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Does the 'Dynamic' Bone Model Applicable for Dentine?

Abstract

Nowadays, most of recent adhesive dentistry studies tried to show a great similarity between the 'dynamic' bone model and dentine. The main purpose of this short communication article is to advise the academic community to exert more efforts and direct more research money to conduct some controlled randomized clinical trials in this particular area. Also, to respect the clinical aspects, which is much more complicated in comparison with the standardized laboratory model performed under optimum conditions.

Keywords: Dentine bonding; Matrix metalloproteinases; Cysteine cathepsins durability; Clinical performance

Short Communication

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Nowadays, most of recent adhesive dentistry studies tried to show a great similarity between the 'dynamic' bone model and dentine. Many authors attributed the degradation of dentine bonding to the presence of internal enzymatic activity; matrix metalloproteinases (MMPs) or cysteine cathepsins endopeptidases within dentine [1,2]. Most of these studies neglected the differences between "bone" and dentine. Bone is a highly vascular calcified connective tissue contains three types of cells; osteoblasts, osteocytes, and osteoclasts [3]. Despite of its hard structure, bone is a dynamic organ that is continuously resorbed by osteoclasts and neoformed by osteoblasts [3].

The current published manuscripts in the field of adhesive dentistry applied the bone-proteolytic systems on dentine without a strong evidence of presence of an osteoclystic-activity in dentine. Most of these studies attributed the degradation of resin/collagen interface to the proteolytic activity within the dentine [4]. Although, this activity may play a 'minor' role in bonding degradation, the role of clinical procedure errors is usually unconsidered.

Majority of the current 'basic research' studies in adhesive dentistry neglected the long-term clinical success of adhesive restorations which is reported in many published clinical trials. The outcome of the randomized clinical trials (RCT) by Pallesen et al. [5,6] and Van Dijken et al. [7] showed that adhesive tooth-coloured restorations had good clinical performance after 15, 27 and 30 years. Moreover, the results of the thirteen-year RCT by Peumans et al. [8] showed that two-step self-etch adhesives had good clinical performance in non-carious cervical lesions.

According to the 'theoretical' outcome of 'basic research' laboratory studies, most of the adhesive restorations should fail after few years, however this is not clinically applicable. In fact, the majority of these 'theoretical' studies neglected the essential role of some important clinical factors in creating successful restorations; isolation of operating field, tissue changes in caries-affected substrate [9], the influence of caries removal method [9] and clinician's errors during the application of dental adhesives. Furthermore, the type of adhesive restorative materials and the polymerization process play great role on the long-term service of the restoration. The laboratory finding of the studies (conducted on isolated collagen fibers) assumed that all adhesive/collagen interfaces subjected to 'theoretical' proteolytic activity in light of the biological features found in the medical bone models. Hence, the trend of contemporary adhesive research is to discover a new material for inhibition of proteolytic activity in dentine.

The critical question is "*Can dentine proteolytic-activity-inhibitors, separately, solve the degradation problem and create a long-lasting 'successful' restoration*?" Finally, the main target of writing this short communication article is to advise the academic community to exert more efforts and direct more research money to conduct some controlled randomized clinical trials in this particular area. Also, to respect the clinical aspects, which is much more complicated compared to in comparison with the 'standardized' laboratory models performed under optimum conditions.

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