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RESEARCH ARTICLE

New Advances On Biomaterials for Regenerative and Reparative Treatment Following Periodontal and Peri-implant Diseases

Gaetano Isola^{1,*} 

¹Department of General Surgery and Surgical-Medical Specialties, Unit of Oral Pathology, School of Dentistry, University of Catania, Catania, Italy

Recent data show that the correct management of periodontitis and peri-implantitis represents a potential challenge in the health system [1, 2]. Periodontal disease and peri-implantitis are multifactorial diseases with infectious aetiology which, following an important immune response of the host [3, 4], culminating in the progressive loss of supporting tissues, alveolar bone and finally determine the loss of the tooth or of the implant [5] and that affect patients' quality of life [6 - 8]. However, in addition to these conditions, the morphostructural alteration of the stomatognathic system's hard and soft tissues can be determined by teeth extraction, trauma, prosthetic restorations [9] oral tumors, and pathological conditions such as severe dental or skeletal malocclusions [10, 11].

A correct relationship between neoformation and bone resorption is fundamental in order to maintain, in the long term, the periodontal [12] and peri-implant support tissues. It has been widely demonstrated that homeostasis and tropism of periodontal and peri-implant tissues are regulated by specific cellular pathways, with highly advanced intra- and inter-cellular regulation and signaling mechanisms [13 - 16].

However, in the last few decades, research in digital dentistry [17 - 19], oral tissues and regenerative engineering has made great strides in successfully managing the problems arising from these pathologies, and having as its primary objective that of regenerating missing or damaged tissues in order to obtain a correct restoration of the periodontal and peri-implant apparatus.

In recent years, more and more efforts in the clinical and scientific fields have been made in the field of periodontal tissue engineering and with the aim of obtaining the regeneration of periodontal hard and soft tissues through specific customized approaches with the use of growth factors,

scaffolds and highly innovative materials [20] that allow to regenerate the missing tissue and, at the same time, to guarantee excellent aesthetics and function [21].

The research in the engineering field of the oromaxillofacial district has been directed in order to guarantee an increasingly specific and personalized approach that also assesses the different clinical condition [22], specific and environmental site of the patient affected by periodontal disease [23 - 25].

In this regard, the developed dental engineering was aimed at finding a wide range of techniques focused on the management and regulation of the many molecular pathways at the genetic level that is activated during inflammatory and infectious pathologies of the craniofacial district [26].

Periodontal and bone regeneration is essentially applied for the treatment of peri-implant periodontal hard tissue dehiscences, as well as in some conditions related to alveolar ridge defects that require augmentation for subsequent oral rehabilitation [27, 28]. In dentistry, some challenges in the regeneration of periodontal tissue and augmentation of alveolar bone include the development of strategies to optimize regeneration according to specific masticatory forces at the interface between the avascular surface of the tooth and implant, associated with microbial contamination of the gingival biofilm [29, 30]. To address the complexity of oral regeneration and rehabilitation, several approaches of a multidisciplinary nature have been developed that span both clinical and basic research.

For these reasons, a correct approach from molecular to clinical manufacturing and nanotechnology must therefore be assessed in a holistic and multidisciplinary way in order to be able to develop a successful therapeutic strategy to treat patients with diseased periodontal and peri-implant tissues [31, 32].

Therefore, a correct knowledge of the microbial biofilm and host defense mechanisms, in physiological and

* Address correspondence to this author at the Department of General Surgery and Surgical-Medical Specialties, School of Dentistry, University of Catania, Via S. Sofia 78, Catania, 95123 Italy; Tel/Fax: +390953782453; E-mail: gaetano.isola@unict.it

pathological conditions is a fundamental approach for the patients [33, 34]. In fact, in most cases of treatment of periodontal or peri-implant disease, a simple disintegration of the bacterial biofilm through a surgical or non-surgical approach does not allow to fix tissue integrum.

Therefore, there is a need to establish specific treatment plans that evaluate the best strategies that allow obtaining real healing of periodontal or peri-implant defects and improve the long-term prognosis of the patients with periodontitis and peri-implantitis.

Recently, efforts have been made in recent years to predictably stimulate true bone regeneration of periodontal tissues by introducing bioactive models or constructing patient-specific bone substitutes or growth factors [5, 35].

In this regard, this special issue was aimed to analyze and update the current knowledge on the most recent therapies and approaches of orofacial disorders [36, 37].

More specifically, in this special issue, several highly current problems have been addressed, including the treatment alternative for Obstructive Sleep Apnea Syndrome (OSAS), the modern approaches to structural alterations such as Stafne's bone cavity, the telemedicine approach for orofacial pain, maxillary expansion and, above all, the remote treatment and monitoring of the patient suffering from oral diseases during COVID-19 infection. There have been many key advances in the field of periodontal engineering and regeneration in various pathological conditions over the past few decades. In the future, bioengineering applied to pathologies of the facial area will allow obtaining a better therapeutic response through the development and use of specific biomimetic scaffolds highly performing to the needs of the individual patient. However, despite these recent and exciting developments, much work remains to be done to translate these interesting preliminary results into traditional routine clinical practice. Furthermore, future research should better match and validate approaches based on tissue biology and engineering, in order to obtain products that always give more predictable and reproducible results on a large scale and allowing obtaining the maximum function, aesthetics and best quality of care of the single patient through increasingly personalized approaches.

Therefore, in the next few years, all that remains is to instill significant scientific and clinical efforts in order to improve research in the engineering and regenerative fields to better treat and with a personalized approach the pathologies of the oral and maxillofacial district.

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