

Comparative Evaluation of a Dynamic Navigation System Versus a Three-Dimensional Microscope in Retrieving Separated Endodontic Files: An in Vitro Study

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Abstract : Introduction: instrument separation is a common challenge in the endodontic field. Various techniques and technologies have been developed to improve the retrieval success rate. This study aimed to compare the effectiveness of a Dynamic Navigation System (DNS) and a three-dimensional microscope in retrieving broken rotary NiTi files when using trepan burs and the extractor system. Materials and Methods: Thirty maxillary first bicuspid teeth with sixty separate roots were split into two comparable groups based on a comprehensive Cone-Beam Computed Tomography (CBCT) analysis of the root length and curvature. After standardised access opening, glide paths, and patency attainment with the K file (sizes 10 and 15), the teeth were arranged on 3D models (three per quadrant, six per model). Subsequently, controlled-memory heat-treated NiTi rotary files (#25/0.04) were notched 4 mm from the tips and fractured at the apical third of the roots. The C-FR1 Endo file removal system was employed under both guidance to retrieve the fragments, and the success rate, canal aberration, treatment time and volumetric changes were measured. The statistical analysis was performed using IBM SPSS software at a significance level of 0.05. Results: The microscope-guided group had a higher success rate than the DNS guidance, but the difference was insignificant ($p > 0.05$). In addition, the microscope-guided drills resulted in a substantially lower proportion of canal aberration, required less time to retrieve the fragments and caused a minor change in the root canal volume ($p < 0.05$). Conclusion: Although dynamically guided trephining with the extractor can retrieve separated instruments, it is inferior to three-dimensional microscope guidance regarding treatment time, procedural errors, and volume change.

Keywords : dynamic navigation system, separated instruments retrieval, trephine burs and extractor system, three-dimensional video microscope

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