Endodontic Spotlight

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Spring 2013

Introduction
I hope everyone is enjoying our slightly nicer spring weather and the longer days. The theme for this edition is mineral trioxide aggregate or MTA. MTA is a recently developed material that has been shown to have numerous uses and is one of the biggest innovation in endodontics in the last few decades. Our first two articles demonstrate its use in open apex cases and in perforation repairs. Lastly, we have a study from the University of Washington that looks at the effect of MTA on pulp cells.

Spotlight on Mineral Trioxide Aggregate (MTA)
Mineral trioxide aggregate or MTA was developed by Mahmoud Torabinejad, who is a UW Endodontics alumnus and currently serves as the Endodontics Program Director at Loma Linda. It is available in either the gray or white form and is sold commercially in the United States as ProRoot MTA by Tulsa Dentsply. MTA contains numerous components including tricalcium silicate, tricalcium aluminate, calcium silicate, tetracalcium aluminoferrite, and bismuth oxide, and is similar to Portland cement. MTA has been showed to be extremely biocompatible and can support both hard and soft tissue repair and healing. It has been used to repair perforations, as a root end filling material in endodontic surgery, to perform apexification on teeth with open apices, to increase the chance of pulpal survival for teeth requiring pulp caps or pulpotomies, and allow for the possibility of revascularizing necrotic teeth. Because of the dramatic increase in success rate for perforation repair with MTA versus any other material, any clinician who performs root canal therapy should have MTA in stock so that the perforation can be immediately sealed. The main weakness of this material is that it is difficult to handle – it should be mixed to a consistency similar to wet sand on a beach and then placed and tamped into the defect. Yet despite this issue, it is an incredible material that is extremely useful in endodontics.

Mente J, Leo M, Panagidis D, Ohle M, Schneider S, Bermejo JL, Pfefferle T. Treatment outcome of mineral trioxide aggregate in open apex teeth. J Endod 2013;39:20-6.
This cohort study evaluated treatment outcomes for MTA apexification cases. The MTA apexification procedure, which is used to fill a tooth with an open apex, involves placing a plug of MTA in the apical area to prevent extrusion of the filling material, followed by filling the coronal portion of the canal with gutta percha. In this study, 252 teeth were treated with MTA apexification by endodontists, general dentists, or supervised dental students, and recalled and reevaluated clinically and radiographically between 12-128 months later. The authors found that 90% had healed, 4% were showing signs of healing (asymptomatic with a smaller periapical radiolucency), and 6% had failed. They also noted two prognostic factors that affected the likelihood of success. Teeth without preoperative apical periodontitis healed at a higher rate than those that had a preoperative lesion (96% versus 85%). Additionally, they found that endodontists had a significantly higher success rate then general dentists or supervised dental students (there was no significant difference between general dentists and dental students).
SUMMARY: This cohort study shows a high success rate for the MTA apexification technique.

Main C, Mirzayan N, Shabahang S, Torabinejad M. Repair of root perforations using mineral trioxide aggregate: A long term study. J Endod 2004;30:80-3.
This retrospective case series demonstrated the high success rate of perforation repairs with MTA. 16 cases with various types of perforations (furcal, lateral, apical, or strip) were treated with MTA and recalled at least one year (12-43 months) later for clinical and radiographic examination. All cases were healed with normal tissue architecture at the repair site. *SUMMARY: MTA can be used to repair perforations with a high success rate.*

Paranjpe A, Smoot T, Zhang H, Johnson JD. Direct contact with mineral trioxide aggregate activates and differentiates human dental pulp cells. J Endod 2011;37:1691-5
This laboratory study looks at the cellular response to mineral trioxide aggregate (MTA). By measuring the expression of odontoblastic genes, they showed direct contact between dental pulp cells and the MTA is necessary to help differentiation into odontoblast-like cells. Although additional research is necessary, these results suggest that using a membrane or matrix under the MTA in procedures such as pulp capping or revascularization may limit the beneficial effects from the MTA. *SUMMARY: MTA should be placed in direct contact with the dental pulp cells.*

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