Editorial

Endocator-paradigm shift in the evaluation of microbial load in root canals

The primary objective of endodontic therapy is to prevent and treat apical periodontitis, a condition primarily caused by the bacteria. The correlation between bacterial biofilm load and the size of radiographic lesions has been established in both treated and untreated teeth, emphasizing the importance of microbial evaluation in endodontics.[1] A comprehensive review by Shin *et al*. highlighted the capacity of next-generation sequencing (NGS) technology to identify as many as 916 bacterial species in endodontic infections.[2] The density of bacterial populations varies significantly across the different types of endodontic infections, ranging from 10^3 to 10^8 cells per canal in primary endodontic infections, 10^4–10^9 cells in acute apical abscesses, and 10^3–10^7 cells in previously treated canals with apical periodontitis. The mean number of microbial species ranges from 10 to 30 but can reach up to 100 phylotypes per canal, with the number of species proportional to the size of the periapical lesion.[3]

Various techniques exist for assessing microbial phyla in infected root canals, including culture methods, polymerase chain reaction (PCR), reverse-transcriptase PCR, 16S rRNA gene sequencing, fluorescence *in situ* hybridization, denaturing high-performance liquid chromatography, denaturing gradient gel electrophoresis, NGS, DNA probe methods, oligonucleotide probes, checkerboard DNA-DNA hybridization analysis, and terminal restriction fragment length polymorphism.[4,5] However, these methods, whether culture-based or molecular, are often technique-sensitive, time-consuming, expensive, require advanced training, and necessitate complex laboratory equipment. As a result, they are not well-suited for chairside tests to confirm root canal disinfection outside of a research setting.

An accessible and cost-effective alternative for detecting and quantifying bacterial levels involves the use of adenosine triphosphate (ATP) to rapidly assess the remaining cellular debris in a root canal. ATP serves as an indicator of metabolic activity and is universally present in all living cells. Previous research has demonstrated a correlation between low ATP levels and negative bacterial cultures, indicating ATPs sensitivity in detection well below the threshold of bacterial culture negativity.[6-10] Recently, the Endocator was introduced in endodontics to provide a rapid evaluation of ATP levels in a root canal within 10/15 s. The Endocator translates ATP levels into a 0–100 Endoscore based on typical ATP levels during a root canal procedure. For necrotic teeth, this innovative tool can be employed to confirm disinfection, and for vital teeth, it can be used to confirm the sufficient removal of pulp tissue before the final three-dimensional obturation. While additional research is needed to ascertain the correlation between ATP levels and clinical outcomes, ATP testing has proven to be a valuable tool for confirming disinfection in our clinic and has enhanced the disinfection techniques employed by our residents.

In summary, rapid ATP testing represents a paradigm shift in the assessment of microbial load in root canals, offering a rapid, efficient, and chairside compatible method for confirming disinfection before obturation.

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