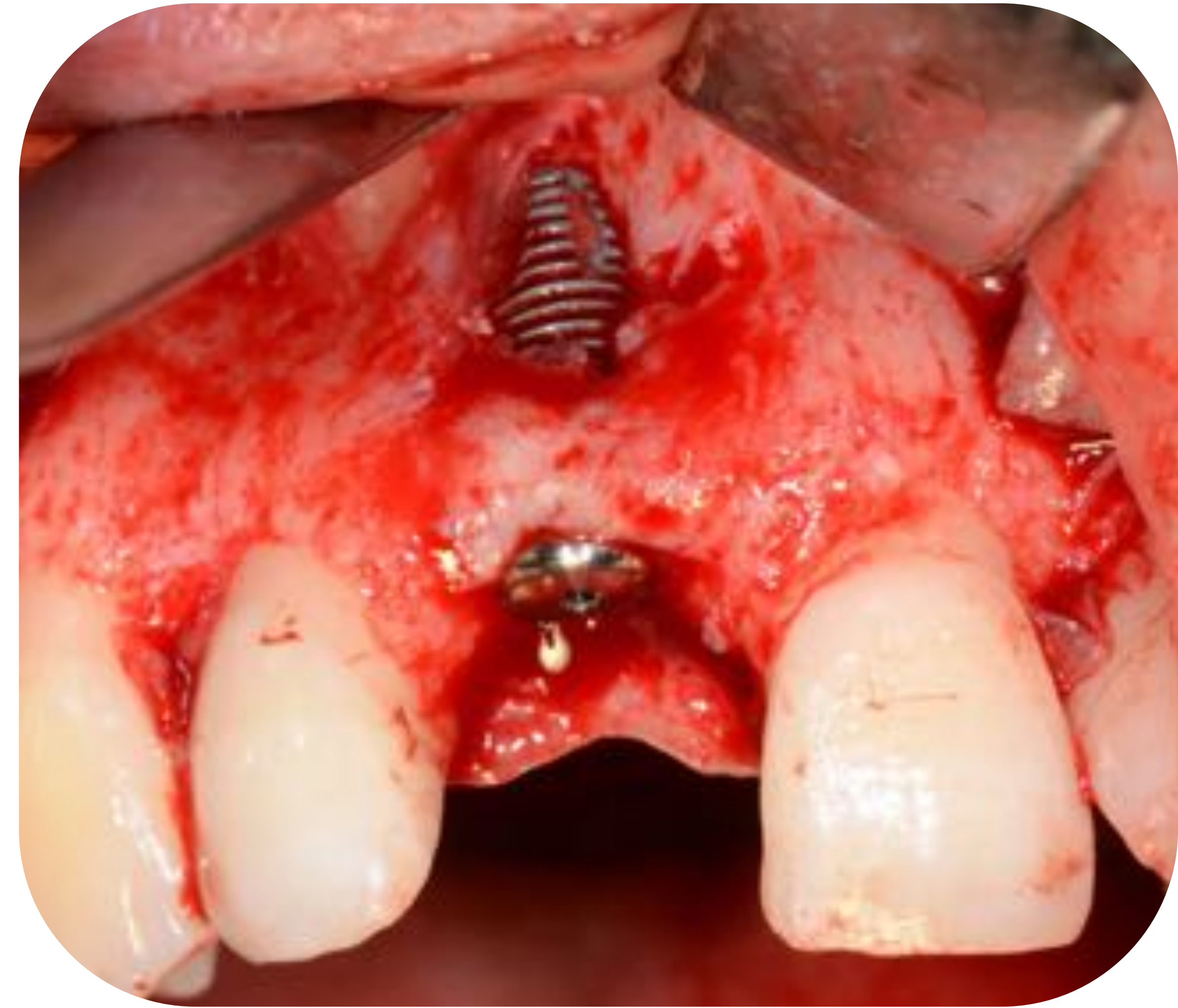
To cite this article:

Chiapasco M, Zaniboni M. Clinical outcomes of GBR procedures to correct peri-implant dehiscences and fenestrations: a systematic review.

Clin. Oral Impl. Res. 20 (Suppl. 4), 2009; 113–123.

doi: 10.1111/j.1600-0501.2009.01781.x

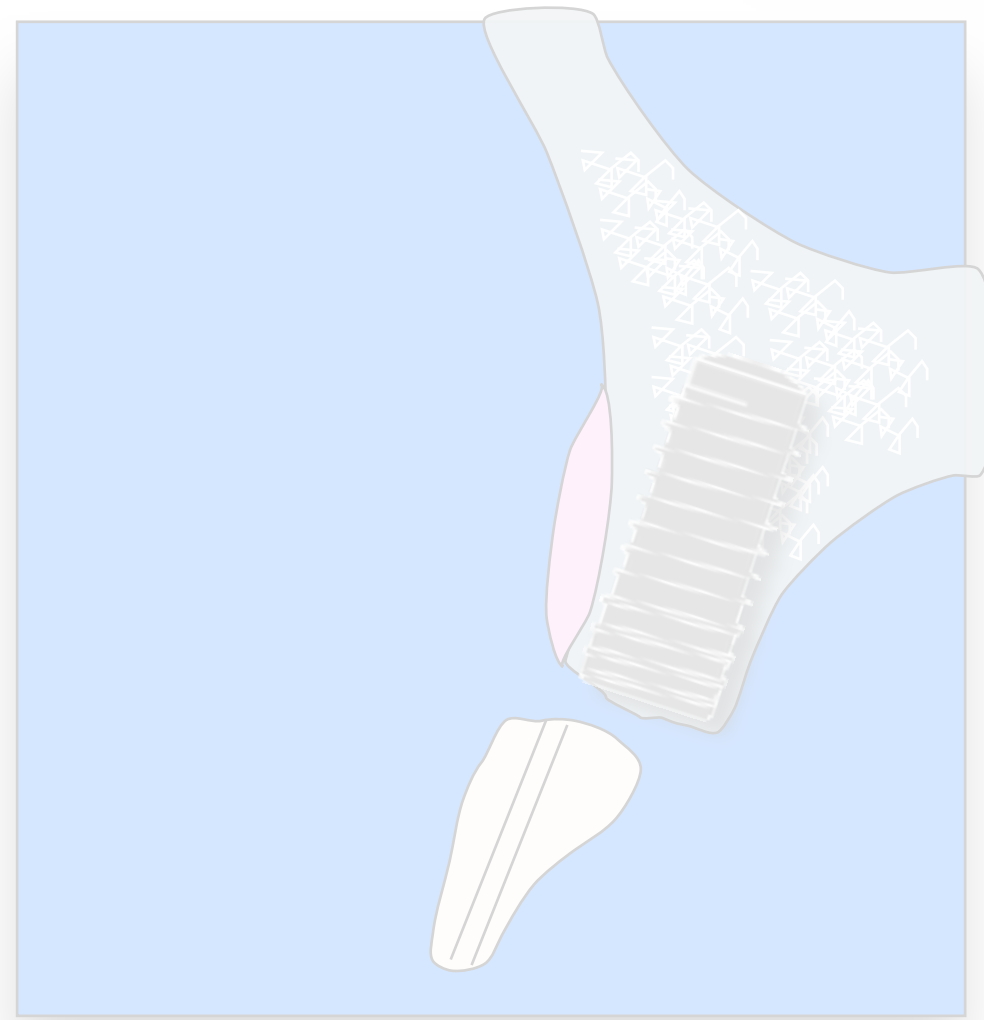
Conclusion: Despite the favorable results obtained, it was difficult to draw a significant conclusion as far as the more reliable grafting material and membrane barrier for the correction of dehiscence/fenestration defects are concerned, due to the limited sample of patients and the wide variety of grafting materials and membranes, used alone or in combination. Moreover, due to the lack of randomized clinical trials, it was impossible to demonstrate that such augmentation procedures are actually needed to allow the long-term survival of implants.





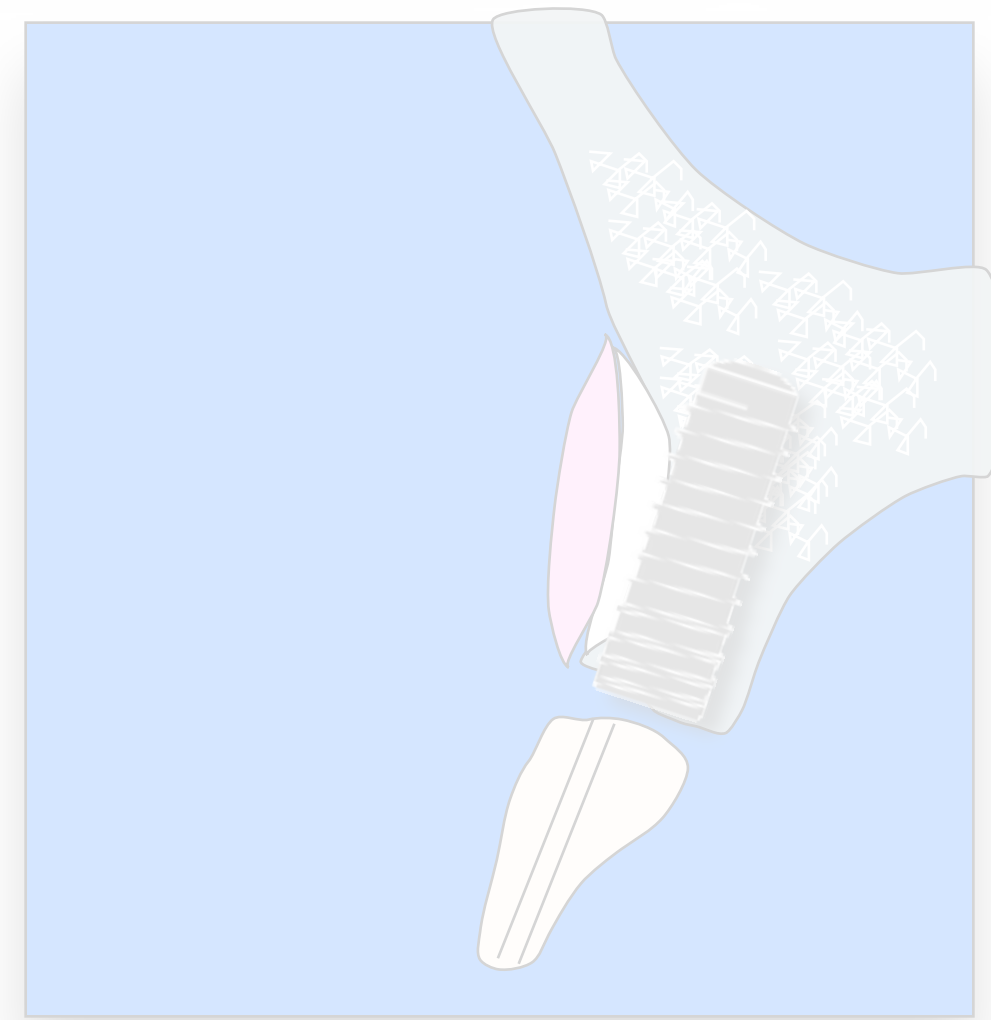
Prosthetics by dr. Procopio
Milan, Italy

Classification of Defects in Different Classes



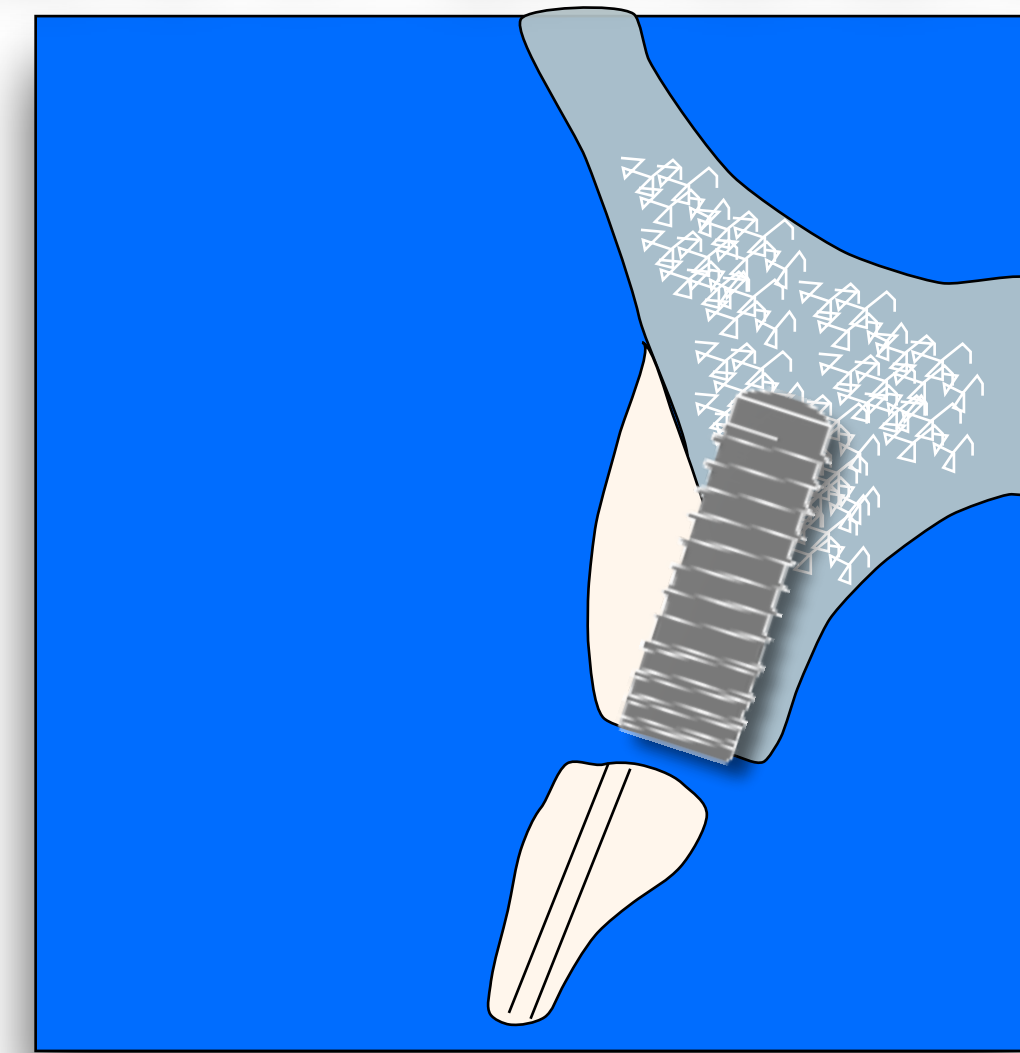
CLASS I

Implant completely embedded in bone - only "esthetic" needs



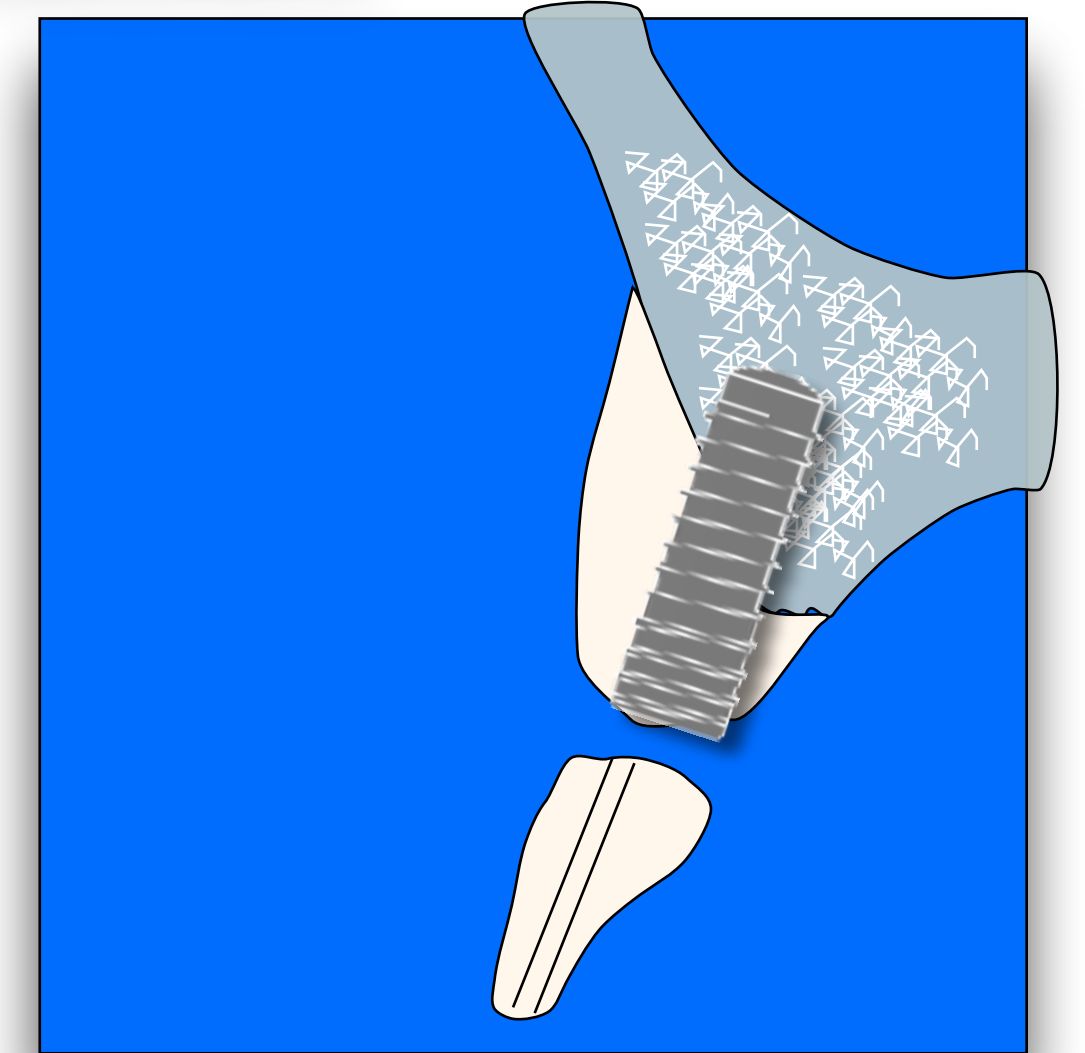
CLASS II

Implant partially exposed, but with possible placement - grafting needed



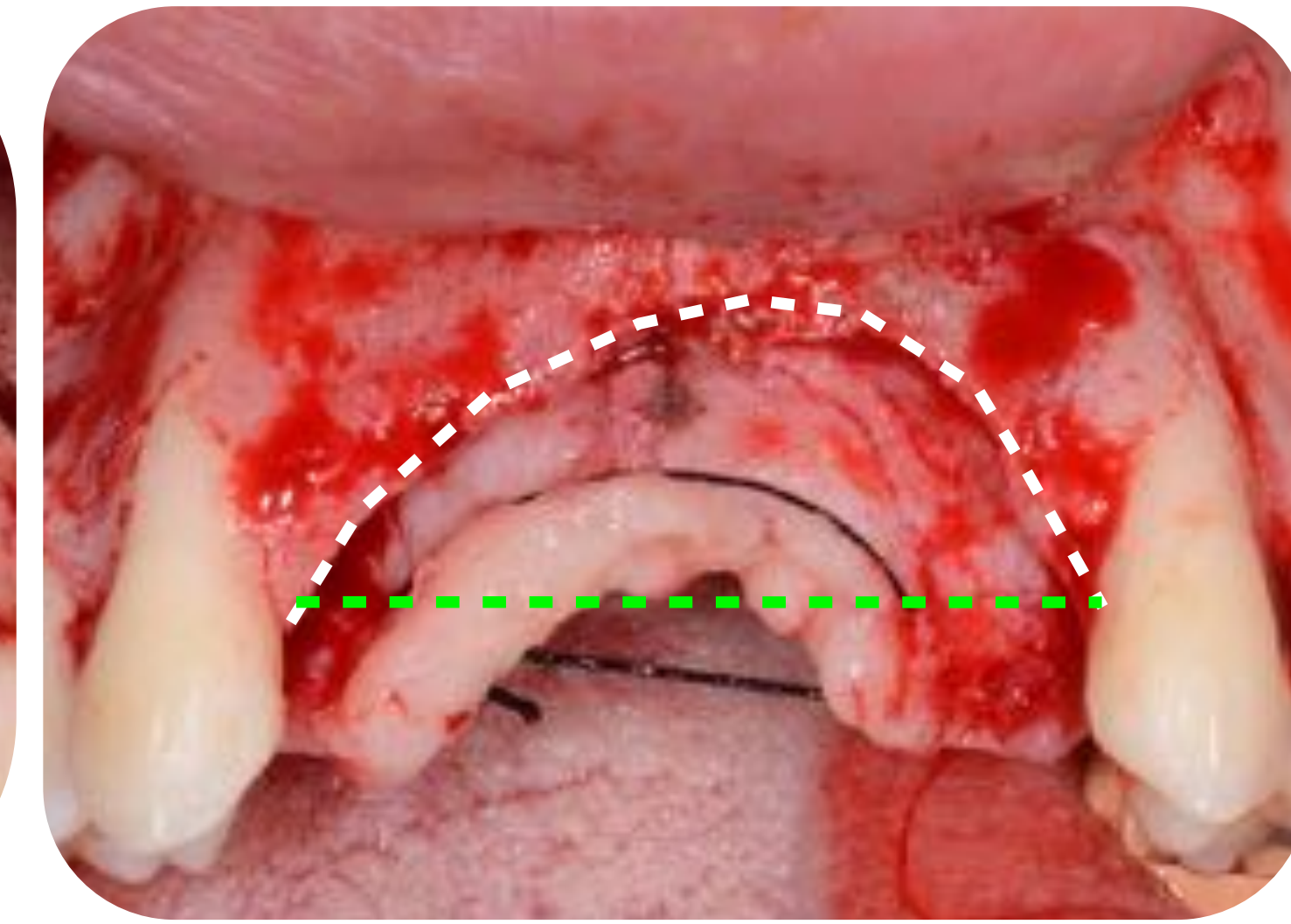
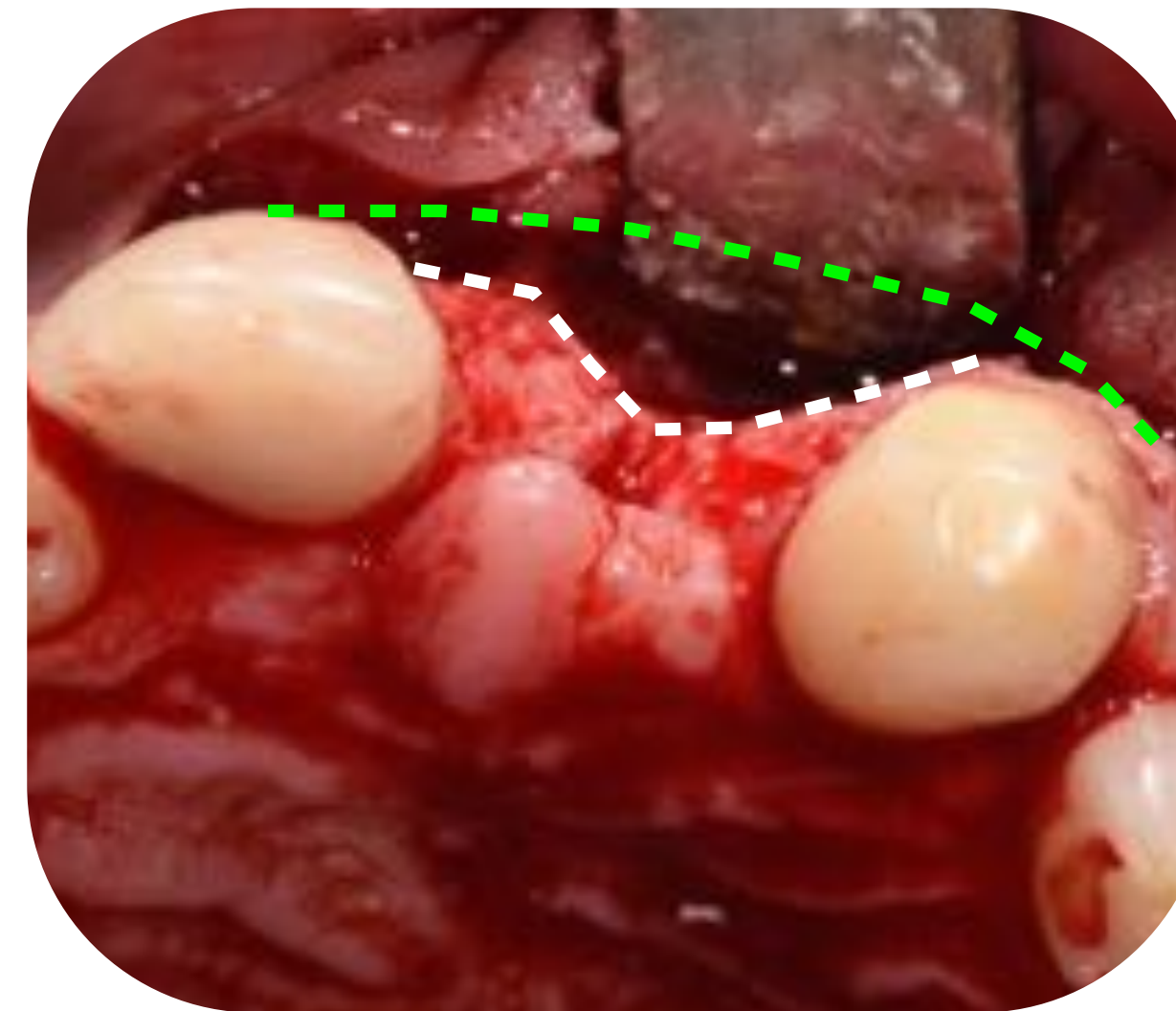
CLASS III

Relevant horizontal resorption - grafting needed with delayed implant placement

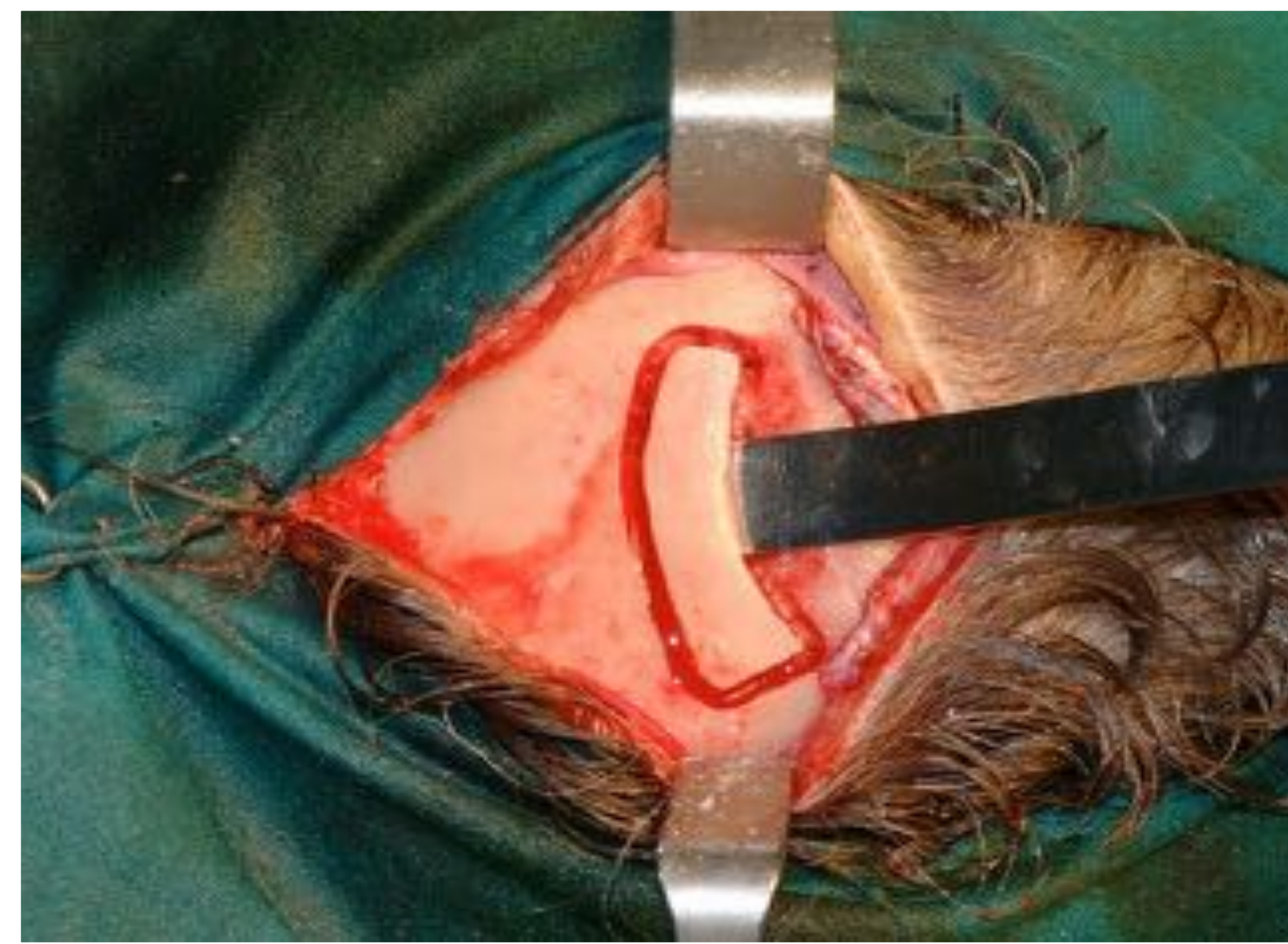
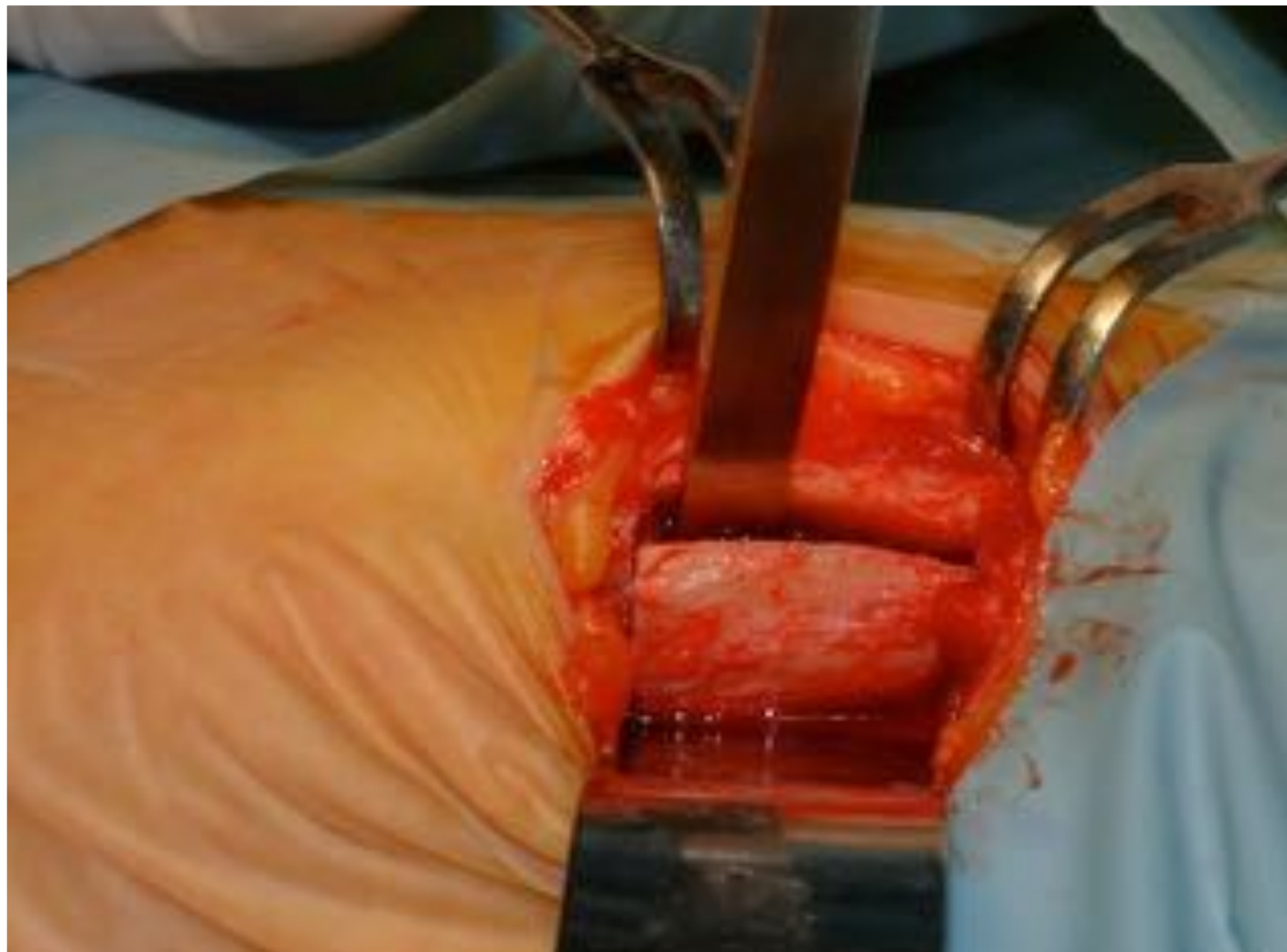


CLASS IV

Relevant horizontal and vertical resorption - grafting needed with delayed implant placement



Autogenous Bone

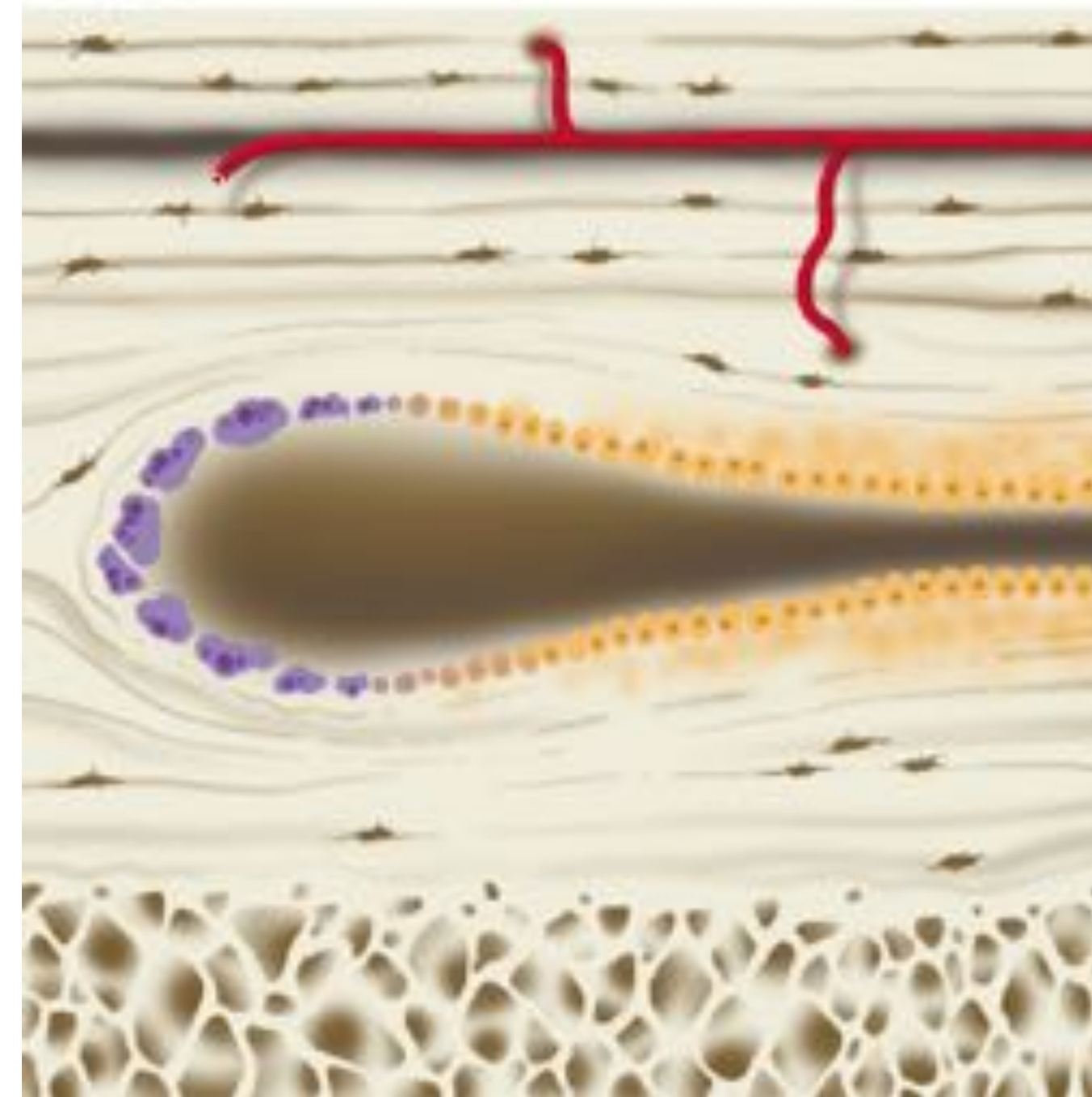
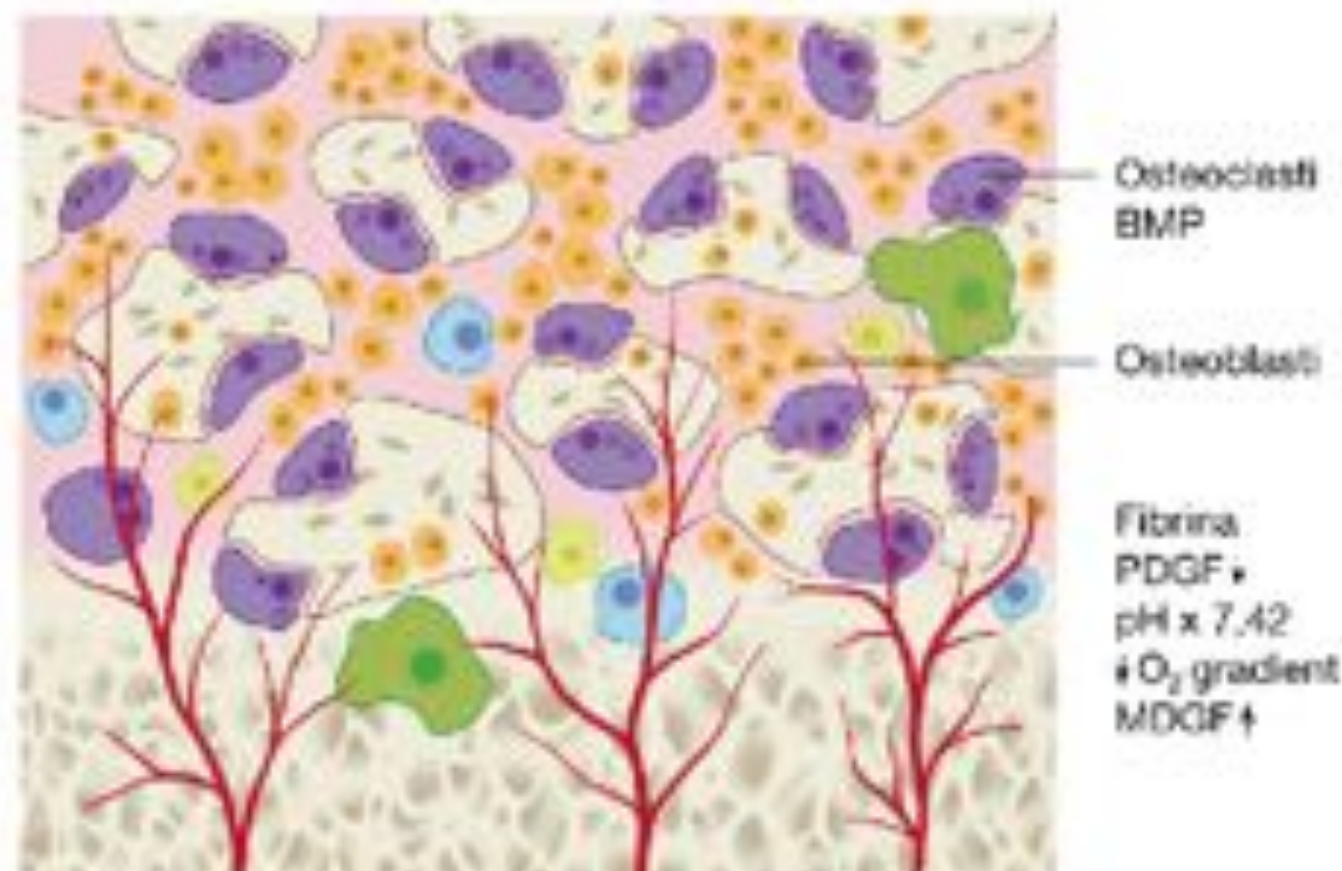
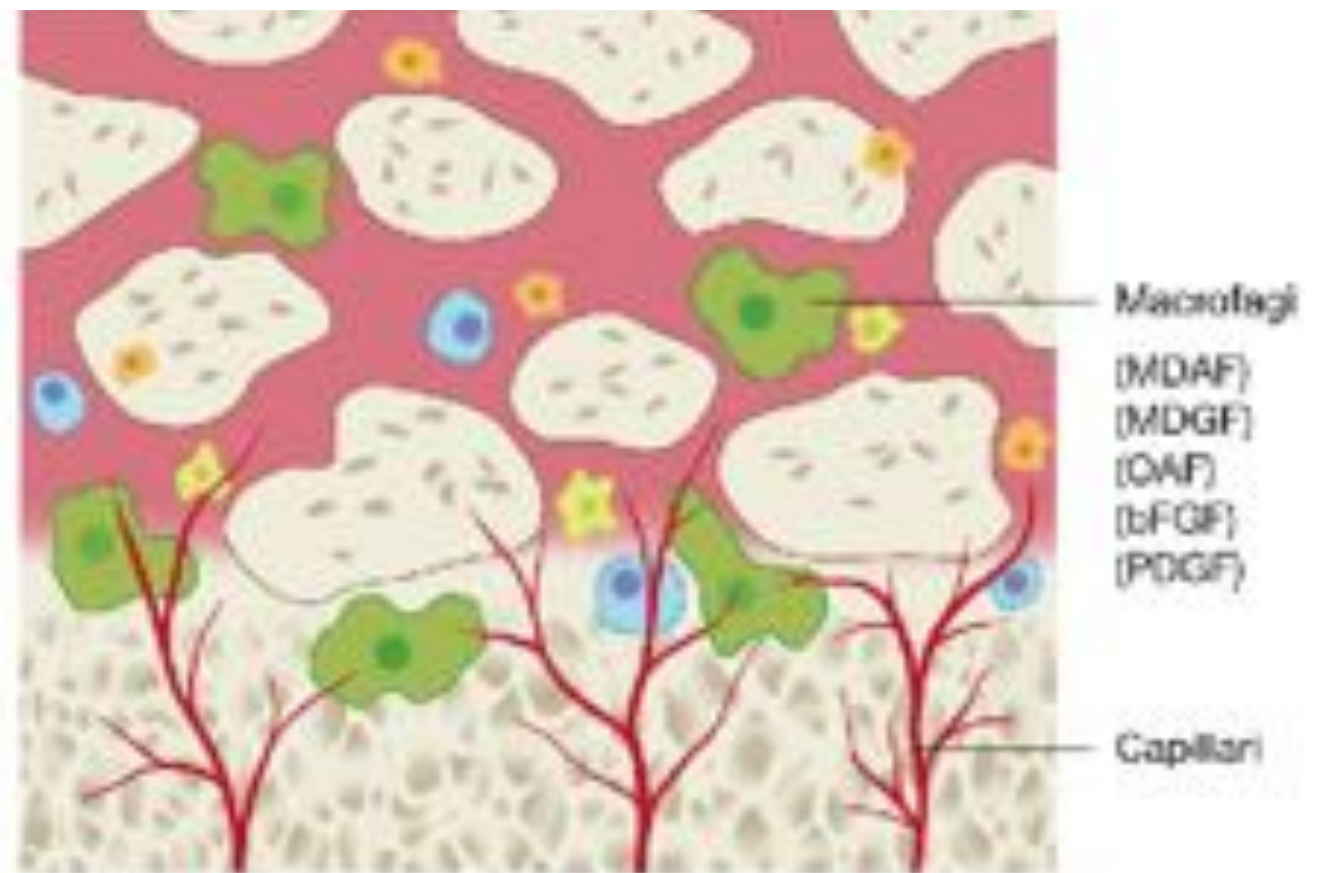


Autogenous bone is the only material to be osteoinductive/ osteogenetic and osteoconductive at the same time



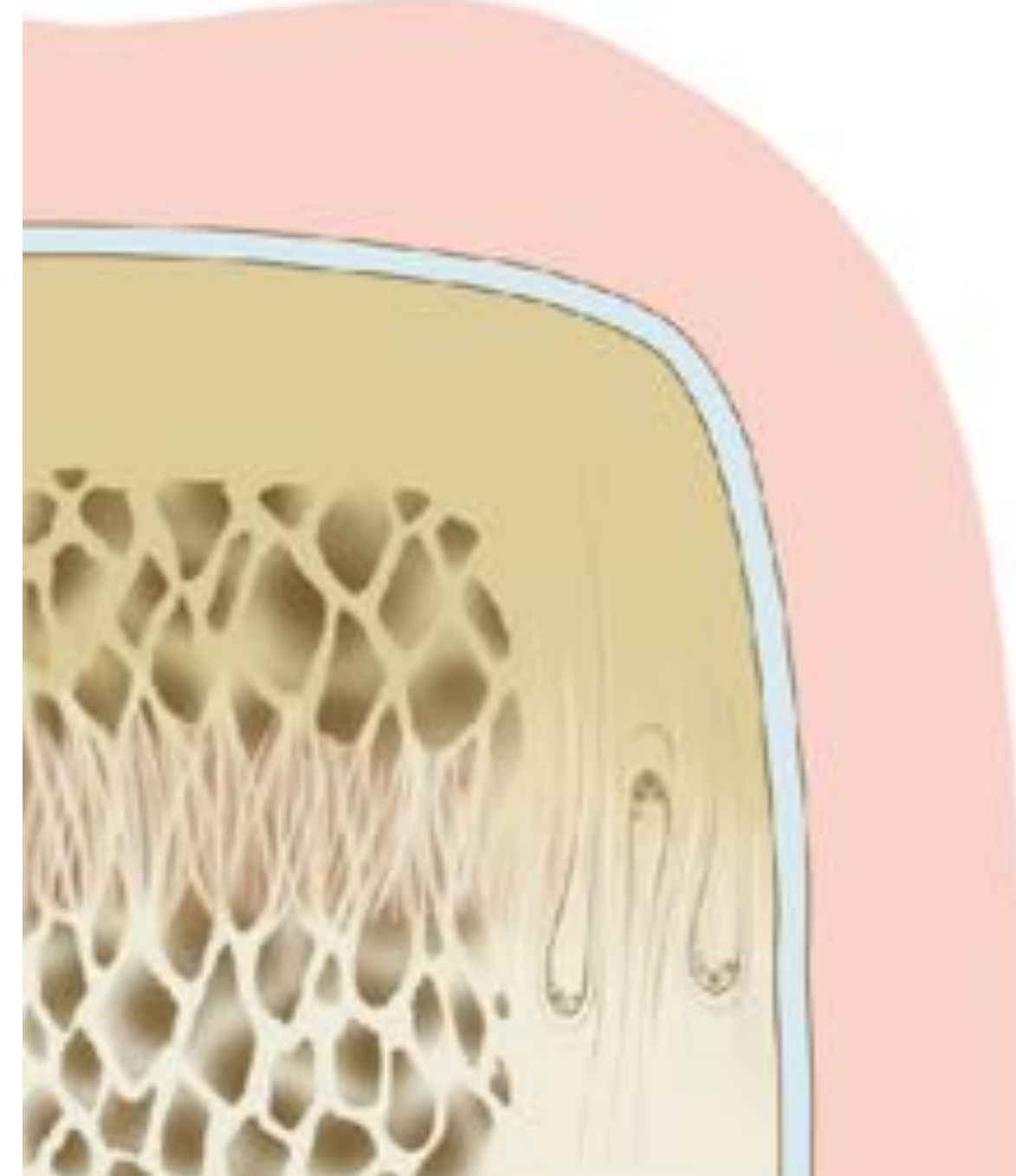
Dent Clin N Am 51 (2007) 729–746

THE DENTAL
CLINICS
OF NORTH AMERICA



Bone Graft Materials

Harry V. Precheur, DMD^{a,b,*}



RELEVANT BONE / SOFT TISSUE DEFECTS



Prosthetically Guided Regeneration



● Guided Bone
Regeneration



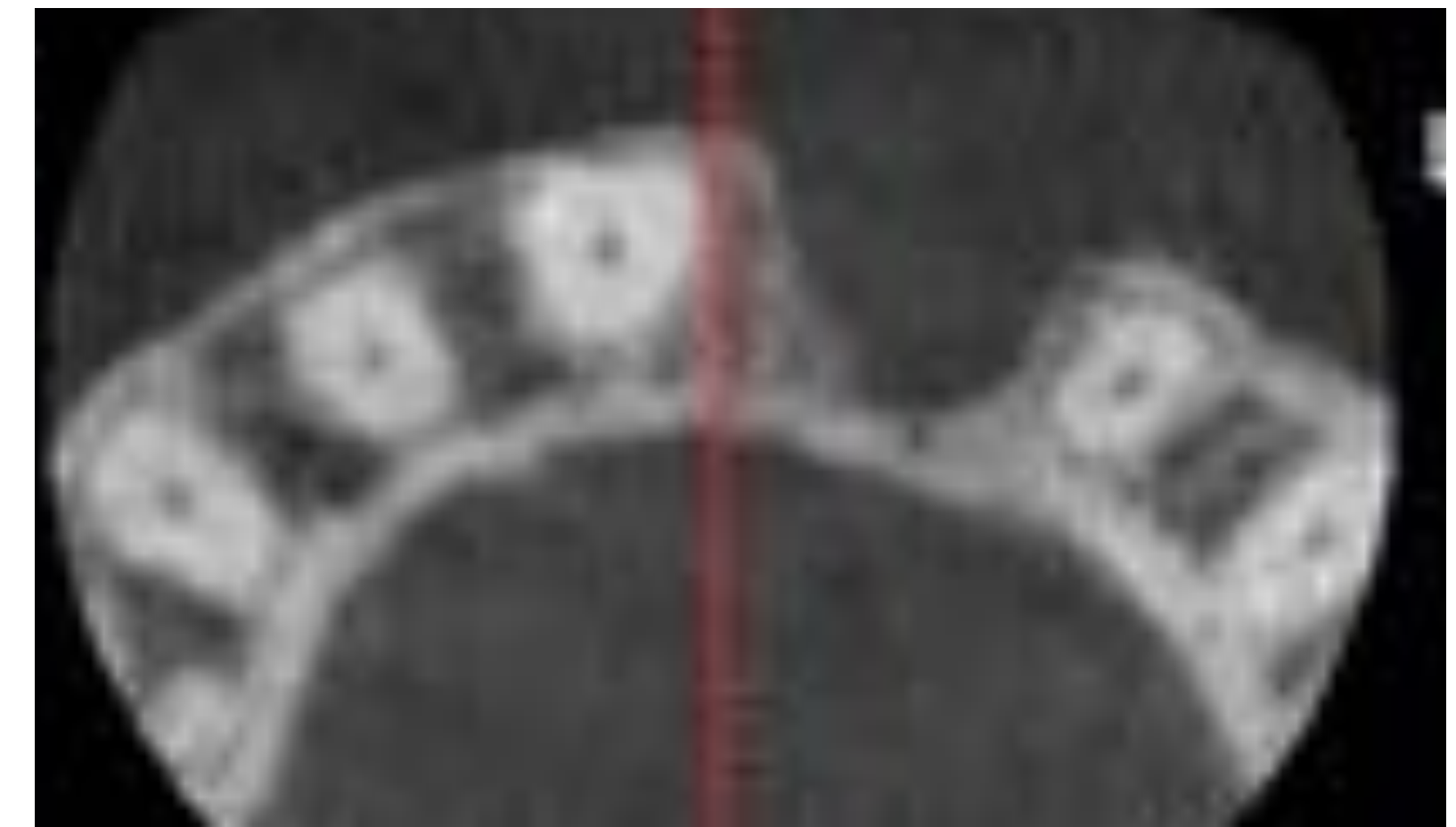
● Bone
blocks



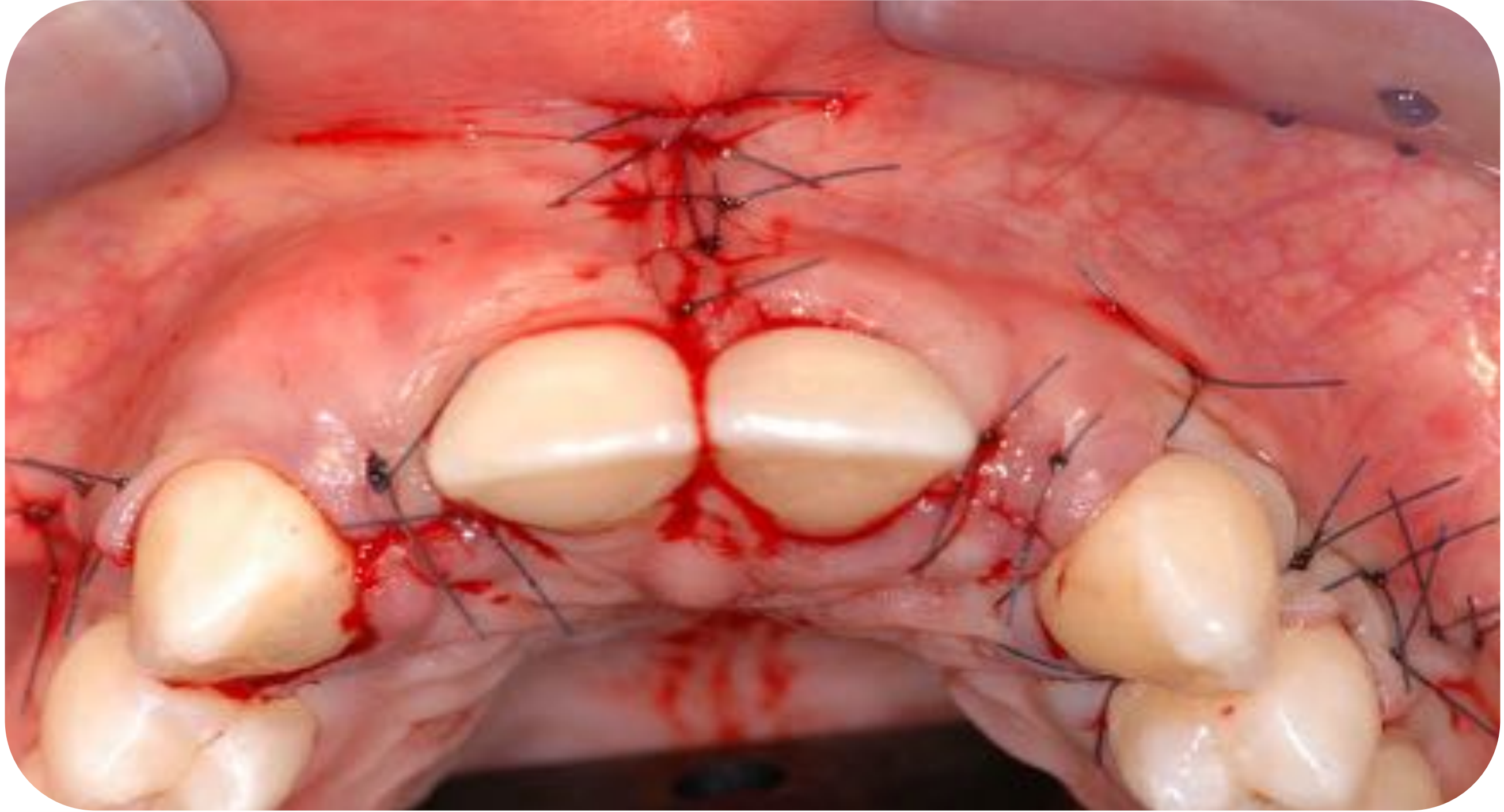
● Soft tissue
reconstruction

Main Indications for Resorbable Membranes in association with Biomaterials and Autogenous Bone

- Horizontal defects (moderate vertical defects), with both immediate or delayed implant placement









Advantages of GBR with resorbable membranes

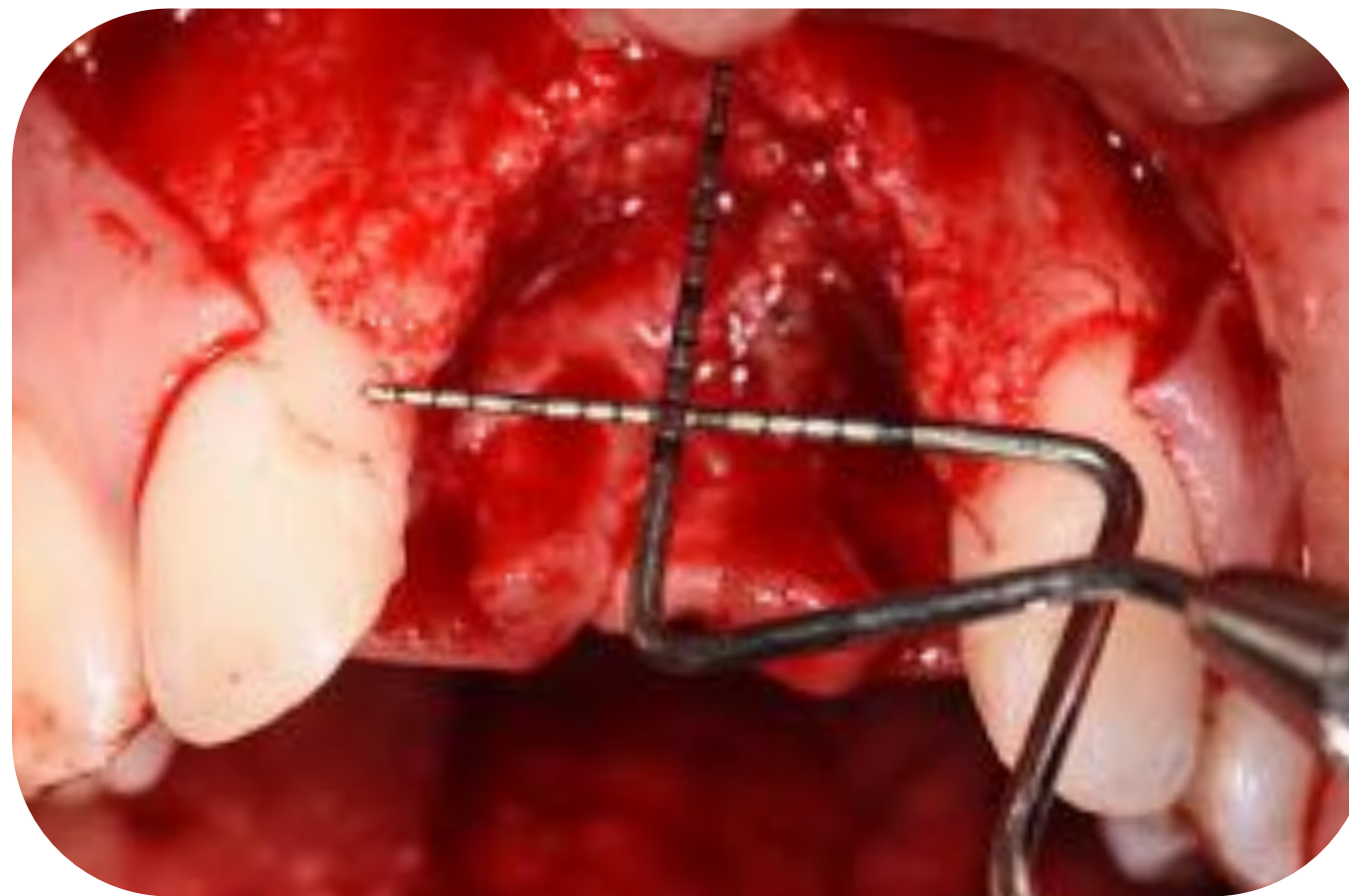
- Easy handling of the procedure
- Low complication rate also in case of membrane exposure

Limits of GBR with resorbable membranes

- Literature is vast, but mainly related to horizontal defects in partially edentulous patients
- Resorbable membranes may be not indicated for vertical defects or complex 3D defects

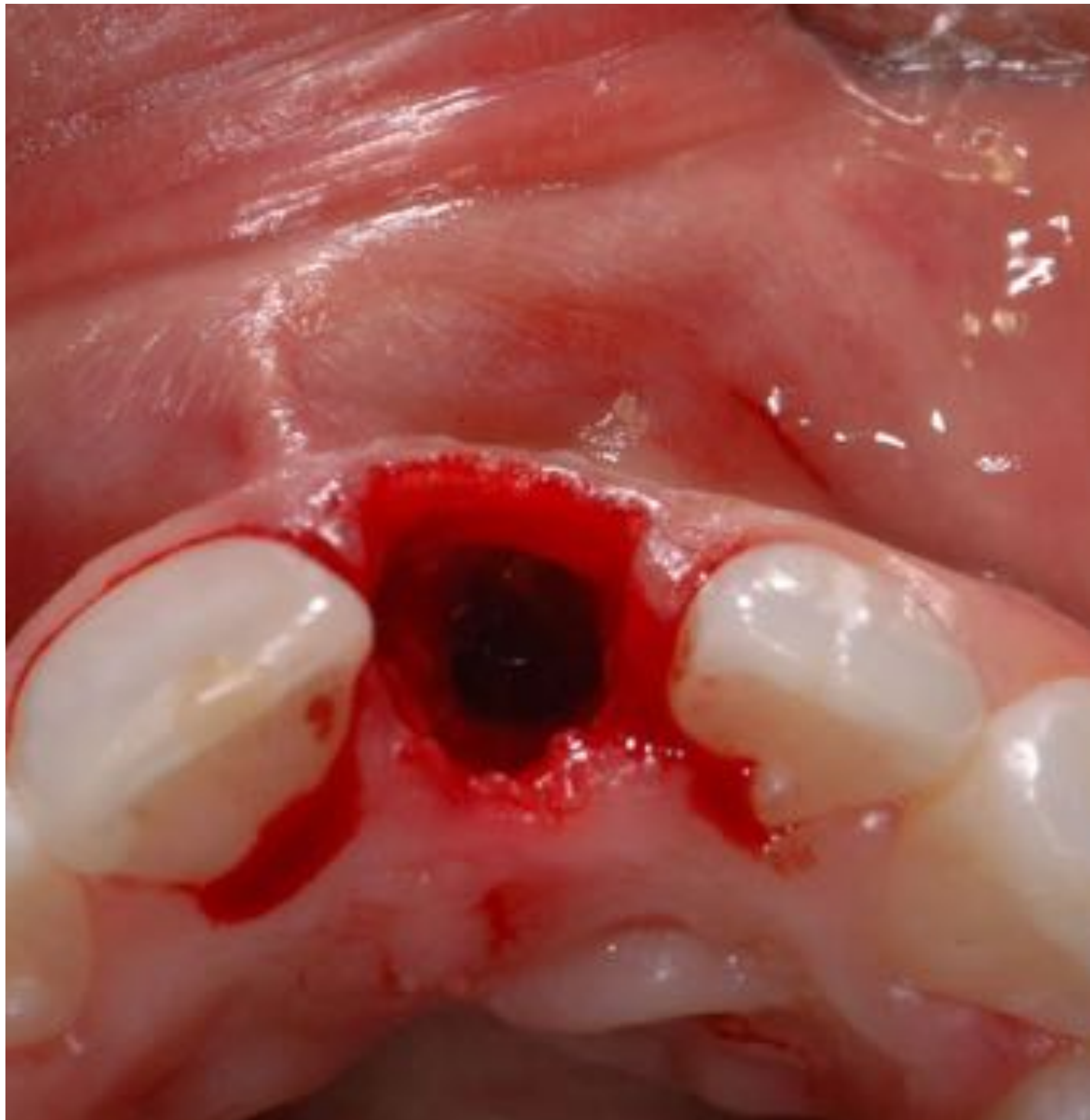
Main Indications for Nonresorbable/Slowly Resorbable Membranes/ Titanium Meshes in Association with Biomaterials and Autogenous Bone

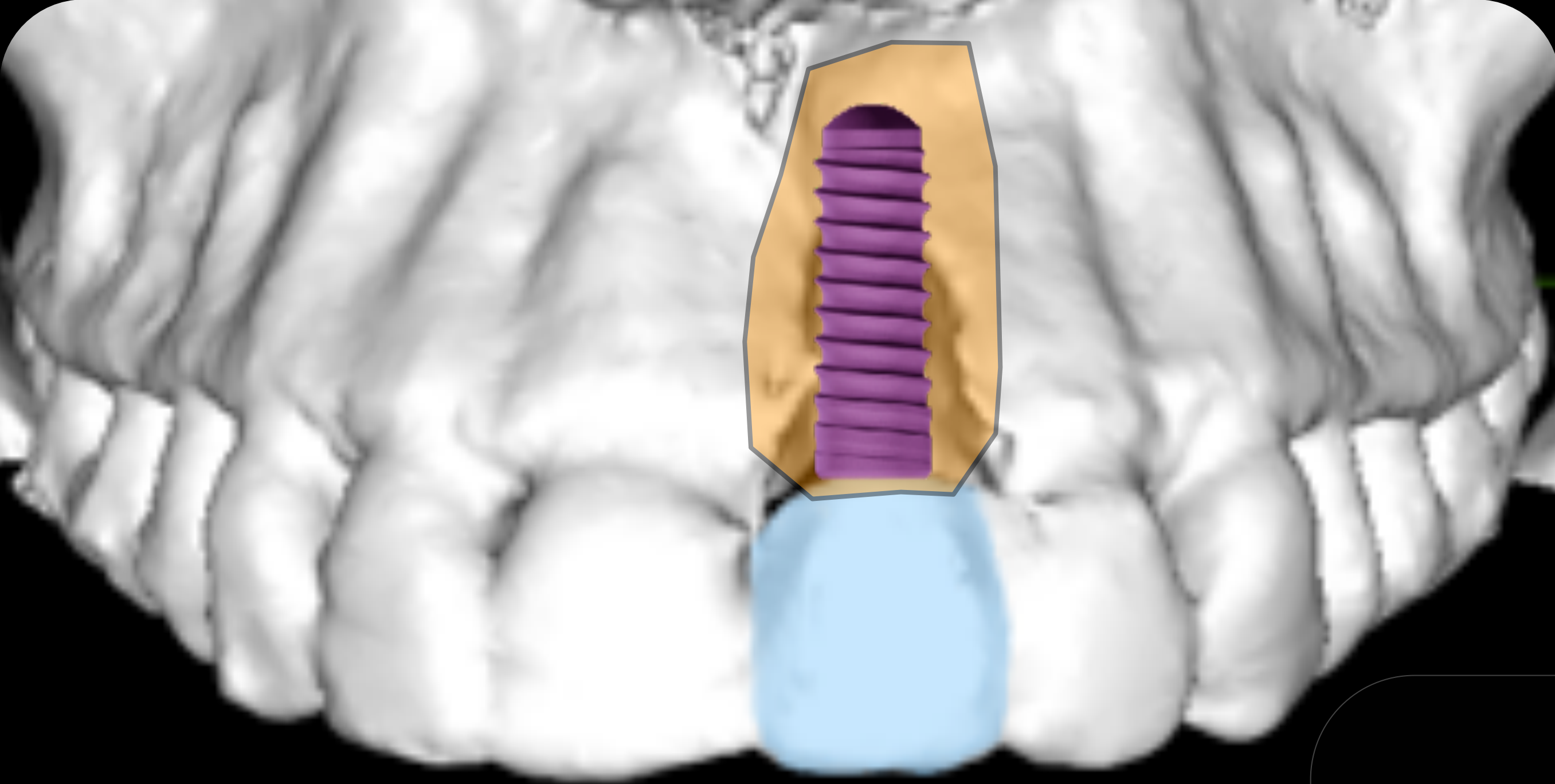
- Vertical or complex 3D defects, in particular when the edentulous area is not too wide (partial edentulism) and the morphology of the defect is “irregular”





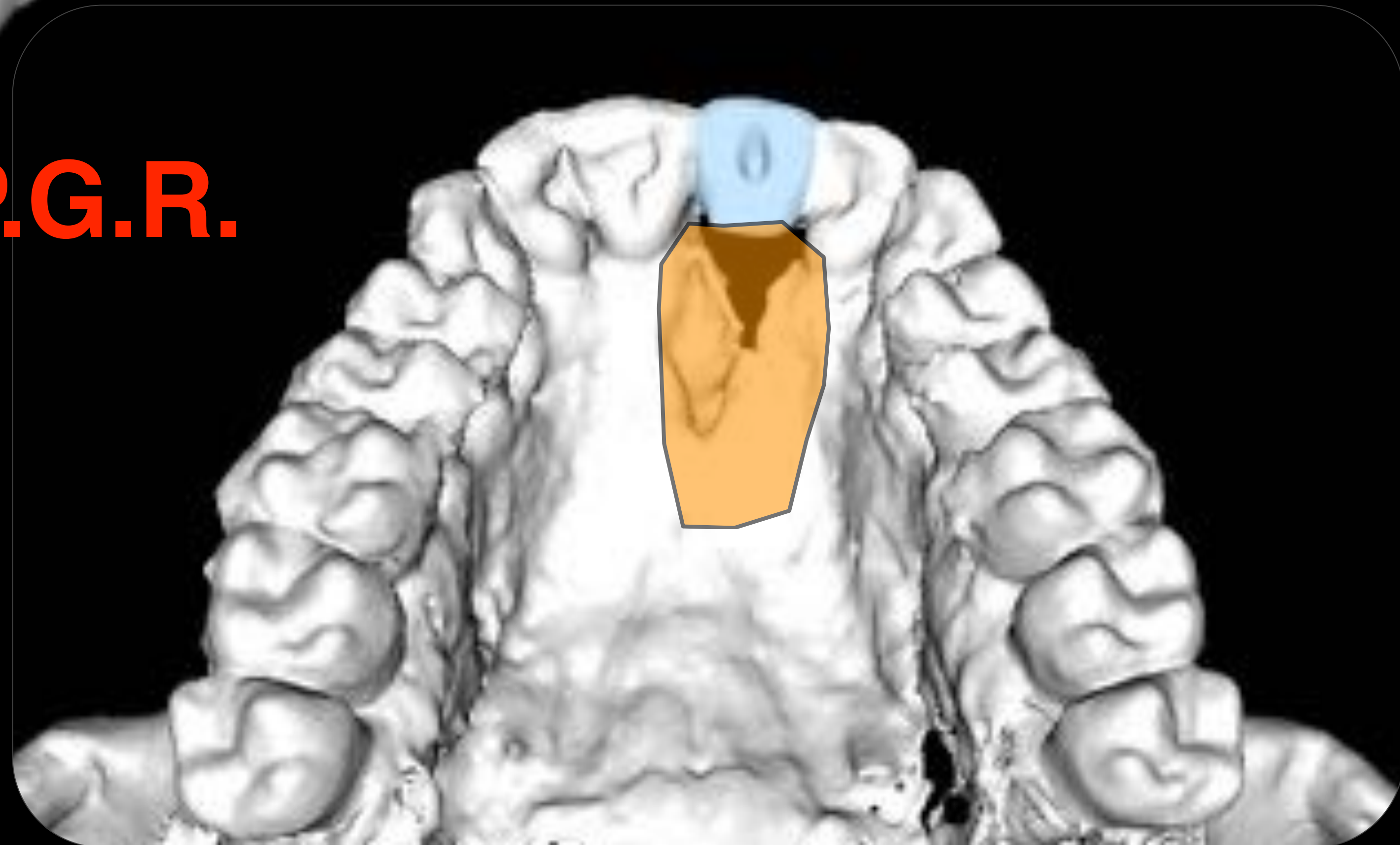
- Pt. # - Female, 26 years old
- Good general health, no perio problems on residual dentition, thin biotype
- Left central incisor lost because of post-traumatic external and internal resorption + chronic infection
- Asking for a fixed solution without touching neighboring teeth





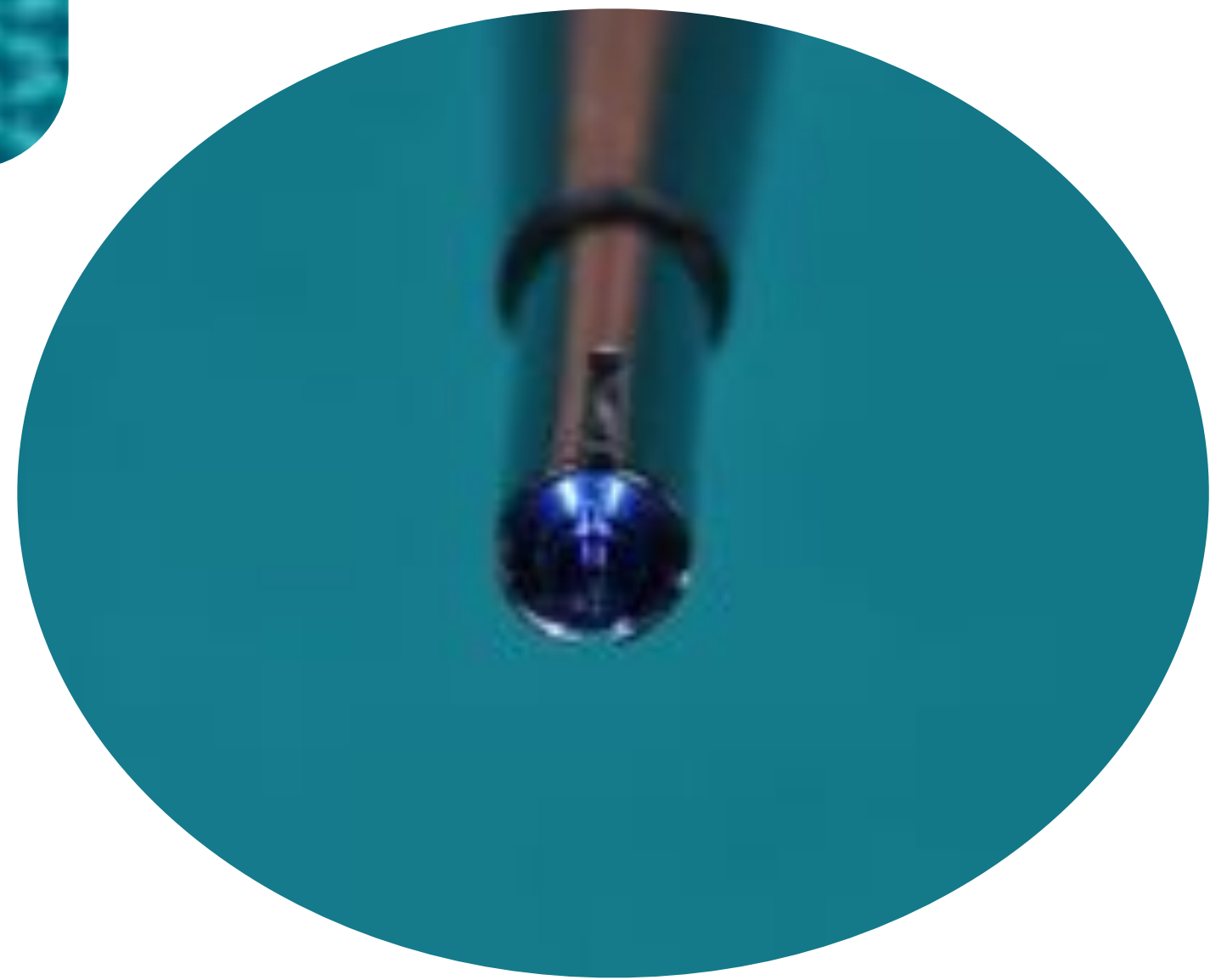
Prosthetically Guided Regeneration

P.G.R.



Prosthetically Guided
Implant Placement







Personal references on GBR

Chiapasco et al. Clinical outcome of autogenous bone blocks or guided bone regeneration with e-PTFE membranes for the reconstruction of narrow edentulous ridges. COIR **1999**:10; 278-288

Chiapasco et al. Vertical distraction osteogenesis versus guided bone regeneration of vertically deficient edentulous ridges: A 1-3 year prospective study on humans. COIR **2004**: 15; 82-95

Chiapasco & Casentini. Horizontal bone augmentation procedures in implant dentistry: Prosthetically guided regeneration. Periodontology **2000**: **2018**; 77: 213-240

I. Milinkovic, L. Cordaro: Are there specific indications for the different alveolar bone augmentation procedures for implant placement? A systematic review. Int. J. Oral Maxillofac. Surg. 2014; 43: 606–625. © 2014 International Association of Oral and Maxillofacial Surgeons. Published by Elsevier Ltd. All rights reserved.

- 53 articles selected for partial edentulism; 15 for edentulous pts
- GBR for horizontal defects MSR=100% - MCR=11.9%
- Bone grafts for horizontal defects MSR=98.4% -MCR=6.3%
- GBR for vertical defects MSR= 98.9% -MCR 13.1%
- Bone grafts for vertical defects MSR=96.3% -MCR=8.1%
- In edentulous pts only bone grafts are supported - MSR=87.7%

Advantages of GBR with non-resorbable membranes

- Bone harvesting with scrapers is simple
- Non-resorbable membranes permit vertical/3D reconstruction of relevant defects in partially edentulous patients

Limits of GBR with non-resorbable membranes

- Complex modelling and fixation of the membrane
- Reconstruction limited to partially edentulous patients
- Higher risk of exposure and need of early removal in case of infection

NEXT FILE