



Effect of Platelet Rich Plasma (PRP) for Regeneration Around Implants in Treatment of Implantitis

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INTRODUCTION:

Platelet-rich plasma (PRP) is an Autologous Blood Product (ABP) with multiple applications in diverse medical specialties. It is obtained by centrifuging the patient's whole blood to form a gel-like structure when mixed with thrombin and calcium chloride.

The method of preparation of PRP (FIG 1) is vital for its biological activity and concentration of growth factors. The leukocytes and neutrophils lend the PRP its antimicrobial potential. PRP is also a source of autologous source of PDGF, TGF, VEGF etc. that are obtained by separating and condensing platelets by centrifugation.

All surgeries cause inevitable trauma which needs their own healing. Implants also heal by osseous tissue regeneration leading to osteointegration. It is known that the amount of bone and the presence of growth factors around implants improve the regeneration potential of the osseous tissue. ABP has been known to contain antimicrobial activity that prevents postoperative infection and improves healing.

Implants are the standard of care with high predictability, but they can fail.

Peri-implantitis is an inflammatory reaction that affects the implant and its supporting tissue. Peri-implantitis can be treated when diagnosed early and implants can be rescued.

Many methods for the treatment of implantitis are proposed. No standard treatment for peri-implantitis exists. There is no evidence of re-osseointegration. Attempts to treat peri-implantitis at an early stage by removing bacterial deposits and adding growth factors to help with healing is one possible avenue for treatment.

It is postulated that the growth factors in PRP act as a healing agent, promote regeneration, and help prevent infection around diseased implants.

PURPOSE:

The purpose of this study was to review the literature and find the success rate of treatment of peri-implantitis using platelet rich plasma (PRP) for healing and regeneration.

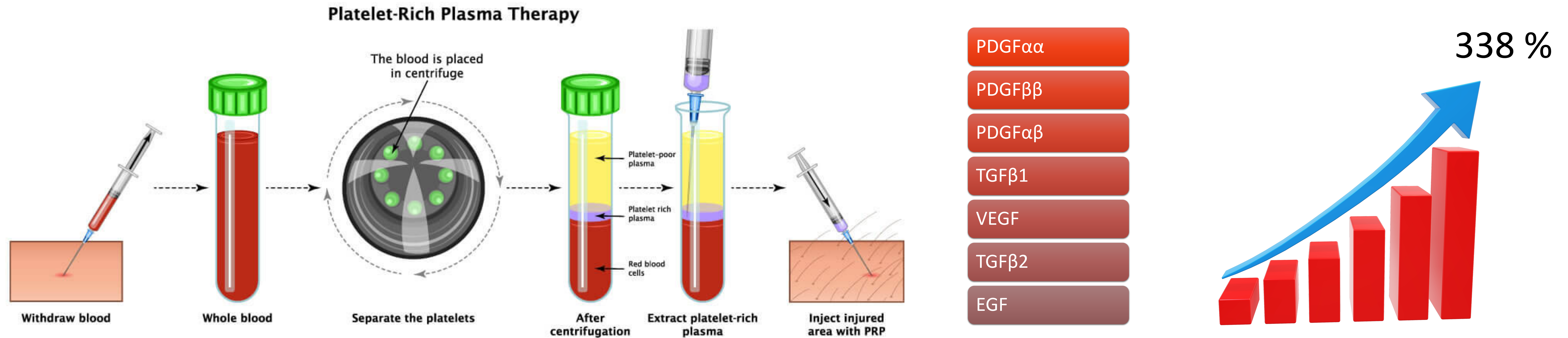


FIG 1: PRP MECHANISM OF PREPARATION [Photograph]Google Images.
<https://www.bowlermedical.org/dr-jannices-blog/category/platelet-rich-plasma>

Palaiologou, Archontia, and Francis Keeling. "Autologous blood products: Usage and preparation protocols." Clinical advances in periodontics vol. 12,4 (2022): 287-293. doi:10.1002/cap.10221

Peri-implantitis is a pathological condition occurring in tissues around dental implants, characterized by inflammation in the peri-implant mucosa and progressive loss of supporting bone.

Multiple animal and human studies have investigated the effect of PRP in peri-implant bone healing and its influence by the concomitant use of PRP.

Material and method:

A systemic search of PubMed, Ovid and Cochrane library was done to look for different methods using platelet-rich plasma to treat implantitis for purpose of regeneration. The studies reviewed were from July 2013 to July 2022. Animals and Human studies were included

Result:

20 studies met the proposed inclusion criteria. Three case studies, eight systemic reviews, and nine human and animal studies. In most studies, implantitis were in the mandible. That showed implantitis on Maxilla has been researched very little. Of all the different treatment methods, a combination of guided regeneration and bone graft with freeze-dried bone showed the most favorable result, but they hardly used platelet-rich plasma for regeneration. Due to the low number of studies, meta-analysis was not possible ($p=0.25$)

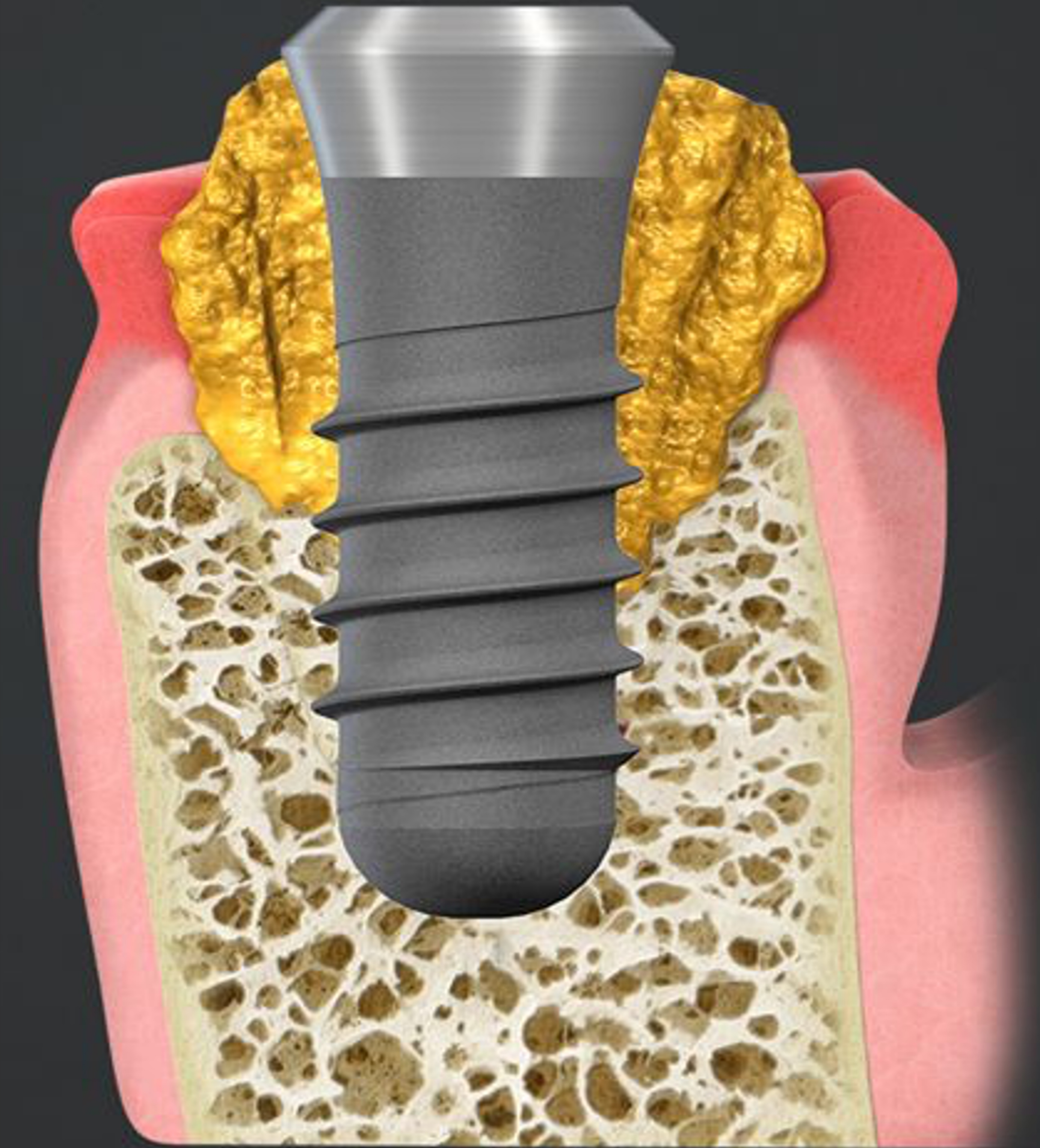


FIG 3: FAILED DENTAL IMPLANT :PERI-IMPLANTITIS [Image courtesy of Prof. Dr. G. E. Salvi]Google Images.
<https://www.straumann.com/group/en/discover/implant-health/implant-health.html>

PRP Mechanism of action in peri-implant defect:

When a small amount of bone graft is mixed with a large volume of PRP, the primary regenerating bone cells either residing in the adjacent tissues or contained in the autograft would be exposed to high PRP concentrations. These large numbers of platelets, which release significant quantities of growth factors are known to promote wound healing.

Factors that Affect the PRP role in peri-implant defect healing:

- **Concentration of PRP within the grafts:** Variations in platelet concentration influence bone healing.
- **Bleeding from the bone affect the PRP concentration:** Since bleeding from the gap might dilute the PRP, it is hard to predict the final concentration of platelets in the gap. Bleeding from the bone can supply the graft with platelets when it is packed in the gap, the bone graft used without PRP will be mixed with some platelet
- **Systemic and local factors that potentially may affect the outcome of treatment**

Conclusion:

With the limited information that was collected, it can be concluded that platelet-rich plasma does not add any benefit to the regeneration treatment of implantitis. ($p=0.25$)

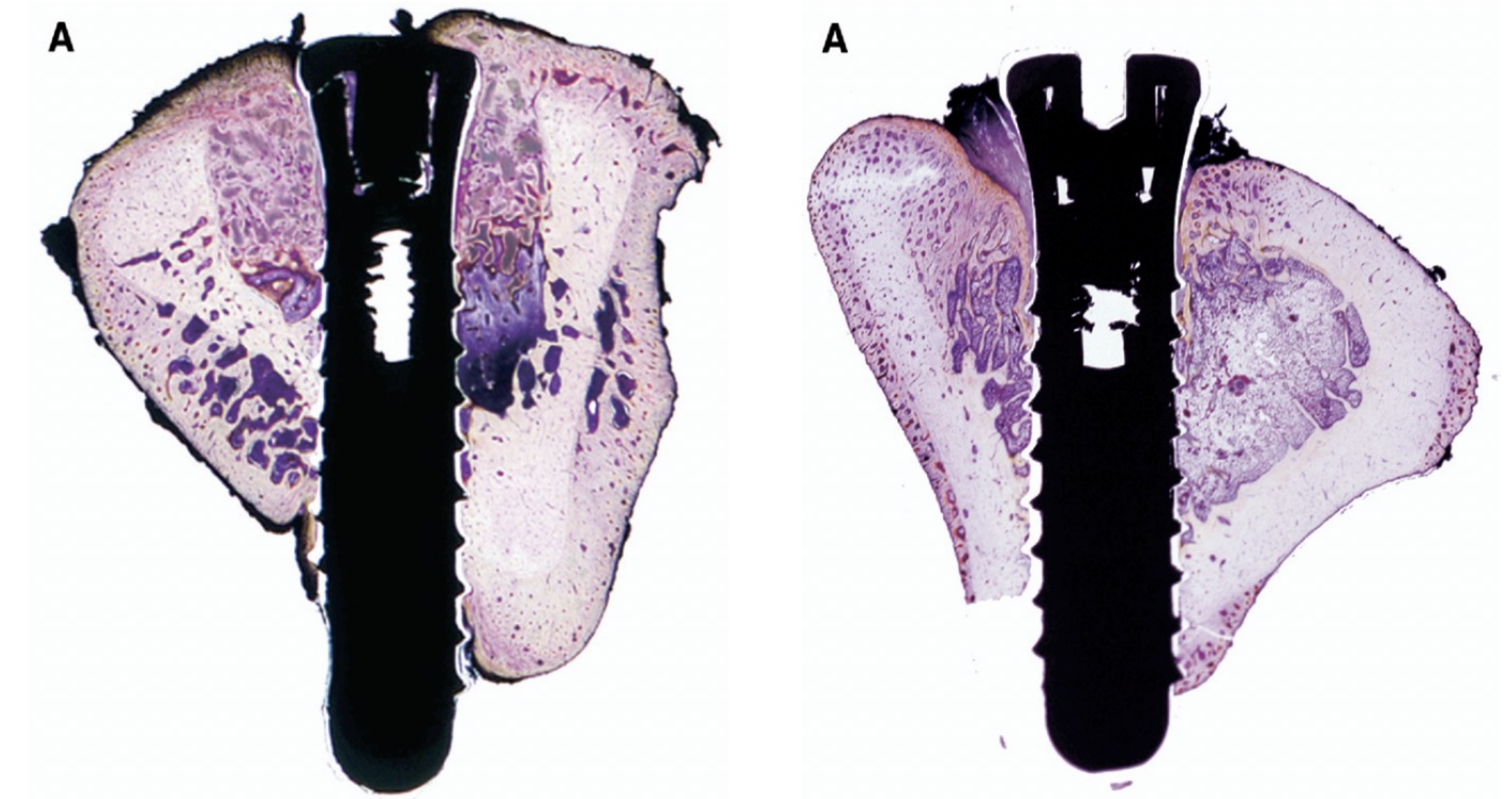
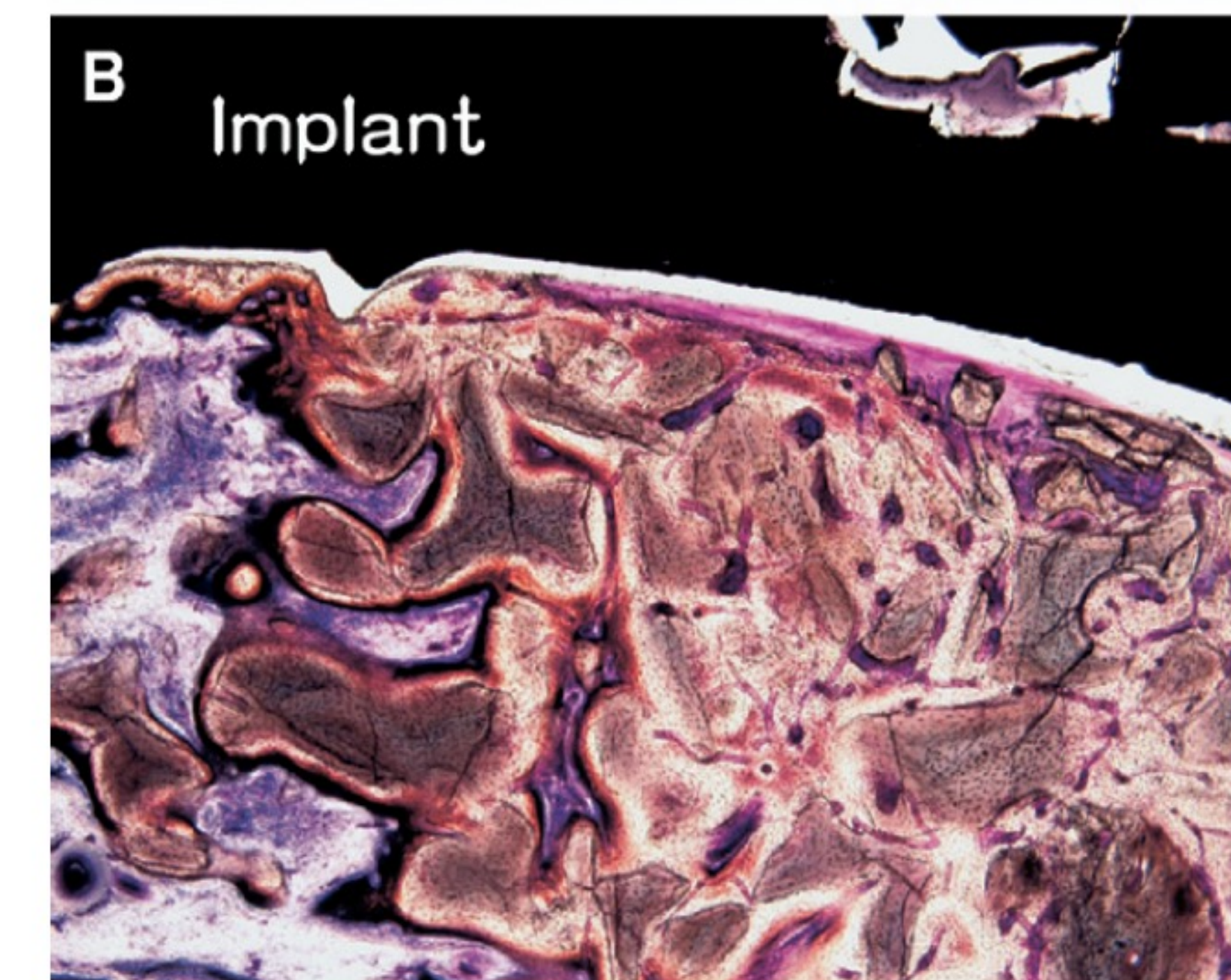


Fig. 2. Section from the Bio-Oss group. **A**, Original magnification $\times 5$. **B**, Original magnification $\times 100$. The newly formed bone contacts the implant surface.

FIG 4. Section from the Bio-Oss group.

A, Original magnification $\times 5$.

B, Original magnification $\times 100$. The newly formed bone contacts the implant surface.

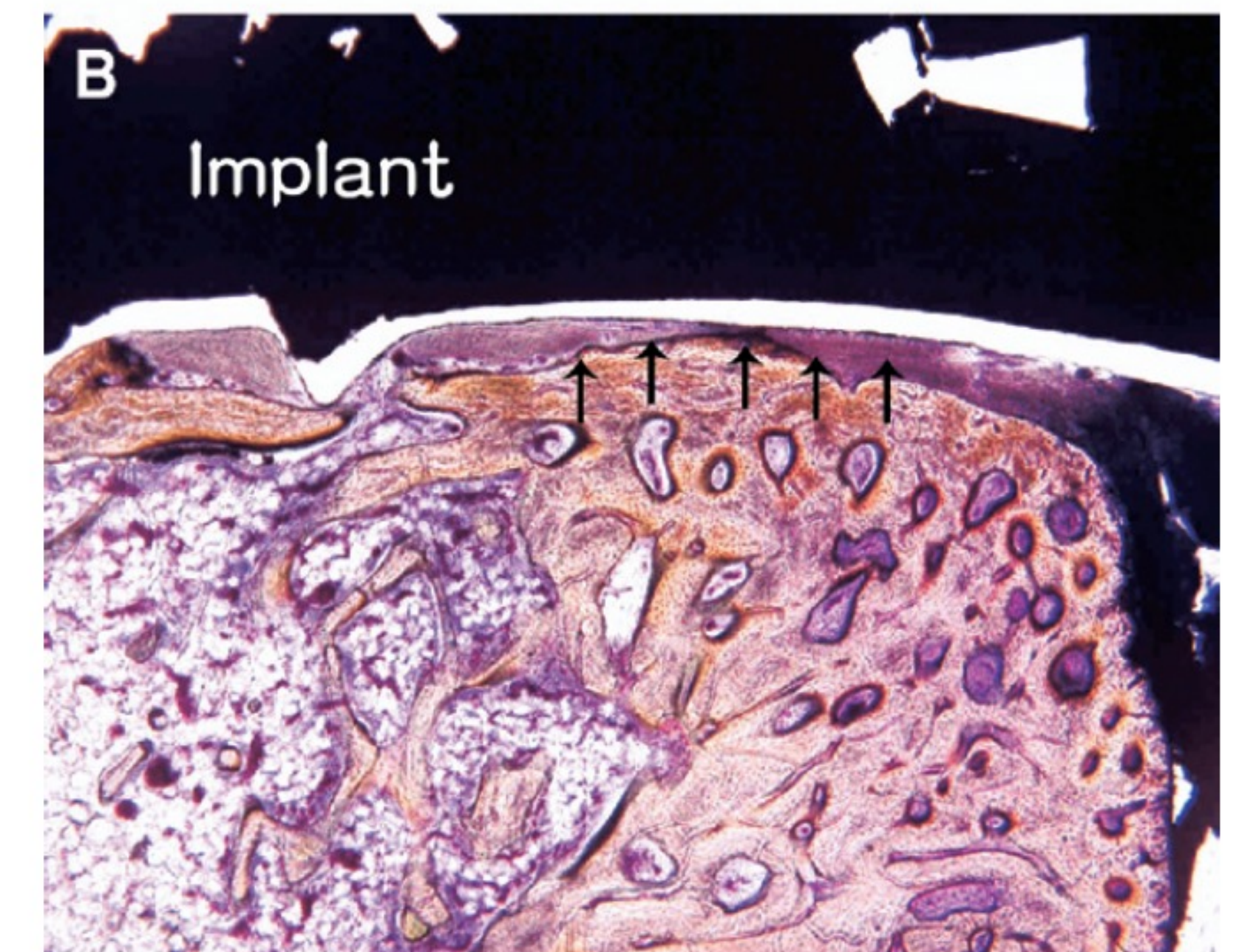


Fig. 3. Section from the Bio-Oss and PRP group. **A**, Original magnification $\times 5$. **B**, Original magnification $\times 100$. A fibrous membrane (arrows) surrounds the implant surface.

FIG 5. Section from the Bio-Oss and PRP group.

A, Original magnification $\times 5$.

B, Original magnification $\times 100$. A fibrous membrane (arrows) surrounds the implant surface.

REFERENCES:

- Masuki, Hideo et al. “Growth factor and pro-inflammatory cytokine contents in platelet-rich plasma (PRP), plasma rich in growth factors (PRGF), advanced platelet-rich fibrin (A-PRF), and concentrated growth factors (CGF).” International journal of implant dentistry vol. 2,1 (2016): 19. doi:10.1186/s40729-016-0052-4
- Song, Dandan et al. “Effect of platelet-rich and platelet-poor plasma on 3D bone-to-implant contact: a preclinical micro-CT study.” International journal of implant dentistry vol. 7,1 11. 18 Feb. 2021, doi:10.1186/s40729-021-00291-5
- Taschieri, Silvio et al. “Immediate post-extraction implants with or without pure platelet-rich plasma: a 5-year follow-up study.” Oral and maxillofacial surgery vol. 21,2 (2017): 147-157. doi:10.1007/s10006-017-0609-2
- Georgakopoulos, Ioannis et al. “The impact of Platelet Rich Plasma (PRP) in osseointegration of oral implants in dental panoramic radiography: texture based evaluation.” Clinical cases in mineral and bone metabolism : the official journal of the Italian Society of Osteoporosis, Mineral Metabolism, and Skeletal Diseases vol. 11,1 (2014): 59-66.
- Albanese, Antonino et al. “Platelet-rich plasma (PRP) in dental and oral surgery: from the wound healing to bone regeneration.” Immunity & ageing : I & A vol. 10,1 23. 13 Jun. 2013, doi:10.1186/1742-4933-10-23
- Mombelli, Andrea, Raphaël Moëne, and Fabien Décaillet. “Surgical Treatments of Peri-Implantitis.” Eur J Oral Implantol 5 Suppl (2012): S61–S70. Print.
- Strauss, Franz Josef et al. “The use of platelet-rich fibrin to enhance the outcomes of implant therapy: A systematic review.” Clinical oral implants research vol. 29 Suppl 18,Suppl Suppl 18 (2018): 6-19. doi:10.1111/clr.13275
- Isler, Sila Cagri et al. “Efficacy of concentrated growth factor versus collagen membrane in reconstructive surgical therapy of peri-implantitis: 3-year results of a randomized clinical trial.” Clinical oral investigations vol. 26,8 (2022): 5247-5260. doi:10.1007/s00784-022-04493-y
- Baron, M et al. “Experimentally induced peri-implantitis: a review of different treatment methods described in the literature.” The International journal of oral & maxillofacial implants vol. 15,4 (2000): 533-44.
- Mombelli, A. “Etiology, diagnosis, and treatment considerations in peri-implantitis.” Current opinion in periodontology vol. 4 (1997): 127-36.
- Palaiologou, Archontia, and Francis Keeling. “Autologous blood products: Usage and preparation protocols.” Clinical advances in periodontics vol. 12,4 (2022): 287-293. doi:10.1002/cap.10221
- Dhurat, Rachita, and Ms Sukesh. “Principles and Methods of Preparation of Platelet-Rich Plasma: A Review and Author's Perspective.” Journal of cutaneous and aesthetic surgery vol. 7,4 (2014): 189-97. doi:10.4103/0974-2077.150734
- You, Tae-Min et al. “Platelet-enriched fibrin glue and platelet-rich plasma in the repair of bone defects adjacent to titanium dental implants.” The International journal of oral & maxillofacial implants vol. 22,3 (2007): 417-22.
- Renvert, S., Roos-Jansåker, A.-M. and Claffey, N. (2008), Non-surgical treatment of peri-implant mucositis and peri-implantitis: a literature review. Journal of Clinical Periodontology, 35: 305-315. <https://doi.org/10.1111/j.1600-051X.2008.01276.x>
- Roos-Jansåker, Ann-Marie, Stefan Renvert, and Jan Egelberg. “Treatment of Peri-Implant Infections: a Literature Review.” Journal of clinical periodontology 30.6 (2003): 467–485. Web.
- Marx RE, Carlson ER, Eichstaedt RM, Schimmele SR, Strauss JE, Georgeff KR. Platelet rich plasma: growth factor enhancement for bone grafts. Oral Surg Oral Med Oral Pathol Oral RaiolEndod 1998;85:638-46.
- Maeno, M et al. “Function of Platelet-Induced Epithelial Attachment at Titanium Surfaces Inhibits Microbial Colonization.” Journal of dental research vol. 96,6 (2017): 633-639. doi:10.1177/0022034516688888