Microleakage of three filling materials for furcation perforation

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INTRODUCTION: Success of endodontic treatment can be compromised when furcal-floor or radicular perforation occurs[1]. When an iatrogenic or pathological perforation exists, this communication must be removed by a hermetic and biocompatible filling. The aim of the study was to evaluate and compare the sealing ability of three biomaterials used for furcal-floor perforation obturation: IRM® (Intermediate restorative material from Detrey Caulk,), MTA (Pro-root®, from Detrey Maillefer, Ballaigues, Switzerland) and an ordinary commercial version of Portland cement (abbreviation: PC).

METHODS: 40 lower molars were selected. Easy access to the furcation area was a criterion of selection. Three groups of twelve teeth each were randomly formed: a group of 4 teeth was used as a control group (2 negative and 2 positive controls). Classical Access cavities were created. Standardised perforations were made using ISO # 006 round burs. Filling material was applied according to the manufacturer's protocol, using a Messin gun and a small plugger. Cotton pellets moistened with sterile distilled water were placed, and the access cavity was filled with IRM. The teeth were placed on a wet support for 24 hours. All surfaces of the teeth except the furcation area were coated with two layers of nail varnish. The microleakage test was carried out using a passive dye penetration method (1% basic fushin solution). After embedding in epoxy resin and cutting exactly at the furcation point, each sample was placed under a light microscope connected to a video camera and a computer. A qualitative analysis (score method) and a quantitative analysis (measurements of dye penetration length) were performed. For qualitative analysis, the Fisher's modified Chi squared test was used and, for quantitative analysis, the Kruskal and Wallis test and the Mann and Whitney U-test were used.

RESULTS: All the perforations sealed with IRM were infiltrated by the dye up to the pulp chamber. The modified Chi^2 test showed that the scores were dependent on the filling materials. The differences between IRM and MTA, and between IRM and Portland cement were statistically significant ($p<0.005$) but there was no statistically significant difference between MTA and Portland cement. The comparison of mean dye penetration lengths was statistically significant ($p<0.001$).The Mann and Whitney U-test showed a statistically significant difference between IRM (105.93 µm ± 27.23) and MTA (31.85 µm ± 34.90), and IRM and Portland cement (34.90 µm ± 38.88), but no statistically significant difference between MTA and Portland cement.

Fig 1: dye penetration for IRM, MTA, and PC

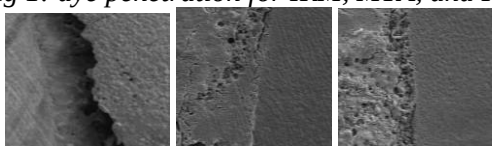

Fig 2: SEM Observation(x1000) for IRM (gap), similarity for MTA and PC (no gap)

DISCUSSION & CONCLUSIONS: Many other studies have been carried out concerning microleakage of MTA and PC, using different evaluation methods. They all conclude that both have a better sealing ability than other cements[2]. MTA and PC used to repair furcation perforation seem to have the best sealing ability according to the conditions of this experiment. MTA and PC show comparable properties[3] when evaluated in vitro and in vivo[4]. The results suggest that PC has the potential to be used as a less expensive root-end filling material.

REFERENCES: [1]S. Seltzer, I. Sinai**,** (1970): *Periodontal effects of root perforations before and during endodontic procedures*, J Dent Res 49:332-9. [2]G. De-Deus, et al (2006), *MTA versus Portland cement as repair material for furcal perforations* Int Endod J. 39:293-8. [3]T. Dammaschke T et al (2005): *Chemical and physical surface and bulk material characterization of white ProRoot MTA and two Portland cements.* Dent Mater.21:731-8. [4]J. Camilleri et al (2005) *The chemical constitution and biocompatibility of accelerated Portland cement for endodontic use*. Int Endod J.38:834-42.