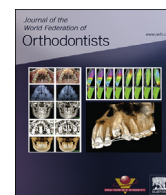


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Effect of bisphosphonates on orthodontic tooth movement in osteoporotic patients: A review

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ABSTRACT

Background: This review discusses the side effects of bisphosphonates (BPs) in orthodontic tooth movement (OTM) with the main focus on suggesting key aspects for the clinical management of patients with osteoporosis by orthodontists.

Methods: Studies were selected through a search of the PubMed electronic database. The keywords used for the search were BPs, tooth movement, orthodontics, osteoporosis, and bone remodeling. The search was restricted to English-language articles published between 2001 and 2017.

Results: This article provides updated information about the mechanism of action of BPs; their effects on bone metabolism, particularly with regard to OTM; oral radiographic considerations in the osteoporotic patient; and the potential use of bone turnover biomarkers from oral fluid as predictors of bone remodeling and key aspects for the clinical management of patients with osteoporosis by orthodontists and dentists.

Conclusions: The interactions of BPs and oral/maxillofacial tissues with a high bone turnover rate such as maxilla or jaws can influence the success rate of dental procedures that involve bones around the teeth, such as extractions, periodontal surgery, and OTM.

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1. Introduction

The application of orthodontic force to a tooth leads to a sequence of events in the dentoalveolar complex [1]. Bone resorption induced by orthodontic treatment on the side of the alveolar bone undergoing compression is a key and essential step in orthodontic tooth movement (OTM) (Fig. 1). In the past few decades, the number of adult patients seeking orthodontic treatment

has increased. Therefore, for orthodontists, the management of osteoporotic patients is currently an important challenge because most patients are managed with prescription drugs that can influence the outcome of orthodontic treatment in relation to the reduction of bone remodeling [2]. Such drugs include bisphosphonates (BPs), one of the most popular groups of antiresorptive drugs.

Osteoporosis (OPO), a “condition of porous bone,” is clinically defined through the estimation of bone strength by assessment of bone mineral density. It is characterized by low bone mass and microarchitectural deterioration of bone tissue, leading to enhanced bone fragility and a consequent increase in fracture risk [3].

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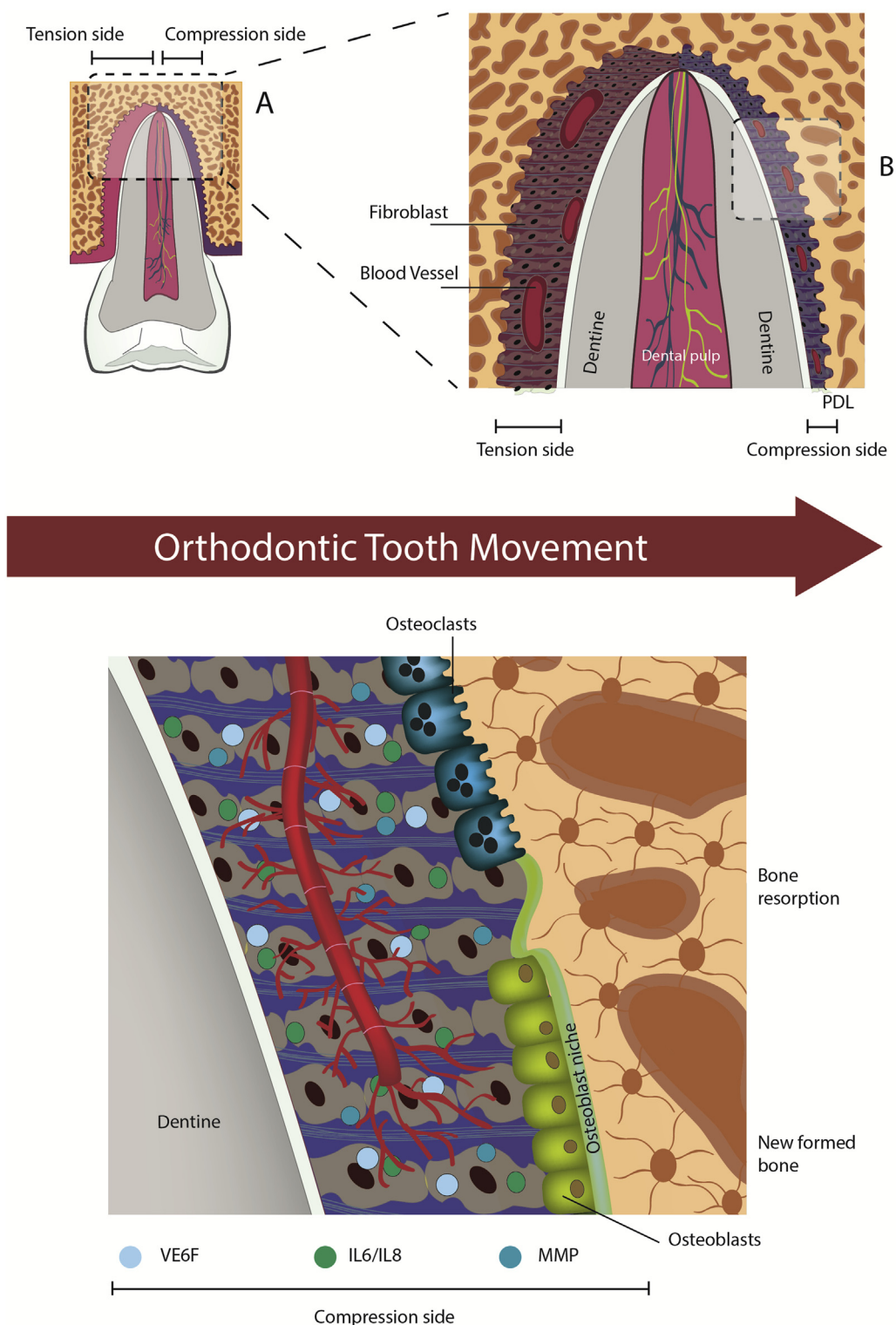


Fig. 1. (A) The biological responses of hard tissue to biomechanical load around the tooth are different between a tension area and a compression area. (B) In the resorption area, blood flow is altered in response to compression within the periodontal ligament (PDL), and the mechanical forces are transduced to the PDL cells, which triggers the biologic response via an aseptic transitory inflammatory process. (C) After the PDL and vascular response in the compression area, several local inflammatory mediators are involved in recruiting osteoblasts and OCLs to remove and deposit bone on the pressure and tension sides of the root.

BPs are synthetic analog pyrophosphates that are highly selective for osteoclasts (OCLs) [4], and they have recently received much attention in the dental literature. These drugs are used to treat various diseases, such as OPO, osteopenia (OP), Paget disease, malignant hypercalcemia, and some cancers [5]. Although the most

common dental side effect of BPs is medication-related osteonecrosis of the jaw (MRONJ), other oral complications that are not completely clear can occur, including the inhibition of OTM. Insufficient information is available on the role of the orthodontist in the treatment of patients with a current history of BP use. The

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