Mineral trioxide aggregate — a new experimental material for retrograde filling

Sealing ability of amalgam, super EBA cement, and MTA when used as retrograde filling materials by J. Aqrabawi 2000; 188: 266-268

Objective
To compare apical microleakage of MTA following reverse retrograde root filling with that following amalgam and EBA retrofilling.

Design
Prospective random control trial.

Setting
It was conducted at the University of Jordan in 1998.

Materials and methods
The root canals of 79 extracted teeth were instrumented and obturated with vertically condensed gutta-percha. Each tooth was apically resected and the apex was prepared ultrasonically to 3 mm depth and the root surface isolated with nail varnish. Teeth were divided randomly into three groups of 25 teeth each. First group was retrofilled with amalgam, second group with EBA and the third group with MTA. Following immersion in 1% methylene blue dye for 72 hours, the roots were sectioned and the depth of dye penetration was evaluated by a stereomicroscope at x10 magnification.

Interventions
Super EBA is a reinforced zinc oxide cement based on a mixture of 32% eugenol and 68% ethoxy benzoic acid (EBA). MTA is a mineral trioxide aggregate cement (MTA) based on a mixture of sterile water.

Main outcome measures
The sealing effectiveness of the retrograde filling materials used in this study was determined by their ability to inhibit dye penetration.

Results
56% of the group filled with amalgam and 20% of the group filled with EBA showed dye leakage beyond the retrofilling material whereas the MTA group showed none, two samples from MTA group were eliminated because of their fractured roots. The chi-squared test revealed a statistically significant difference among all three groups ($P < 0.05$).

Conclusion
MTA cement provides a better seal than amalgam and EBA cement when used as retrograde filling, but the extrapolation of this result into a clinical practice may be questionable.

In brief

- The apicectomy procedure — the placement of the retrograde filling — is essential in today's endodontic science.
- The use of the common retrograde material (amalgam) has been decreasing mainly because of the public concern about environmental effects of mercury.
- A new experimental material: mineral trioxide aggregate (MTA) has been considered as the retrograde material of choice.
- Although MTA is still awaiting to be approved for human use by the Food and Drug Administration, it is now used in European states.

Comment

Mineral trioxide aggregate (MTA) is a remarkable material for use in endodontics. It is basically the material used in the building trade as the basis of cement and mortar. It sets even in wet conditions, the reaction being a hydration and crystallisation. Its use was pioneered by Dr Torabinajad of the University of Loma Linda in California, USA, and he has found it to have exceptional properties of biocompatibility, even when it is expressed from the apex of the tooth. Quite why this should be the case is not clear; the material is very alkaline (pH 12), and might be expected to irritate the tissues. But Nature can be capricious, and in fact the hard tissues of the body seem to positively welcome this material.

The present paper compares the sealing ability of MTA with other accepted endodontic sealers, namely amalgam and zinc oxide-EBA cement. In the study, conventional endodontic preparation was given to 79 freshly extracted human teeth, which were divided into three groups of 25, all of which used gutta percha points in conjunction with one of the sealers. Controls were also prepared, two each of a negative control (fully coated with nail varnish) and a positive control (instrumented and obturated with gutta percha and sealer).

The extent of leakage was determined using methylene blue dye. The results showed that none of the MTA-sealed teeth had any leakage. By contrast, 14 of the amalgam-sealed teeth (56%) and 5 of the EBA-sealed teeth (20%) showed considerable leakage. These results were highly significant statistically.

There was thus clear evidence that MTA provided a hermetic seal when used as a root end filling material. Its potential clinical properties are thus as promising as its other biological ones. Dr Aqrabawi is cautious about extrapolating these results to clinical practice, and there is certainly anecdotal evidence that MTA, being a slow setting paste, is difficult to use in the clinic. Nonetheless, it does have great potential; and these findings once again vindicate Dr Torabinajad's decision to use this particular building material in endodontics.

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