Obturation with heat and vibration: The DownPak device

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Achieving successful endodontic treatment requires an accurate diagnosis and appropriate cleaning, shaping, and three-dimensional obturation of the canals. This article describes a new obturation technique that utilizes a warm plugger or spreader, delivered (in conjunction with vibration) with a single cordless device, the DownPak.

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Successful endodontic treatment depends on a proper diagnosis, a favorable prognosis assessment, and proper disinfection, cleaning, shaping, and obturation of the canals and radicular spaces. Since it may not be possible to disinfect and clean all of the canal ramifications thoroughly, obturation makes it possible to seal the roots internally to prevent leakage coronally or from periradicular tissues.[1]

At present, there is no ideal obturation material. Gutta-percha remains the primary obturation material in use today; other obturation filling materials that have gained some attention include Resilon (Pentron Clinical Technologies, Wallingford, CT; 800.551.0283) and ProRoot MTA (Dentsply Tulsa Dental, Tulsa, OK; 800.662.1202). All of these materials are limited in their ability to seal all accessory and main canals thoroughly and three-dimensionally. Nevertheless, it is important to obtain a homogenous mass of obturation material that will conform well to the interior walls of the canals when plasticized; gutta-percha and Resilon are the most suitable materials.

Heated gutta-percha changes its crystalline form from a beta-phase, which is relatively solid, to an alpha-phase, where it becomes a more plasticized material that is stickier and adheres to the canal walls.[2] In its alpha phase, gutta-percha can be compacted vertically and laterally by using mechanical or rotary instruments. Resilon, a polyester- and methacrylate-based resin obturator, has good flow and bonds to etched canal walls after it is heated, which may provide a tighter seal of the canal system while strengthening the root system.[3]

Several techniques have been used to facilitate the placement of gutta-percha, including cold and warm lateral compaction, warm vertical compaction, injectable systems, carrier-based obturation, and thermomechanical compaction. All of these techniques require various degrees of clinical proficiency and certain techniques may be more appropriate than others, depending on the canal system that is to be obturated.

For example, when a tooth has a large internal resorption defect in the canal, cold lateral compaction may not fill all of the canal space adequately; vertically compacting or injecting warm gutta-percha may be a more appropriate obturation technique for such resorptive defects. Because of the multitude of canal ramifications in any given tooth, it is difficult to fill these spaces three-dimensionally unless the gutta-percha is heated, enabling it to flow into the internal cul-de-sacs. In vitro studies have demonstrated that cold lateral compaction is approximately 25% less dense than warm lateral compaction and that gutta-percha fills significantly more canal space when warm vertical compaction is used.[4-6]

Even after heating and compacting gutta-percha or Resilon, there still may be voids in the obturating materials. To minimize this problem, Martin developed a self-contained electronically heated spreader for warming and laterally compacting gutta-percha (Endotec, Medidenta International, Inc., Woodside, NY; 800.221.0750). This device significantly enhanced the compaction of gutta-percha.[7]

A 1993 study found that the Endotec device increased the density of the obturation by approximately 15%.[8] Although this obturation device is no longer available commercially, it demonstrated that electrically induced heat on a spreader or plugger tip was an efficient way of delivering heat to gutta-percha, producing a denser obturation as a result.

The subsequent Touch ‘n’ Heat system (SybronEndo, Orange, CA; 800.346.3636) and the System B (SybronEndo) expanded on this concept and were found to be successful for creating a more homogenous obturation of gutta-percha.[9]

The EndoTwinn (MDCL, Amsterdam, The Netherlands; 31.204.867.571) is another such device that has been used throughout Europe for many years. Like the Endotec, the EndoTwinn is a hand-held heat-carrying instrument with a spreader or plugger tip. Sonic vibration was incorporated to augment the effectiveness of EndoTwinn’s heated tips. Several studies have reported that by simultaneously combining the efficacy of heated obturating material with vibrating energy, the average percentage of gutta-percha in the canal space could increase significantly, especially in the more narrow tapered canals.[10-12]

Efforts to improve and refine the EndoTwinn led to the introduction of the DownPak (Hu-Friedy, Chicago, IL; 800.483.7433) in early 2007. The DownPak enables the clinician to employ variable temperature settings and to turn off the vibration feature if desired. The variable temperature settings become useful when different obturation

materials are used. For example, Resilon softens at a lower temperature than gutta-percha. The DownPak is cordless and lightweight, with an ergonomically balanced hand-held grasp; all of the switches and adjustments are easily accessible on the handle.

Technique

Figures 1–5 illustrate the DownPak being used for a clinical case. First, the appropriate DownPak tip is selected so that it reaches a depth in the canal that is 3.0–5.0 mm from the apical terminus (Fig. 1 and 2). A silicone stop can be adjusted on the tip as a reference point for this measurement. Next, the canal walls are coated with sealer and a master gutta-percha (or Resilon) cone is placed in the canal to working length. Using the tip of the heated DownPak, excess coronal gutta-percha is removed with the tip of the heated DownPak to the level of the orifice. With a sustained push, the DownPak tip is introduced into the canal with the heat and vibration modes activated; at that point, it is extended down the canal space to the predetermined binding point, 3.0–5.0 mm from the apical terminus. The tip is rotated rapidly two or three times 180 degrees clockwise/counterclockwise and heated for one second; at that point, the tip is removed quickly along with any excess gutta-percha (Fig. 3 and 4). Any remaining voids can be sealed coronally with additional accessory cones by applying vertical compaction as described above (Fig. 5).

Fig. 1. A pretreatment radiograph demonstrating recurrent caries.

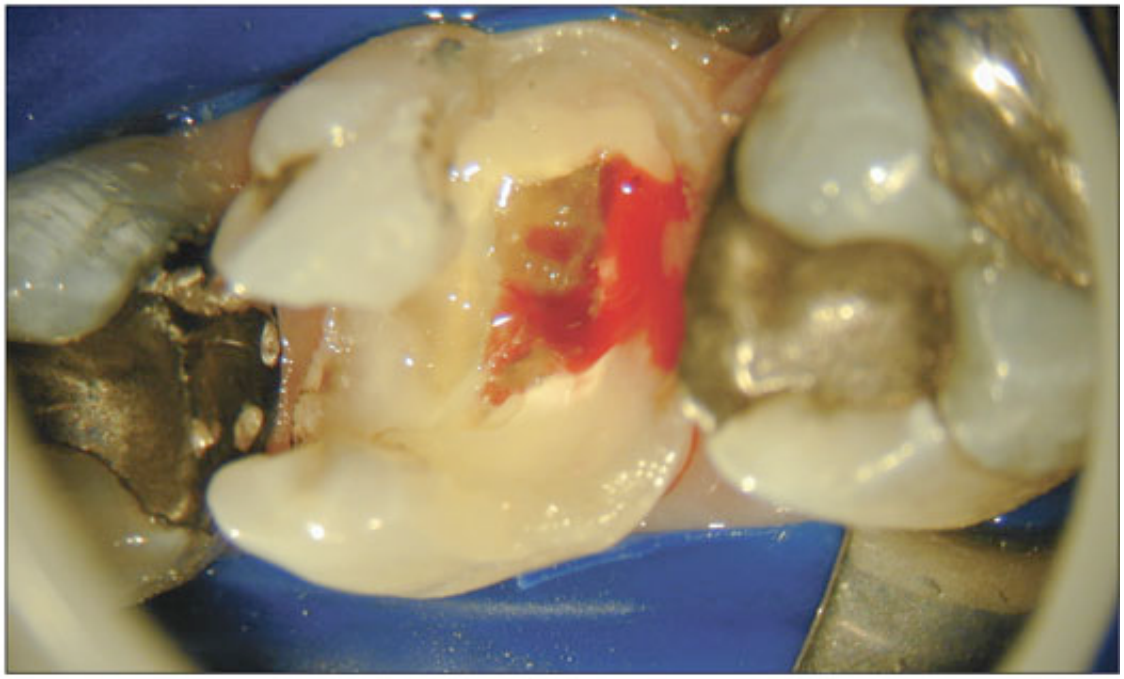

Fig. 2. Restoration and caries removal with pulp exposure.

Fig. 3. DownPak compaction of gutta-percha showing five canals.

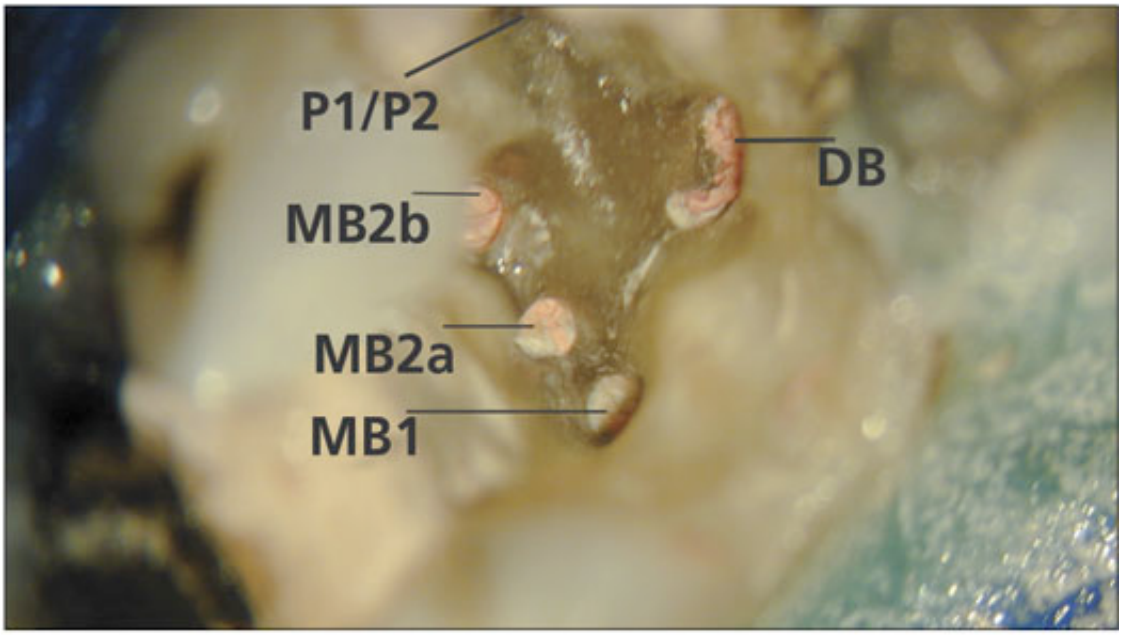

Fig. 4. The pulp chamber after obturation.

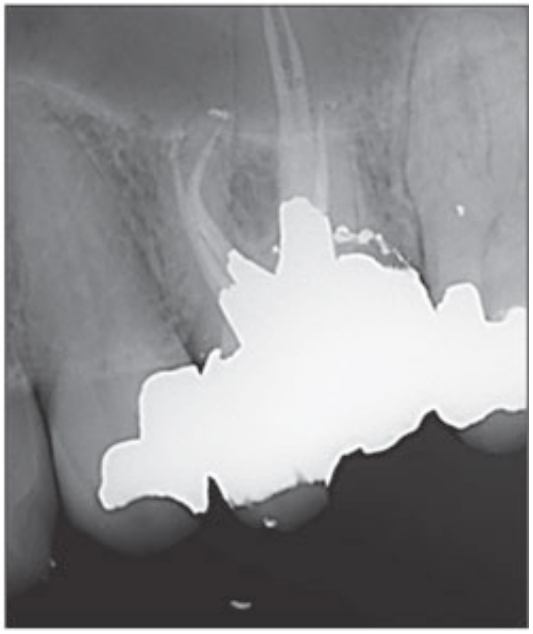

Fig. 5. A post-treatment radiograph.

Summary
The literature and this article have documented the benefits patients receive when clinicians employ plasticized gutta-percha and vertical compaction combined with vibration. The advent of cordless devices like the DownPak make it easier than ever for general practitioners to employ techniques that many endodontists utilize.

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Disclaimer
Dr. Cohen is on the advisory board of Hu-Friedy Company.

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