Background

Newer materials are emerging in the field of endodontic surgery to be ideally used as root end filling materials possessing good sealing ability which is the prime requisite for a successful endodontic surgery. This *in vitro* study was done to evaluate the sealing ability of four new root end filling materials – Mineral trioxide aggregate (MTA), Biodentine, Endosequence root repair material (ERRM) and Bone cement in ultrasonically prepared root ends using Confocal laser scanning microscope (CLSM).

Materials and Methods

Root canals of 80 freshly extracted human permanent maxillary central incisors with straight canals were selected, cleaned and sectioned transversely using diamond disc and standardized to a uniform length of 16mm. All the root canals were instrumented with K files using step back technique. The coronal one-third of the canals were prepared using Gates Glidden drills. Apical enlargement was done till size 50 and canals were filled with 2% gutta-percha of size 50 and accessory cones using lateral condensation technique with AH Plus as sealer. All the roots were coronally sealed using composite resin restorative material. After storing in saline for 24 hours, root end resection was done at 3mm from apex using diamond disc. Root end cavities were prepared using ultrasonic retro tip with a depth of 3 mm and width of 1mm. The four retrograde filling materials were mixed according to manufacturer’s instructions and the retrograde cavities were filled. After storage in saline for a week, the teeth were dried and coated with two layers of nail varnish except at the apical 1 mm. The samples were immersed in Rhodamine B dye solution for 24 hours. Then
they were embedded in resin moulds to create a platform and cross-sectioning was done using hard tissue microtome. The sections were viewed under CLSM and the values for maximum penetration of dye into dentinal tubules were recorded.

**Statistical Analysis**

Data were analyzed statistically using Statistical Package for Social Sciences, (SPSS) version – 17 Software for Windows. Data entry was done with Microsoft office Excel Spread Sheet where data were expressed in its mean and standard deviation and were analyzed using ANOVA and multiple comparisons Post Hoc Bonferroni test.

**Results**

Sealing ability of MTA was superior compared to the other three materials with the least microleakage of 241.43 µm which was statistically significant from other materials. Sealing ability of Bone cement was next to MTA with a microleakage of 377.79 µm which was statistically significant from other materials. ERRM showed a microleakage of 457.31 µm and Biodentine showed a microleakage of 476.48 µm and the difference between these two groups were not statistically significant.

**Conclusion**

Within the limitations of the present study, it can be concluded that

1. All the four materials tested in this study showed good sealing ability
2. MTA showed better sealing ability followed by Bone cement, ERRM and Biodentine.
Keywords:

Root end filling, Mineral Trioxide Aggregate, Endosequence Root Repair Material, Biodentine, Bone cement, Confocal Laser Scanning Microscope.