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Effect of Microorganisms on Differently Instrumented Teeth

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Objectives To investigate the potential influence of various instrumentation methods in periodontal therapy on bacterial colonization of dentine, as well as on the cytokine expression profile of pulpal cells.
Methods Eigthy extracted teeth underwent root canal treatment. The apices were sealed with composite, the pulpal chambers were left empty, and access preparations were temporarily sealed. The teeth were subjected to scaling and root planing using manual instruments, ultrasonication, and air-polishing. Uninstrumented teeth served as control. A six-species bacterial mixture (*Streptococcus gordonii, Actinomyces oris, Fusbacterium nucleatum, Parvimonas micra, Tannerella forsythia*, and *Porphyromonas gingivalis)* was used for incubation of the teeth. Bacterial counts were quantified after incubation periods of 2 and 24 hours. Following incubation with the bacterial mixture over 10 weeks, pulpal cells were seeded into the pulpal chambers and evaluated for cytokine expression.
Results Control samples of dentine exhibited a median bacterial count of 5.97 log10 cfu after 2 hours of incubation, which increased to 8.01 log10 cfu after 24 hours. In contrast, instrumented samples contained 5.73 log10 cfu and 7.71 log10 cfu, respectively. Among the treatment modalities, ultrasonication achieved the most significant reduction with a median decrease of 0.25 log10 cfu (p=0.010) followed by air-polishing. Twenty-four hours post-instrumentation, significantly lower cfu counts were observed in the hand-scaler group, followed by the air-polishing group compared to the ultrasonication. When pulpal cells were seeded into the chambers of teeth exposed to the bacterial mixture for ten weeks, there was an increase in interleukin-8 (IL-8) and matrix metalloproteinase-3 (MMP-3) expression compared to negative controls. Statistically significant increases in IL-8 were observed in the non-instrumented and air-polishing groups (p=0.027 vs. negative control), while MMP-3 expression was significantly higher in the hand-scaler and air-polishing groups (p=0.012 and p=0.006 vs. negative control, respectively).
Conclusions Instrumentation resulted in decreased bacterial colonization and increased IL-8 and MMP-3 expression in pulpal cells.