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PHYSIOLOGICAL ROLE OF IMMUNE SYSTEM ELEMENTS IN ORTHODONTIC TREATMENT

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ABSTRACT : Orthodontic treatment is an inclusive treatment that includes growth adjustment of the craniofacial area and alveolar bone reconstruction that affects the movement of teeth. Apply orthodontic forces to correct teeth anomaly via alveolar bone remodeling includes a combination of cellular and molecular events in the gum. Orthodontic tooth movement is based on force induced periodontal ligament and alveolar bone remodeling. Mechanical motivation on a tooth causes an inflamed response in the gum tissue. Inflammatory immune markers stimulate the biological processes associated with alveolar bone resorption. The aim of this article is shedding light on the significance role inflammatory immune response in orthodontic treatment.

Key words : Orthodontic, inflammation, immune response.

INTRODUCTION

The application of orthodontic forces to correct mandibular and maxillary teeth irregularities through alveolar bone remodeling involves a series of coordinated and regulated molecular and cellular events in the periodontium i.e. periodontal ligament (PL), alveolar bone (AB), cementum and gingiva. The PL and AB are the two important structures which actively participate in bone remodeling in response to mechanical forces (Nayak *et al.,* 2013). Orthodontics comprise of tooth movement in the jaw from one position to another to attain esthetics (Sabane *et al.,* 2016 and Asiry, 2018).

Orthodontic tooth movement (OTM) is a process relies on coordinated tissue resorption and formation in the surrounding bone and PL. Under normal/healthy conditions, such movement is carried out by highly coordinated and efficient bone remodeling, which requires coupling of bone formation following bone resorption (Li *et al.,* 2018). The rate of bone resorption controls the rate of tooth movement, while the rate of bone formation determines the success of treatment. Based on these concepts, the biological events of orthodontic tooth movement can be divided into two main phases: a catabolic phase when bone resorption occurs and an anabolic phase when bone formation occurs (Alikhani *et al.,* 2016).

Orthodontic forces changes periodontal tissue vascularity leading to the synthesis of various signaling molecules and metabolites. The released molecules generate cellular responses around the teeth, providing a favorable microbiological environment for tissue deposition or resorption (Krishnan and Davidovitch, 2006; Kumar *et al.,* 2015). Various cell-signaling pathways are initiated, which ultimately stimulate PDL turnover, as well as localized bone resorption and bone deposition Bartzela *et al.,* 2009).

However, fixed orthodontic treatment also has its common complications (Lakschevitz *et al.,* 2011), such as producing plaque to cause different degrees of irritation to the gingiva of patients and causing gingivitis (Duarte *et al.,* 2014 and Liu *et al.,* 2018). Root resorption is found in at least 90% of orthodontic patients, although the majority of cases do not compromise dental functions (Årtun *et al.,* 2009). This situation changes the subgingival ecosystem and facilitates the increasing of periodontal pathogens levels, which express virulence factors that stimulate host cells to release several types of inflammatory cytokines (Teles *et al.,* 2010 and Gong *et al.,* 2011and Alves *et al.,* 2012).

The way to analyze changes during orthodontic treatment is through molecular analysis of fluid from the gingival sulcus or gingival crevicular fluid (GCF). This analysis indicates immune and inflammatory reactions resulting from microbial challenge and host defenses, as well as the biomechanical stress caused by orthodontic movement (Gong *et al.,* 2011 and Alves *et al.,* 2012).

Immune cells in orthodontics

Even though in normal conditions the movement of