Masterclass in Clinical Practice

Endodontics

with

Prof Peet van der Vyver[1]
Dr Martin Vorster[2]
Dr Nicoline Potgieter[3]

How to close an open apex with MTA

[1] Peet van der Vyver,
BChD (Pret); Dip. Odont (Aest Dent);
Dip.Odont (Endo); MSc Odont (Endo), PhD (Endo)

[2] Martin Vorster,
BChD (Pret); PGDipDent (Endo); MSc (Odont)

[3] Nicoline Potgieter,
BChD (Pret); PGDip (Paedo); PGDipDent (Endo); MSc

Introduction

According to the American Association of Endodontists, 2003, Apexification is defined as a method to induce a calcified barrier in a root with an open apex or the continued apical development of an incomplete root in teeth with necrotic pulp and is considered the treatment of choice in teeth presenting with a necrotic pulp and open apex.

Two widely accepted methods of achieving an apical barrier in immature teeth, prior to obturation of the canal are, the multiple visit apexification with calcium hydroxide or the single visit apexification with Mineral Trioxide Aggregate (MTA). Since the introduction of ProRoot MTA (Dentsply Sirona) in 1993 by Torabinejad, the traditional use of the multiple visit calcium hydroxide technique was gradually replaced by the orthograde insertion of the MTA apical plug as a successful one-step technique.

MTA is antimicrobial and biocompatible, stimulates cytokine release from bone cells, and promotes hard tissue formation permitting an adequate seal that prevents bacterial micro-leakage.

However, the clinical placement of MTA at the apex of a root is challenging without the correct equipment, materials and techniques. The Micro Apical Placement (MAP) One system (System Produits Dentaires SA, Vevey, Switzerland (Figure1), a universal carrier with special needles, is the tool of choice that can be used for easy and accurate placement of an MTA plug. The system consists of a stainless-steel applicator with a bayonet catch for different exchangeable and bendable NiTi memory shape applicator cannulas. The cannulas are available in two sizes, with external diameters, 0.9 mm (yellow) and 1.1 mm (red). The internal diameter of the cannulas is 0.6 mm (yellow) and 0.8 mm (red), which allows for sufficient portions of the filling material to be applied successively.

The Apexification technique enables predictable results if the steps are followed as described in the following case report:

A 30 year old male patient presented with a history of trauma on his maxillary left central incisor. A periapical radiograph revealed a large periapical lesion around the root tip of the left central incisor (Figure 2) and CBCT scan confirmed the lesion and an open apex.

TOP TIP: *A CBCT scan is very valuable to determine if an apex is open or not as well as to determine the location and angle the canal exits the root canal system.*

The tooth was accessed after anaesthesia and rubber dam placement. Length determination was done using an electronic apex locator and also confirmed radiographically (Figure 4). Taking into account the large preoperative size of the root canal system, a size 40/06 ProFile (Dentsply Sirona) instrument was used for root canal preparation (Figure 5).

TOP TIP: *It is advised to pack MTA when apical size is 55 k-file or larger. Opening the canal to a size 60 makes it easier for predictable placement and condensation of MTA in the apical part of the canal.*

Calcium hydroxide was placed as an intracanal medicament for a few days and removed at the next visit using sodium hypochlorite and the sonically driven EDDY (VDW) irrigation tip.

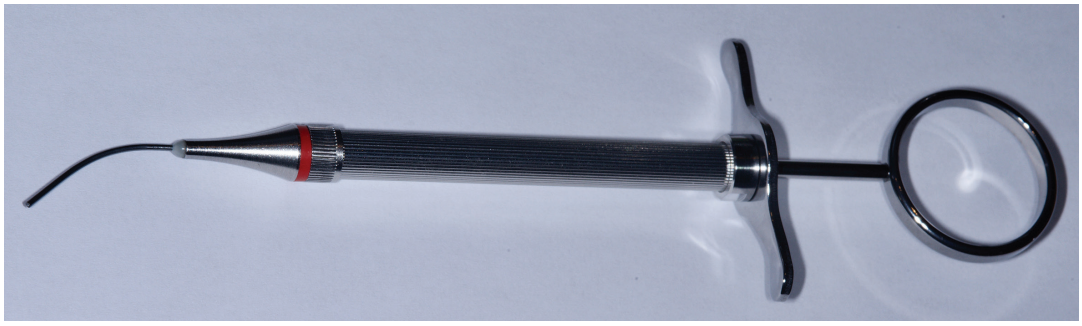

Figure 1: MAP One system, the mixed MTA material can be picked up from a dispenser/ well and the cylinder of cement initially compacted and contained in the tube of the MAP head can be dispensed into the root canal without the dispersion of the filling material.

Figure 2: Pre-operative periapical radiograph.

Figure 3: Sagittal view CBCT scan confirmed the lesion and showed the presence of an open apex at the root tip.

Figure 4: Periapical length determination radiograph with a size #55 k-file.

Figure 5: Root canal preparation with a ProFile 04/60 instrument.

Figure 6: A Machtou endo plugger fitted to working length and apex locator reading marked with a silicone endo stop.

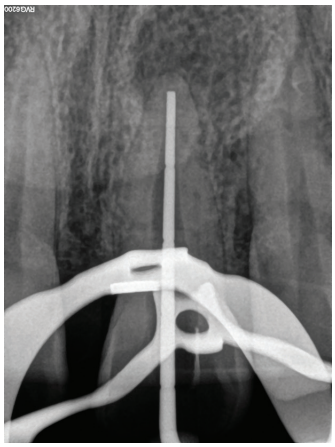

Figure 7: Radiographic confirmation of the position of the Machtou endo plugger in the root canal system.

TOP TIP:*Literature suggests that when Calcium Hydroxide is placed as a root canal dressing within the root canal of non-vital immature teeth, it may increase the risk of root fracture, and this risk appears to increase over time. It is advisable to limit the time that the material stays inside the root canal system. The increased risk of root fracture after long term placement of Calcium Hydroxide is an additional reason why the single visit MTA technique is preferred.*

A Machtou endo plugger (Dentsply Sirona) (Figure 6) size 2 was fitted to working length using again an electronic apex locator and confirmed radiographically to determine the depth of placement of the MTA. The depth of plugger penetration down the canal was marked by placing a silicone endo stop on the measured length.

TOP TIP: *This is a very important step and you need radiographic confirmation of the position where you*

Figure 8: The MAP One system used to pick up a small amount of premixed MTA and dispensed into the root canal system.

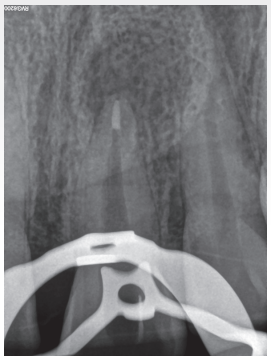

Figure 9: Periapical radiograph confirming the apical position of the MTA plug.

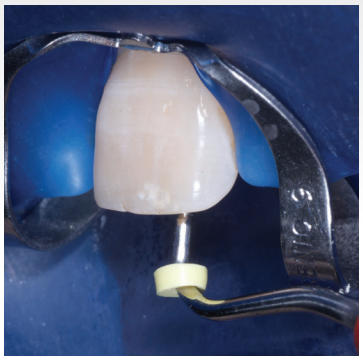

Figure 10: A 4-5 mm distance visible from the incisal crown tip towards the silicone endo stop confirmed the length of the apical MTA plug.

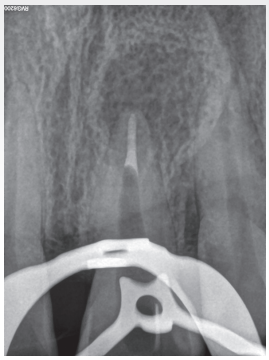

Figure 11: Periapical radiograph confirmed a 5 mm plug of MTA.

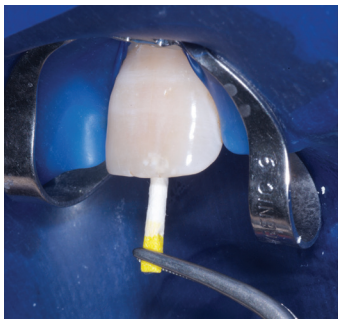

Figure 12: A large size paper point was slightly moistened in sterile water and pumped up and down in the canal to clean the root canal walls.

Figure 13: Warm gutta percha was dispensed into the rest of the root canal system to complete canal obturation.

will pack the first plug of MTA. The plugger should be approximately 1 mm short of the radiographic apex- allowing the space for the MTA plug – so it might be necessary to adjust your reading that was obtained from the apex locator. Also of importance is that the plugger you select correspond more or less with the apical diameter of the apical foramen of the root canal.

The MAP One system was used to pick up a small amount of premixed MTA and dispensed into the root canal system (Figure 8) and condensed to the predetermined working length. The same procedure was repeated before taking a periapical radiograph to confirm correct placement of the material (Figure 9).

TOP TIP: *When dispensing the material in the root canal it is advisable to wiggle the placement device at that level to ensure that the cylindrical plug of MTA stay behind in the root canal.*

TOP TIP:*The periapical radiograph after placement of two small amounts of MTA is key towards a successful outcome.*

The position of the placed and condensed MTA plug will determine if you can continue if the plug is at the tip of an ultrasonic scaler on the plugger. If the plug is placed past the apex it cannot be corrected but alert the clinician to use lower condensation force to place the rest of the material to avoid further overfill. A good suggestion here is to pack the rest of the MTA with a paper point and not a stainless steel plugger to minimise the condensation force applied.

After confirmation that the first layer of MTA is in the correct position, the same procedure was repeated until there was a 4-5 mm distance visible from the incisal crown tip towards the endo stopper on the plugger (Figure 10). A periapical radiograph confirmed a 5 mm plug of MTA (Figure 11).
To clean the walls of the remaining root canal system, the tip of a large size paper point was slightly moistened in sterile water and the paper point was pumped up and down to clean the root canal walls (Figure 12). Warm gutta percha was dispensed into the rest of the root canal system to complete canal obturation (Figure 13).

TOP TIP: *If root canal cement is placed directly against the unset MTA in creates a crumble effect with the MTA and becomes messy. First dispense a small plug of warm gutta percha against the unset MTA and condense. This can be followed by cement placement and obturation with warm gutta percha.*

Scan to view video:
Prof Peet van der Vyver, Masterclass - Apexification