EDITORIAL

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# Enamel matrix derivative proteins used for regeneration of bony defects in periodontitis.

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## Introduction

Various therapeutic options incorporating nonsurgical treatments, as well as conservative and regenerative surgical techniques, have been used for the treatment of intrabony defects throughout the last three decades, with varying degrees of success [1]. Since the early 1970s, to achieve predictable periodontal regeneration, an evolution of different treatments has been studied such as: various types of bone grafts and/or substitutes applications; guided tissue regeneration growth and differentiation factors; enamel matrix proteins [2,3]. The major goals of periodontal treatment are to eliminate infection and resolve chronic inflammation in order to stop the progression and prevent it from recurring [4]. A lack of bleeding on probing and minimal probing pocket depths (less than 4 mm) are the clinical signs of this [1]. Nevertheless, despite the presence or absence of bleeding on probing, the persistence of residual periodontal pockets of >5 mm after active periodontal treatment is linked to an increased risk of disease development like an additional loss of attachment and a tooth loss [3]. Increased probing depths after treatment have been linked to the existence of intrabony or angular periodontal abnormalities, a symptom of periodontitis, and have been proven to affect the long-term prognosis for teeth [5]. Clinical studies have shown that traditional periodontal surgery [6], which includes a variety of access flap methods, can result in probing depth reduction, hard tissue filling, or even the removal of the intrabony aspect [3,5,7]. Even though such techniques may optimize clinical outcomes, the rehabilitation is primarily characterized by the formation of a long junctional epithelium with a limited or no regeneration of root cementum with functionally periodontal ligament fibers connected to new alveolar bone [2,3].

One of the products commonly employed for periodontology treatment is called Emdogain® (Institute Straumann, Basel, Switzerland), and this is a combination of freeze-dried DMA (powder) and a hydrogel (propylene glycol alginate) to complete the formulation [8]. The pure protein complex, freeze-dried and enriched with amelogenins, isolated from the amellar matrix collected from dental swine germs is referred to as "Enamel Matrix Derived" (EMD) [9,10]. Amelogenins, present in EMD, represent an extracellular matrix protein complex that induce the formation of acellular cementum [11]. Amelogenins activate the proliferation and differentiation of periodontal fibroblasts and osteoblasts when absorbed on the root surface. The regeneration of the periodontal ligament and cementum is the primary function of amelogenins in periodontal regeneration [12]. The EMDs then promote the reconstruction of the periodontium in a complex mechanism of activation of osteo-regeneration through the bone cells while inhibiting the epithelialization of the damaged sites [13].

Lars Hammarstrom's pioneering research showed that enamel matrix proteins might act as essential regenerative proteins capable of supporting periodontal regeneration, including the development of new cementum, functionally oriented periodontal ligament

fibers, and new alveolar bone. There have been a good number of articles about the biological basis and therapeutic application of Lars Hammarstrom's innovative work [11-13].

A crucial factor that may lead to bias during the histopathological analysis and that must be taken into account for a fair interpretation of the healing outcome, also for an equitable comparison between treatment modalities, refers to the variation in morphological characteristics and dimensions of naturally developing periodontal defects [14]. For a fact, the vascular and cellular resources of the periodontal ligament, alveolar bone, and gingiva that surround the defect appear to have a significant impact on the repair of deep three-walled intraosseous lesions and deep dehiscence or gingival recession defects. Contrarily, it is clear that in two- or one-walled intraosseous defects, the distribution and contribution of tissue resources are drastically changed and diminished. Actually, the proportions of the defect seem to be a significant factor in predicting healing achievements in the clinical setting, both after conventional surgical therapy. Where wide defects responded with less bone gain compared to narrow defects, and after periodontal regenerative surgery, better clinical outcomes, in other words, larger clinical attachment level (CAL) gain and bone fill, are achieved in deep, narrow intrabony defects compared to wide, shallow defects.

Miron et al. [15] pointed out the effects on early wound healing. All sites were reevaluated using a visual analogue scale to determine the level of post-treatment discomfort after a median of 4 weeks. EMD administered had a beneficial impact on intraosseous defects, as shown by an evaluation of postoperative regeneration, healing, and morbidity.

Regarding the clinical outcomes following in intrabony defects using EMD alone, Miron et al. [15-16] highlighted among his clinical research studies that EMD significantly improved CAL gains and pocket depths. Those results were mainly conducted by an open flap debridement (OFD) surgical technique.

Despite the fact that the enamel matrix derivative has been around for more than 25 years as a periodontal tissue regenerator [10-12], it is also astonishing that it is still one of the few biomaterials that can histologically show genuine periodontal regeneration with the production of new cementum, periodontal ligament, and alveolar bone that is still readily available for clinical usage. Specific enamel matrix proteins have several biological functions, and more study is being done to characterize how these activities affect the behaviour of cells and tissues.

## Conclusions

Using a range of techniques and materials, periodontal regeneration in human intrabony defects can be accomplished to varying degrees, according to the findings of the current editorial. Following the application of various bone grafts and analogues, guided tissue regeneration, biological agents, and other combinations, periodontal regeneration can be observed. From a clinical standpoint, it is also increasingly crucial to continue researching the use of EMDs to see if bone regeneration outcomes may be further enhanced by minor adjustments to EMD support systems or by minimally invasive surgical techniques, EMD continues to be one of the benchmarks for biologic-assisted periodontal regeneration.

**Conflict of interest:** None to declare.

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