

Background

Hyperbaric Oxygen Therapy's (HBOT) efficacy is obtained by enhancing reactive oxygen species (ROS) and reactive nitrogen species (RNS) production, promoting cell growth, and modulating inflammatory response. As a result, HBOT promotes soft tissues healing and bone regeneration by improving osteosynthesis, neoangiogenesis and vasculogenesis and contrasting infections caused by anaerobic pathogens. It has been successfully used in many pathologies characterized by osteonecrosis, such as avascular necrosis of the femoral head (AVNFH). Referring to the oral and maxillofacial districts, HBOT increased bone regeneration rate in osteoradionecrosis, mandibular osteomyelitis, and dental implantation.

Periodontitis is a chronic inflammatory disease affecting soft tissues that support and surround the teeth and bone. Caused mainly by bacterial plaque and anaerobic bacteria such as *P. gingivalis*, local immune response can also to loss of teeth attachment. HBOT in periodontitis showed to improve clinical parameters such as probe depth (PD), clinical attachment level (CAL), and bleeding on probing (BOP) compared with standard antibiomatic and dental medicine treatments but specific indications on HBOT use in periodontitis are lacking.

In this case report, we describe the use of HBOT and Advanced Platelet-Rich Fibrin (A-PRF) pre-treated implants in an immediate dental implant due to severe periodontitis and loss of teeth attachment, despite strong clinical contraindications.

Case Report

A 51 years old woman came to our attention due to her superior incisors' pain and mobility. The dental examination found diffused mobility, deep periodontal pockets, bleeding, and suppurative discharge when probing (Fig 1A and B), posing the diagnosis of severe periodontitis. Loss of bone attachment was radiologically documented (Fig 1C).

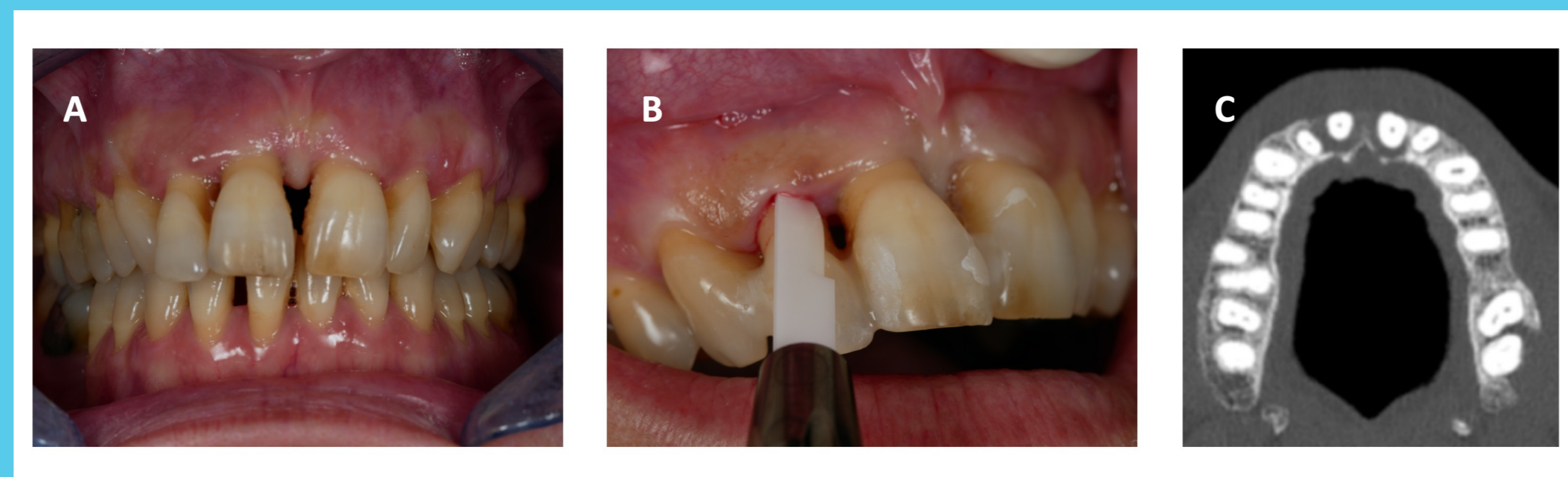


Fig. 1: The disease's initial status at the first visit

Periodontitis was classified as the most severe level, Stage IV, Grade C, according to the new classification of periodontal disease (Tab 1). Acute periodontitis and suppuration are absolute contraindications to the immediate positioning of post-extraction implants. However, the patient firmly requested an immediate implant to relieve her physical and psychological discomfort. The four superior incisors were removed in a single session and the implant site was prepared using piezoelectrical inserts (*Piezosurgery, Mectron s.p.a., Carasco, Italy*). The zirconia implants (*Zirkolith Z5m, Z-systems AG, Oensingen, Switzerland*) were previously soaked for 10 minutes in A-PRF obtained from autologous blood tissue of the patient by centrifugation. A-PRF was absorbed in the porous structure of the implants and provided an external coating. Then the implants were inserted with a dedicated surgical kit (**Fig 2**). No immediate complications were recorded.

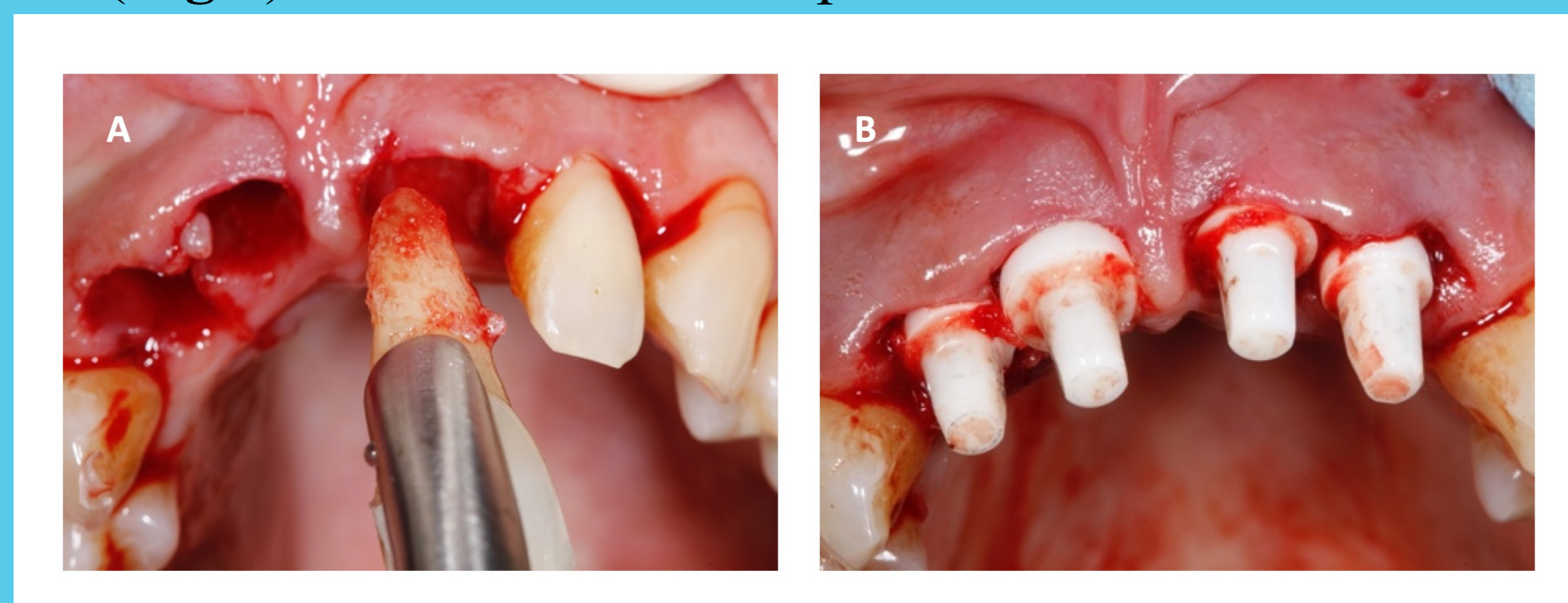


Fig. 2: Pictures obtained the day of the operation

According to the will of the patient, no antibiotic therapy was administered. HBOT was used to help implant integration and to prevent infectious complications. The patient regularly attended a total of 10 sessions of HBOT, 60 minutes daily, at 2.2 ATA: three preconditioning sessions immediately before the extraction – to contrast active infection and enhance tissue vascularization – and seven after the implant. As shown by radiological images, the clinical picture was optimal at the 6 months follow-up (**Fig 3**).

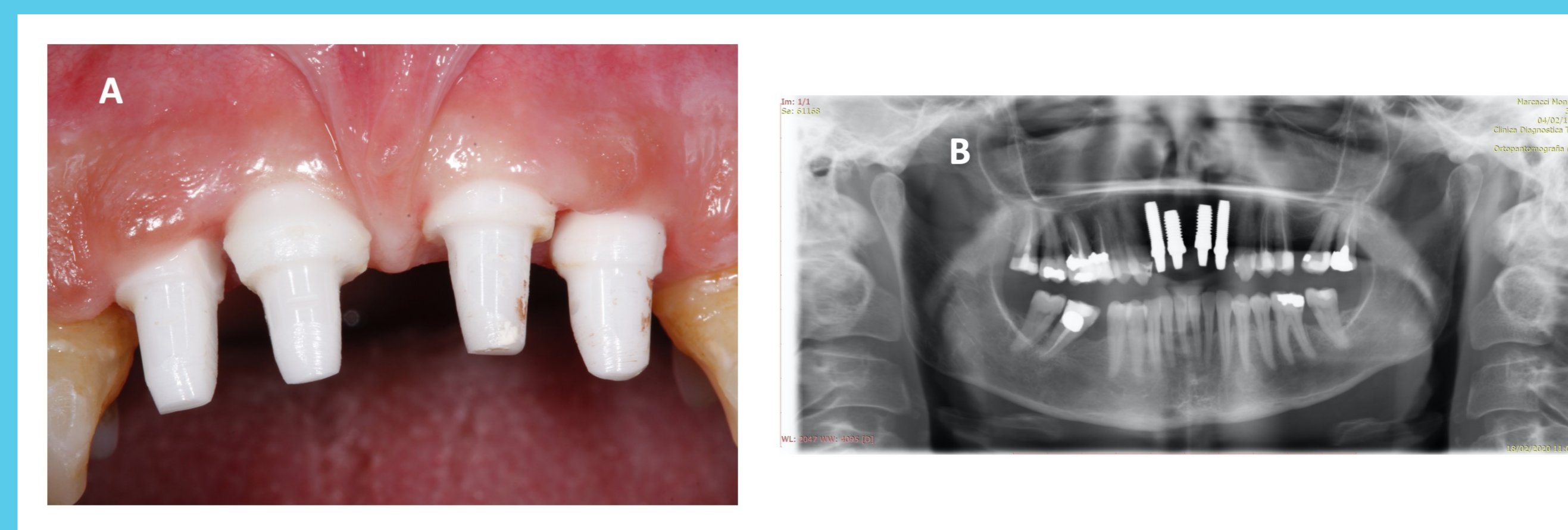


Fig. 3: Pictures obtained six months after the operation

Fourteen months after the intervention, periodontal soft tissues appeared healthy and with an optimal periodontal seal. Other teeth also showed less severe periodontitis with improvements in CAL and BOP. The patient felt relieved from a physical and psychological perspective and reported no significant complications during the whole period. The prosthesis was then finalized with esthetic zirconia-ceramic crowns (**Fig 4**).



Fig. 4: Pictures obtained six months after the operation

Discussion

In this case report we aimed to highlight these topics:

- Implantology is currently the best treatment option for replacing missing teeth, but the presence of a healthy alveolus is crucial for its success.
- Acute periodontitis and active infection are absolute contraindications for immediate implant. Any operation should be discussed and harms and benefits should be considered.
- Osteoradionecrosis, Femoral head necrosis and complicated bacterial infections have in common with periodontitis a similar pathophysiology that implies bone loss due to chronic inflammation.
- Inflammatory markers have a dual role in bone tissue, in acute they promote cell proliferation and differentiation resulting in reparation. Chronically they induce bone resorption and remodelling. HBOT modulates inflammation and can promote bone deposition and stem cell differentiation.
- Many bacterial biofilms are involved in pathologies as for example bacterial plaque in periodontitis. HBO has some mild direct effect against biofilm but it's really effective in improving immune response efficacy against pathogens through enhanced ROS production and neutrophils killing activity.
- HBO also ameliorates antibiotics efficacy and postantibiotic effect
- HBO pretreatment induces vasculogenesis and improve the result of a subsequent therapy in a necrotic or ischemic tissue.
- pretreatment of dental implants improves osteointegration. Advanced Platelet Rich Fibrin (A-PRF) coating shows to be really promising and effective.

Conclusions

In this case report we showed that despite contraindication and critical clinical features, HBOT can be successfully applied in the treatment of periodontitis and implantology. New studies will confirm this assumption and will provide evidence to obtain an official indication