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CURRENT TRENDS AND CLINICAL APPLICATIONS OF OPTICAL COHERENCE TOMOGRAPHY IN ORTHODONTICS

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Optical coherence tomography (OCT) is an emerging technology for performing high-resolution cross-sectional imaging. OCT is a non-invasive, non-radiative optical diagnostic tool based on interferometers. The device measures the time delay and intensity of the light scattered or reflected from biological tissues, which results in tomographic imaging of their internal structure. Optical Coherence Tomography was first reported by Fujimoto et al. in 1991. Since then, the use of OCT has been reported in a wide range of clinical studies, including ophthalmology, dermatology, gastroenterology and dentistry. The use of OCT in the field of dentistry is gaining popularity. The first in vitro images of dental hard and soft tissues in a porcine model was reported in 1998. Later, the in vivo imaging of human dental tissue was presented. In a series of studies using OCT technology in Orthodontics, we assessed the human biological tissues, such as the tooth enamel and cortical bone to evaluate the structures and present the data in a 3D form.In the first of our study, we evaluated the enamel surface during the various orthodontic procedures and presented the data in 3-D manner. Using OCT, we were able to visualize and quantitatively measure the enamel loss occurring due to different orthodontic procedures.

In a first of its kind study, we mapped the cortical bone before and after insertion of microimplants using OCT technology. Microimplants in orthodontic treatments are widely used to achieve anchorage, which is highly relative to the occurrence of microdamage and microcracks during mounting of microimplant onto the bone. Previous studies were either two-dimensional or invasive methods. In this study, optical coherence tomography (OCT) is used to image and analyze the presence of microdamage of bone around the microimplant. 80 microimplants were used in two different methods (drill and drill-free) and in two different angulations. OCT images were obtained in both two-dimensional and three-dimensional modes. Microdamage and microcrack thickness measurements were made for all samples and were statistically analyzed.

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