Abstract

Aim:

To evaluate the cytotoxicity and antimicrobial efficacy of experimentally synthesized Zinc oxide nanopowders and Zinc oxide:Silver nanopowders compared with Zinc oxide Eugenol sealer against Enterococcus faecalis, by assessing the bacterial viability using Confocal laser scanning microscopy.

Methodology:

Experimental Nanosealers ZnO Nanorods and Hybrid ZnO@Ag core-shell nanorods were prepared by hydrothermal method and characterized using UV visible spectroscopy and Transmission Electron Microscopy. Cytotoxicity of the synthesized nano particles were done by MTT Assay on human osteoblast like MG63 cell lines. The extracted human teeth were debrided and decoronated. Then twenty one roots were chemomechanically prepared and were infected with Enterococcus faecalis, with weekly nutrient replenishment for three week. Then they were obturated by cold lateral compaction method using conventional Zin oxide sealer, Nano ZnO sealer and Nano ZnO@Ag sealers and were incubated for a period of 14 days. Following incubation the teeth were sectioned transversely at the coronal, middle and apical regions (n=63) using a hard tissue microtome and the roots were stained with fluorescent DNA binding reagents (FluoresceineDiacetate andpropidium iodide). The bacterial viability was examined by Confocal laser scanning microscopy. Computer assisted determinations of fluorescence for live and dead bacteria were analyzed and were compared statistically.
Results:

Nano ZnO particles showed cell viability of 98.27% at concentration of 0.01mg, 86.23% at concentration of 0.05 mg and 82.70% at concentration of 0.1 mg. Nano ZnO@Ag particles showed cell viability of 95.45% at concentration of 0.01 mg, 90.68% at concentration of 0.05 mg and 88.91% at concentration of 0.1 mg. Both the test materials showed biocompatibility better than the positive control material – the micro Zinc oxide particle sealer.

Nano ZnO:Ag sealer (with a mean value of Live/Dead: Coronal 3rd-9792.14/29053.86, Middle 3rd – 10578.29/16646.86, Apical 3rd – 8122.57/16367.29) was more efficacious against E.faecalis followed by Nano Zno sealer (with a mean value of Live/Dead : Coronal 3rd – 11095.00/14165.71, Middle 3rd – 13425.00/11515.86, Apical 3rd – 8482.43/9721.43) and ZnO sealer (with a mean value of Live/Dead : Coronal 3rd – 22377.43/7593.29, Middle 3rd – 17075.71/10848.57, Apical 3rd – 8825.00/8379.43) at a level of significance of p< 0.05. Significant difference in reduction of live bacteria was found between the three groups in coronal and middle third sections, whereas significant difference in dead bacterial count was found between the three groups in coronal and apical third sections. Also complete elimination of E.faecalis was not achieved with all the three root canal sealers used.

Conclusion:

The present study on biocompatibility showed that the ZnO nanorods and ZnO@Ag Hybrid core-shell nanorods were biocompatible better than the control, ZnO microparticles. The results on antimicrobial efficacy showed that the complete elimination of E.faecalis was not achieved with all the three sealers used. Nano ZnO@Ag sealer was shown to be most efficacious against E.faecalis compared to Nano ZnO sealer and conventional ZnO sealer.