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Comparative analysis of canal centering ratio, apical transportation, & remaining dentin thickness between single file system i.e. oneshape and waveone rotary by using cone beam computed tomography: An *in-vitro* study

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Aim: To compare the canal centering ability, apical transportation & remaining dentin thickness of One Shape & Wave One system in curved root canal using CBCT.

Objective: To evaluate the efficiency of two rotary systems in maintaining original root canal anatomy in curved root canals.

Introduction: Successful root canal therapy depends on effective debridement of the root canal by eliminating debris & microorganisms and shaping of the root canal system without deviating from the original anatomy. Ideally, during root canal preparation, the instruments should always conform to and retain the original shape of the canal. The ability to keep the instruments centered is crucial in curved canals and to deliver an accurate enlargement to the root canal without any unnecessary weakening to the root structure. When curvatures are present, preparation becomes more difficult & there is a tendency for all preparation techniques to divert the prepared canal away from the original axis. Endodontic mishaps are unfortunate occurrences that can occur during root canal treatment which includes ledging, zipping, blockage, strip perforations & canal transportations. Centering is defined as the ability of the instrument to stay centered in the canal. Factors that affect canal centering ability are the design of the instrument which includes cross-section, taper, tip size & flexibility. Canal transportation is one of the most common mishaps during the instrumentation of curved root canals. When Transportation occurs, it has two components - direction and deviation. The direction is an excessive dentine removal in a single direction of the main tooth axis of the canal. The deviation is an undesirable departure from the original canal path, which is the distance in millimeters from the pre and posts instrumented canal as a function of file action. According to the Glossary of Endodontic Terms of the American Association of Endodontists in 2003 canal transportation is defined as: "The removal of canal structure on the outside curve in the apical half of the canal due to the tendency of files to restore themselves their original linear shape during canal preparation". Transportation in the apical third of the root canal promotes the harboring of debris and residual microorganisms as a result of insufficient cleaning of the root canals & over-reduction of sound dentin & destruction of the integrity of the root. The etiology associated with an increased risk of canal transportation include insufficiently designed access cavities, use of inflexible instruments, instrumentation technique, tip design, insufficient irrigation during mechanical enlargement, unseen canal curvatures in two dimensional radiography, skill of operator & degree and radius of a root canal curvature both induce a stress on the instruments.7,8,9,10 Radial lands support an edge of the cutting angle & help to distribute the pressure of the blades more uniformly around the circumference of a curved canal and thus reduces apical transportation. The more severely curved and the shorter the radius of curvature, the greater the risk of transportation. Deviation of the original trajectory of the canal may result in damage of the apical foramen and loss of an apical stop. As a consequence, this will lead to extrusion of debris, irrigants, or filling materials and subsequently An irritation of the periapical tissue. Recently, Wave One and One Shape represent single NiTi file systems which are made of a special NiTi-alloy called M-Wire that is created by an innovative thermal-treatment process. one shape (Micro-Mega, Besancon, France) is to be used in full continuous rotation whereas WaveOne NiTi single-file system has been introduced by Dentsply. The system is designed to be used with a reciprocating motion motor. The benefits of this M-Wire NiTi have increased flexibility and improved resistance to cyclic fatigue. Thus, it is important to assess the canal centering ability of newly introduced single file systems before they can be considered a viable replacement of full-sequence rotary file systems. In the past, methods for assessment of canal transportation, RDT & centering ability included radiographic method, serial sectioning technique, photographic assessment, SEM & computer manipulation technique. The above-mentioned methods were invasive in nature and accurate repositioning of pre and post instrumented specimens is difficult and there is a disadvantage of loss of specimen, whereas radiographs provide the 2-dimensional image of 3- dimensional object. Recently, a non-destructive technology has been advocated for pre and post instrumentation evaluation of canal anatomy. CBCT utilizes a cone-shaped x-ray beam and an area detector that captures a cylindrical volume of data in one acquisition & also used in the analysis of the root canal area and parameters such as canal transportation, centering ratio and the amount of root dentin removed by endodontic instruments. Thus, the purpose of this study was to evaluate and compare the canal transportation, centering ability and RDT after instrumentation with One Shape & Waveone rotary system by using CBCT.

Conclusion: Within the limits of this present study, it was found that Wave One single reciprocation file has less canal transportation and better centering ability & respects original canal anatomy better than one shape.

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