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ABSTRACTS
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An investigation into the relationship between apical root Impedance and canal anatomy

Aim To investigate a possible relationship between apical root impedance and canal anatomy.
Methodology Twenty-three roots from human extracted teeth (mostly single rooted but also from molars) with different apical anatomy were selected. The apical anatomy was initially classified by staining the root tip to identify number of canal exits; after impedance measurements, the anatomy was confirmed by staining and clearing the dentine. The roots were divided into two groups; 12 had simple (S) anatomy (Vertucci type 1 with a single exit) and 11 had complex (C) anatomy (various Vertucci canal types with multiple exist).Impedance measurements were taken using a frequency response analyser at seven levels in the root (0.0, 0.5, 1.0, 2.0, 3.0, 4.0 and 5.0 mm short of the apical terminus) at 14 frequencies ranging from 1120 to 100 000 Hz. Care was taken to control the temperature and other variables that could confound measurement accuracy. The impedance characteristics of individual roots were compared with 37 equivalent circuits (based on a pool created from a previous study); the best fitting equivalent circuit was selected. The equivalent circuits were used as the single outcome measure describing the impedance characteristics and correlated with the canal anatomy (S/C). Generalized estimating equations were used to perform logistic regression to analyse the data.
Results Canal anatomy had a significant ($P = 0.046$) effect on the equivalent circuit model. One circuit (model 10) was found to be the commonest and occurred significantly more commonly in the simple canals. The odds of prevalence of circuit model 10 were 2.2 times (odds ratio 2.17, 95% confidence interval 1.01–4.63) higher in canals with simple anatomy compared with canals with complex anatomy.
Conclusions Canal anatomy had a significant effect on the equivalent circuit describing its impedance characteristics. It should be possible to use impedance spectroscopy to clinically predict and image apical canal complexities.

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The effect of purmorphamine on murine osteoclast activity

Aims The aim of the study was (i) to establish and characterize a model to evaluate the effect of purmorphamine on murine osteoclastic activity; (ii) to test the hypothesis that purmorphamine-stimulated osteoclasts would resorb test calcium phosphate surfaces more than controls. The alternative hypothesis was that purmorphamine-stimulated osteoclasts would be associated with significantly less resorption than baseline controls.
Methodology In the characterization phase, cultured osteoclasts were able to resorb a calcium phosphate coating (CaP) allowing a simple but effective model to assay their activity. Bone marrow from 50 neonatal mice provided the source of osteoclasts that were seeded onto 100 CaP-coated discs to evaluate the effect of purmorphamine on their activity. Culture medium was used as a baseline control and bisphosphonate as negative control.
Results The characterization phase of the study demonstrated that a suitable CaP coating could be reproducibly precipitated onto the discs and that resorption through the action of TRAP-positive, multi-nucleate cells was quantifiable. Bisphosphonate negative controls showed no resorption. From a starting sample of 100 CaP discs, attrition through development and infection problems left five experiment and control pairs, the analysis of which showed that purmorphamine-stimulated osteoclasts were associated with significantly ($P = 0.043$) less resorption than baseline controls, indicating that it probably had an inhibitory effect on osteoclast function.
Conclusions Purmorphamine is an important bone agonist that could possibly be combined with grafting materials and induce bone regeneration. Within the limitations of the study, it can be concluded that purmorphamine does not induce differentiation of precursors into osteoclasts, supporting the alternative hypothesis. The next step would be to evaluate the properties of purmorphamine in conjunction with grafting materials (e.g. hydroxylapatite) by using implantation and usage tests in animals. In this way, the effect of purmorphamine on bone regeneration can be assessed and conclusions about its usefulness can be drawn.

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Biofilm disruption by root canal irrigants and potential irrigants

Aim To investigate the disruption and bactericidal effect of root canal irrigants on single and dual-species biofilms.
Methodology Single-species (*Streptococcus sanguis, Enterococcus faecalis, Fusobacterium nucleatum, Porphymonas gingivalis)* and dual-species (*S. sanguis* and *F. nucleatum*) biofilms were grown on nitro-cellulose membranes and immersed in either a commonly used root canal irrigant; (NaOCl, EDTA, Corsodyl®, iodine) or potential root canal irrigant [sodium dodecyl sulphate (SDS), cetyl trimethyl ammonium bromide (CTAB) and Tween®80] for 1, 5 or 10 min. The number of viable and nonviable bacteria disrupted from the biofilm and those remaining attached to the biofilm were determined using a viability stain in conjunction with fluorescent microscopy. In addition, confocal laser scanning microscopy (CLSM) was used to allow a visual assessment of the disruptive effects of selected agents on the stained biofilms.
Results Gram-negative species were more susceptible to cell removal than their Gram-positive counterparts, *S. sanguis* being the least susceptible. The majority of the cell disruption occurred after the first minute of exposure as all of the agents exerted some effect on bacterial disruption and viability; however, the extent varied according to the agent. The most effective root canal irrigant for disrupting biofilms was NaOCl whilst in contrast iodine was generally effective at bacterial killing but not disruption. Of the

