Xenogenous and xeno-synthetic bone substitutes: state-of-the-art and clinical outcomes

The current clinical knowledge regarding bone augmentation or regenerative procedures has been solidified over decades, initially mostly based on clinical experience. Instead of the ideal pathway designed for human health products, which begins with *in vitro* investigation, followed by animal studies and clinical trials, the first treatments for bone substitutes were developed through clinical experimentation.

However, in recent times, concerns have arisen about the factors that lead to success or failure of bone substitute applications. Scientific knowledge is constantly aiming to answer questions such as "*what is the best bone substitute?*", "*how can the manufacturing process improve the outcomes of materials?*" and "*what happens at the molecular and cellular levels in bone reconstruction?*", among others. Bone substitute materials, such as deproteinized bovine bone matrix, have shown reliable results and can be considered the new gold standard for some procedures in maxillofacial and implantology fields, as is the case of the maxillary sinus lifting.

Beyond the consolidated applications in dental implantology, the use of xenogeneic and xeno-synthetic materials has been advancing to the fields of maxillofacial deformities correction and facial reconstruction/rehabilitation after maxillofacial pathologies.

Clinical outcomes usually induce new laboratory research. Therefore, the translational features of xenogeneic and xeno-synthetic bone substitutes can be considered a two-way street, in which laboratory research feeds clinical practice, and clinical practice and research raise new laboratory investigations.

We personally believe in the power that this dual relationship brings to the development of current knowledge in xenogeneic and xeno-synthetic materials, and their use in various treatments. As guest editors of this section, we aimed to incorporate both aspects of current research on bone substitutes. To accomplish this goal, we invited authors based on their expertise and research interests in both the clinical and laboratory fields and allowed them to freely choose the developments they wanted to share.

As guest editors, we hope that the compilation of papers we have brought can improve the knowledge about xenogeneic biomaterials and probably set up new inquiries for both clinicians and researchers. The main goals of this special series are to provide content that answers the following questions:

(I) What are the main clinical applications of xenogeneic and xeno-synthetic bone substitutes?

(II) How does tissue respond to xenogeneic and xeno-synthetic biomaterials, and how can this response improve clinical outcomes?

(III) What are the clinical outcomes that determine the success of bone augmentation procedures with xenogeneic and xeno-synthetic bone substitutes?

(IV) Finally, we would like to thank the authors for their efforts, time, and expertise in providing content for this series.

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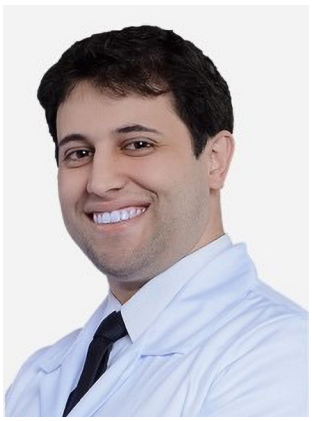

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