Adaptation of a microCT facility for automatic recognition of bioceramic-based sealers in molar root canals aimed at endodontic treatment quality control

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Resumen

Computed tomography (CT) technology has seen tremendous growth since its first medical applications in the early 1970s. Nowadays, high-spatial-resolution digital detectors enable the micro-computed tomography (µCT) technique, which has been introduced to a wide variety of applications, including biomedical sciences like odontological applications. Endodontic treatments stand as one of the most common

dental procedures, and the quality of the treatment is essential to prevent and control any potential infection of root canals. This treatment is typically achieved by careful cleaning, shaping, and sealing steps. Often, endodontic treatments fail due to a poor seal, even if a meticulous root canal preparation is carried out. The present work reports on the spectrometric adaptation of a µCT facility for accurate quantification of root canal sealing with bioceramics, aimed at assessing the sealing performance of the new Bio-C Sealer product. A dedicated irradiation setup along with digital image processing techniques have been developed for the accurate and automatic recognition of dental samples root canal anatomy and bioceramic-based sealers. The performance of the proposed approaches has proved to be qualitatively and quantitatively robust for automatic characterization of the endodontic treatment sealing quality, satisfactorily identifying and segmenting canal root, gutta-percha cone, and bioceramics.