## ABSTRACT

**AIM**: Recently single file systems have come to replace conventional rotary instruments. In this in vitro study four single file systems- two rotary and two reciprocating instruments were selected to evaluate and compare the Canal centering ability, Apical transportation, Dentinal crack formation in the mesio-buccal root of maxillary first molar at coronal, middle and apical third using **CBCT** and **SEM.**

**MATERIALS AND METHODS**: One hundred and twenty freshly extracted human maxillary first molars with curvature 10-20 degrees were analyzed by Schneider's method as per inclusion criteria. Mesio buccal roots of 120 teeth were sectioned and root samples were divided into four experimental groups containing thirty teeth each,**Group I – Hyflex EDM, Group II- OneShape, Group III- WaveOne Gold, Group IV- Reciproc.** After cleaning and shaping as per standard irrigation protocol, the teeth were sectioned and scanned at coronal 1/3$^{rd}$(4mm), middle 1/3$^{rd}$(8mm), apical 1/3$^{rd}$(12mm) of the canal in an axial slice thickness of 1mm. The images were recorded in the computer. The values were tabulated by pre and post instrumentation CBCT images. Canal centering ability and apical transportation were calculated using these CBCT values. Five mesio buccal root specimens from each group were taken for dentinal crack analysis; (5×3=15 samples for each group) 2mm from each section of the coronal middle apical 3$^{rd}$ of the samples were observed under SEM for dentinal crack formation.

**RESULTS**:The canal centering ability was found to be better for OneShape at coronal 1/3$^{rd}$ whereas WaveOne Gold was found to be superior to other three groups at the middle & apical 1/3$^{rd}$. The canal transportation was found to be least for WaveOne Gold followed by Reciproc, whereas the two rotary files Hyflex-EDM and OneShape showed higher value for transportation towards the lateral wall. Using SEM analysis it was observed that OneShape causes more dentinal cracks than other files systems in coronal and middle thirds with cracks evident in all samples at the apical third. Hyflex-EDM and WaveOne Gold showed similar results in the coronal and middle third. But Hyflex-EDM was found to be better in the apical third.

**CONCLUSION**: Canal Centering Ability was not statistically significant for all four experimental groups. Least values for canal transportation was obtained for **WaveOne Gold** almost equivalent to **Reciproc** whereas both rotary files showed higher values for canal transportation. OneShape showed most dentinal crack in the coronal, middle and apical third. **Hyflex-EDM** and **WaveOne Gold** produced least dentinal cracks at all levels.



**KEY WORDS:** Maxillary first molar, Apical transportation, Canal centering ability, Dentinal crack formation, Cone Beam Computed Tomography(CBCT), Scanning Electron Microscope (SEM), **HYFLEX-EDM, ONESHAPE, WAVEONE GOLD, RECIPROC.**