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Obturation of the root canal system

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There have been numerous articles written on instrumentation techniques using the different rotary nickel–titanium files on the market. Practitioners tend to develop a system that works best for them. Often, this is a hybrid of several techniques discussed in various articles [1]. After creating clean, tapered canals, clinicians need to adequately obturate the root canal system. This is best accomplished by using warm gutta percha, with the System B heat transfer system (Sybron Endodontics, Orange, California) (Fig. 1), the new S-Kondensers (Obtura/Spartan, Fenton, Missouri) (Fig. 2), and the Obtura II (Obtura/Spartan) (Fig. 3).

Several years ago, the transition in endodontics took place from stainless steel hand files to nickel–titanium rotary files. Obturation often was still performed with cold lateral condensation of gutta percha, taking twice as long as the newer, warm techniques due to the taper created in the canals. Then, many clinicians made the transition to warm gutta percha, and not only did the radiographic appearance improve but it was also more time efficient [2].

Canals are commonly finished with a 0.04 or 0.06 taper rotary file. This information is not relevant for this article other than when choosing the proper tip for the System B unit (Fig. 4). The 0.06 taper most closely resembles the medium-sized tip on the System B, and if the preparation is finished with 0.04 taper rotary files instead, then the medium/fine System B tip would be indicated. It must also be kept in mind while instrumenting that a size 40 to 45 rotary is necessary to go within 4 mm of the working length of each canal so that the medium System B tip will then be able to fit approximately 4 to 5 mm from the working length. This technique allows the proper removal of the bulk of gutta percha from the canal while transferring heat to the 4- to 5-mm apical plug. This proper removal is accomplished by activating the System B coil with a finger while advancing the now-hot tip (the unit is set at 220°C) down the canal to within 4 to 5 mm

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Fig. 1. System B unit from Sybron Endodontics.

of the working length. The finger is then removed from the coil and the System B tip is allowed to cool down. Because the tips are hollow, they heat up almost instantaneously to the set temperature. After allowing the tip to cool for 10 seconds while still in the canal, the coil is engaged for a split second while pushing apically, and then the tip is withdrawn from the canal with the now-severed gutta percha wrapped around the tip. There will be a learning period when a clinician new to the technique pulls out the entire gutta percha cone from the canal instead of leaving behind that apical plug. When this happens, it means there was not adequate tug back of the master cone and a new cone will need to be refitted [3]. Nonstandardized medium gutta percha cones and a gutta gauge can be used to customize those master

Fig. 2. New set of three S-Kondensers (Obtura/Spartan).

Fig. 3. The Obtura II unit comes complete with instructional video and plastic practice blocks.

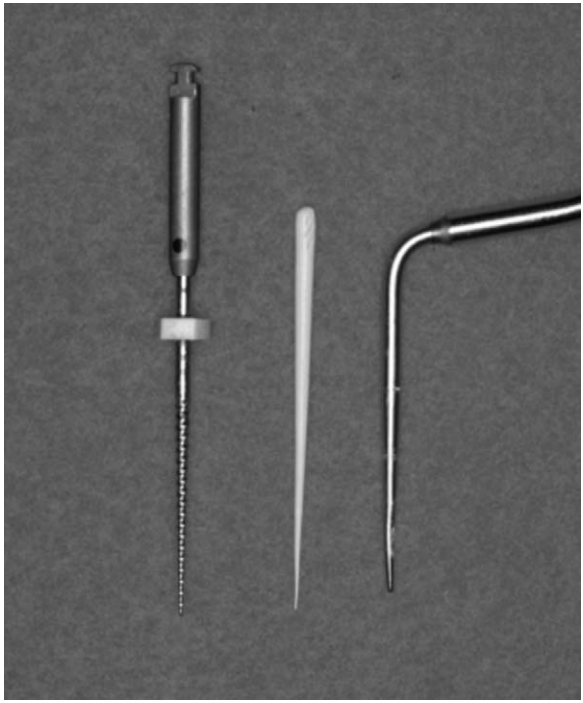

Fig. 4. The medium System B tip compares closely to a medium gutta percha cone and a 0.06 taper rotary nickel–titanium file.

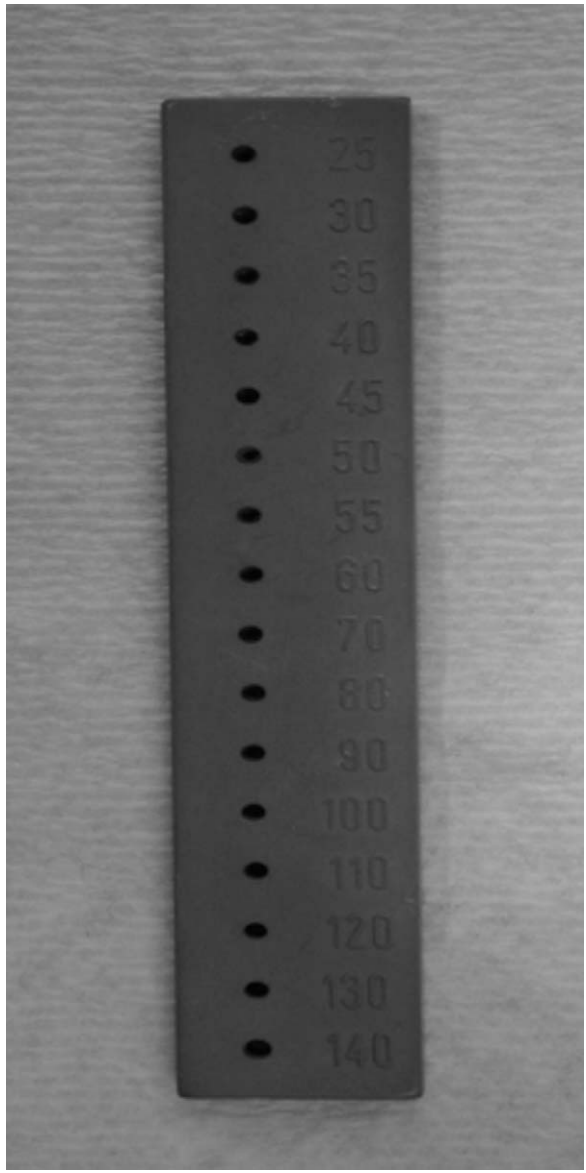

Fig. 5. Gutta gauge, used to customize the gutta percha cone.

cones (Fig. 5). The medium gutta percha cones most closely resemble the 0.06 taper created in the canals, but 0.04 and 0.06 taper standardized gutta percha can now be purchased.

Because of the heat transfer process of the System B, there is now a softened apical plug of gutta percha in the canal. The next step is to

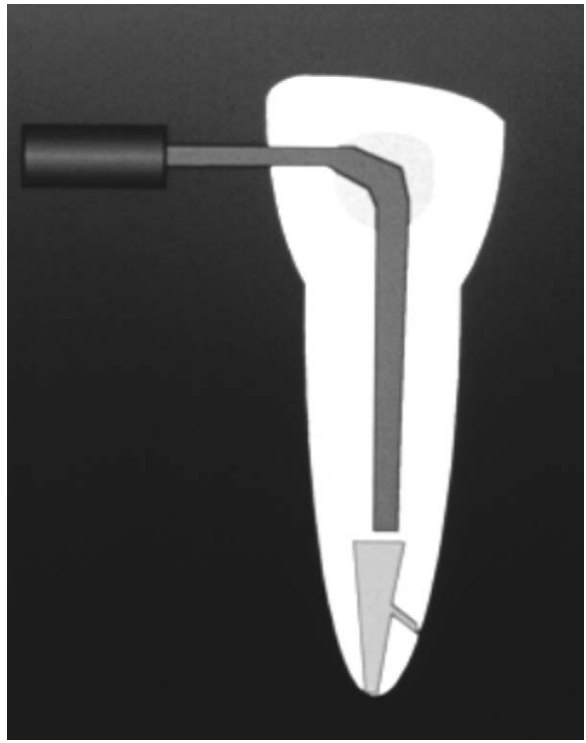

Fig. 6. Apical plug of gutta percha remains in canal and can now be packed down.

condense this plug of gutta percha, achieving a better seal apically (Fig. 6). This is where the new S-Kondensers from Obtura/Spartan come in handy. The S-Kondensers have improved on several problems that existed with other condensers. They are ISO standard colors, so that the black is size 40- nickel titanium on one end and size 80- stainless steel on the other end. The yellow S-Kondenser is 50-nickel titanium and 100- stainless steel, and the blue S-Kondenser is 60-nickel titanium and 120- stainless steel. The nickel titanium end is marked at 5 mm intervals (Fig. 7), to better gauge when you have reached the desired apical distance, and has a .02 taper which gives you excellent compressive strength without compromising flexibility. The handles are made of an anodized aluminum, which is easy to clean and maintains its color throughout autoclaving. The handles are notched to provide a finger rest, positioned so that you can grip the S-Kondenser comfortably and apply firm pressure during condensation (Fig. 8).

After down packing the apical plug of gutta percha we are ready for the Obtura II to back fill each canal (Fig. 9). The Obtura II has helped to improve the density of fills as well as increasing efficiency. The obturation phase of treatment has now become the easy part of a root canal [4]. The

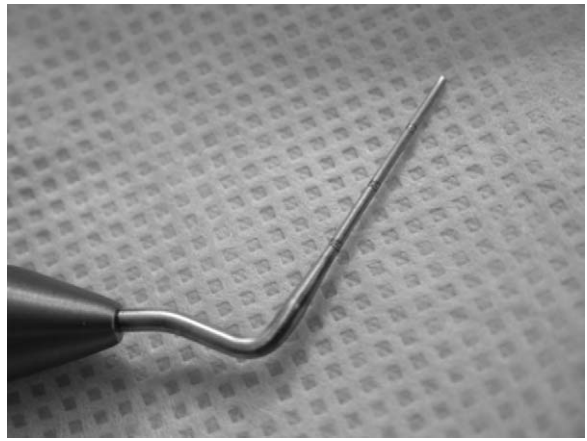

Fig. 7. Notches at 5-mm intervals on the nickel–titanium end of the S-Kondensers.

Obtura II unit is nicely packaged with an instructional video and a plastic block with which to practice. The tips come in 23 gauge and a thinner 25 gauge. If you choose to use the 25-gauge tip, you must use the gutta percha pellets designed for this tip, which soften at a lower temperature. There is a little trick to installing the Obtura II tip that will allow you to obturate either maxillary or mandibular teeth without changing the tip. First, you screw the tip into place with the wrench and use the bending tool to place it between a 45-60 degree curve on the tip (Figs. 10 and 11). Now place the wrench back over the tip and quarter turn counter-clockwise, loosening the tip slightly. This will allow you to rotate the tip, whether you are obturating a lower tooth or an upper tooth, without it loosening too much that gutta

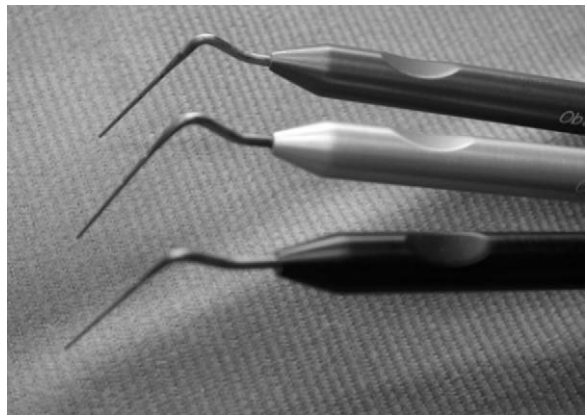

Fig. 8. Indentation in handle of S-Kondenser for finger rest during condensation.

Fig. 9. Obtura II unit ready to go.

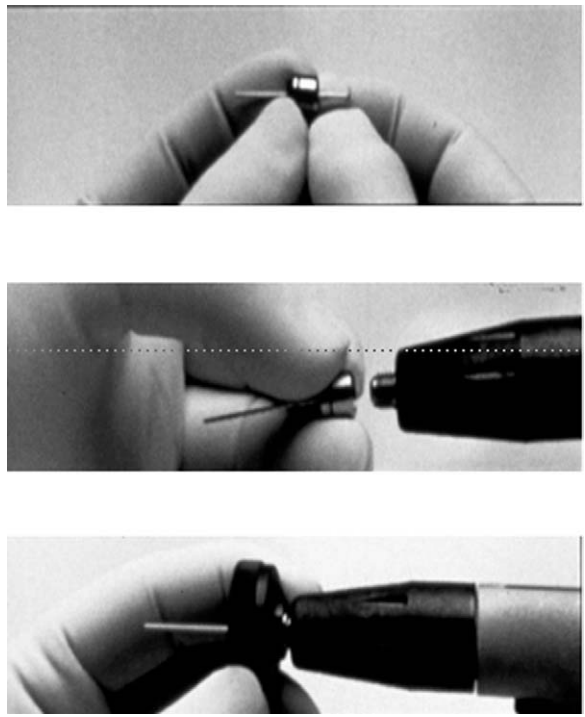

Fig. 10. Installation of needle.

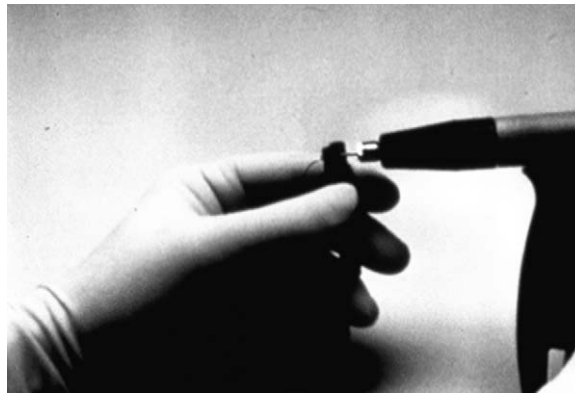

Fig. 11. Tip-bending instrument.

Fig. 12. Void in gutta percha filing.

percha would extrude out the sides. You must place the Obtura II tip in the canal and make contact with the apical plug of gutta percha before back filling. Once the tip is in contact with the now cooled apical gutta percha plug, let it remain there for three seconds, re-heating that apical plug. This will prevent voids from occurring between the apical gutta percha and the remainder of the filling (Fig. 12). If you hear a crackling noise while injecting the gutta percha, it is an air pocket, and will not affect the fill, as long as you continue to press the trigger, filling the canal. You may back fill in one motion, not segmentally, and after completing the back filling of each canal, backpack with the stainless steel end of the S-Kondenser. The root canal is now complete.

Most so-called problems with obturation are actually problems with one's instrumentation. The obturation is in essence an "impression" of what the canal looks like after it has been instrumented. If one is not happy with the appearance of the final x-ray, you are actually criticizing the instrumentation/flaring of the canals. If the master gutta percha cone does not seat all the way to the desired working length, you must go back with a file to make sure there is no debris in the canal and that the flaring is adequate. If the master cone goes beyond the apex (Fig. 13), you must

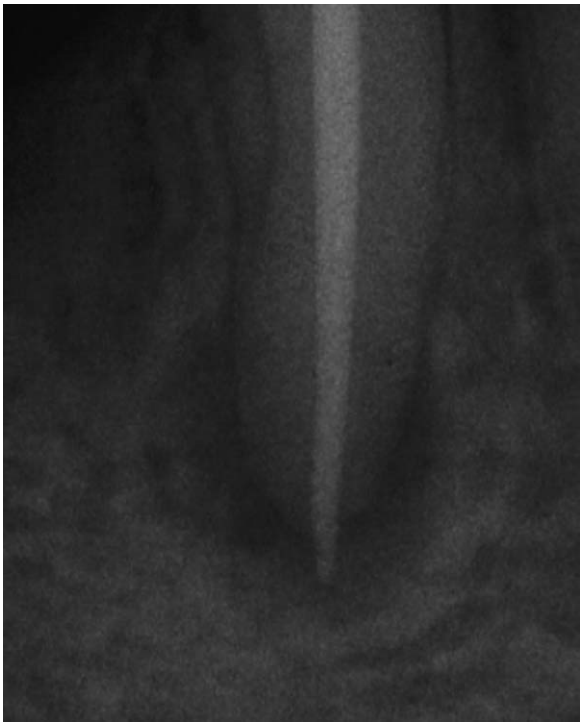

Fig. 13. Gutta percha extruding through apex.

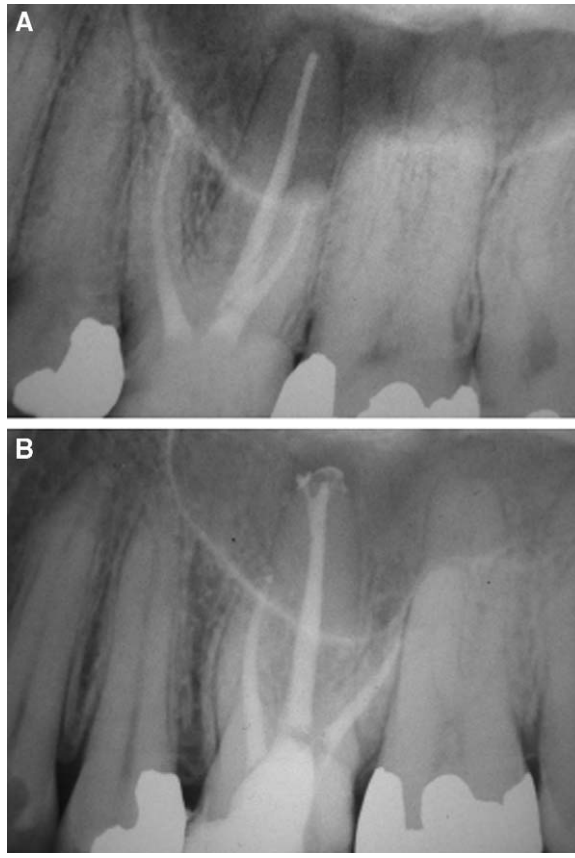

Fig. 14. (*A*) Preoperative radiograph of retreatment of maxillary first molar. (Courtesy Kevin Edwards, DDS, Portland, Oregon) (*B*) Postoperative radiograph.

attempt to achieve an apical stop with further instrumentation at a shorter working length.

There are some cases where the aforementioned technique of obturation makes an impossible case approachable. Examine the pre-operative x-ray of a rnaxillary molar with previous root canal therapy (Fig. 14). Note that the periapical lesion associated with the palatal root is not only at the radiographic apex, but also toward the side of the apex. This maxillary molar had an apical bifurcation of its palatal canal, and instead of burning out the gutta percha with the System B to within 4-5 mm of the working length, this time we went down to within 2mm of the working length, making room to place the second master cone to the desired length. That second master cone is then burned out to within 4-5 mm, and the entire canal is back-filled in one motion with the Obtura II. This case could not have been obturated using a cold lateral gutta percha technique, due to an

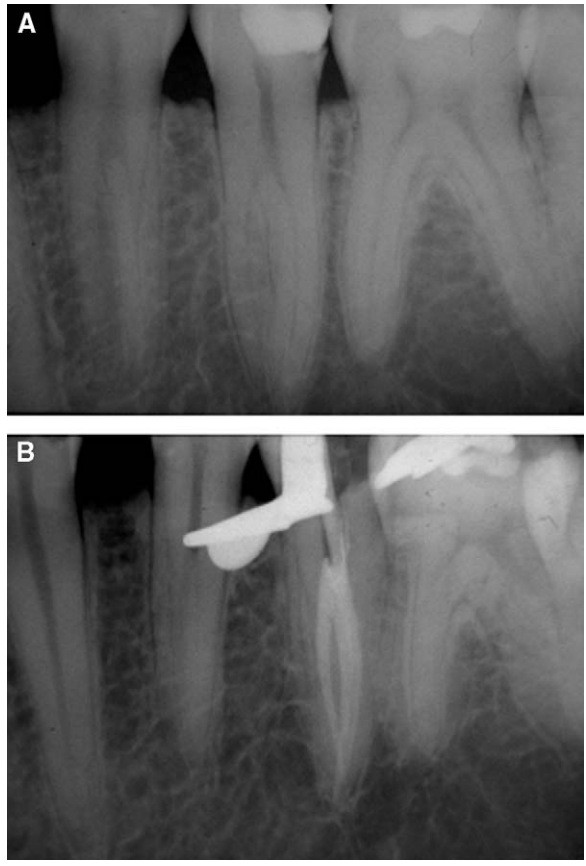

Fig. 15. (*A*) Preoperative radiograph of mandibular bicuspid with trifurcation of canals. (Courtesy Kevin Edwards, DDS, Portland, Oregon) (*B*) Postoperative radiograph.

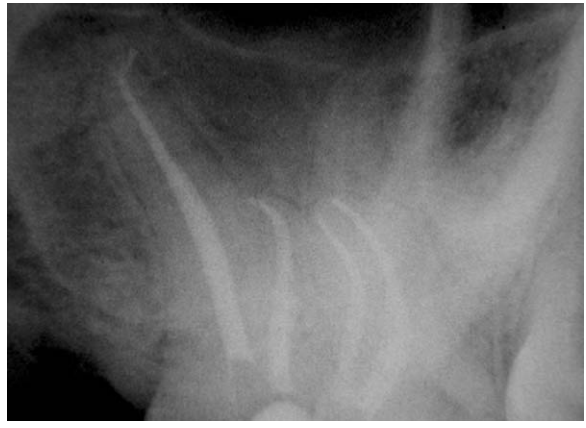

Fig. 16. Four-canal maxillary molar.

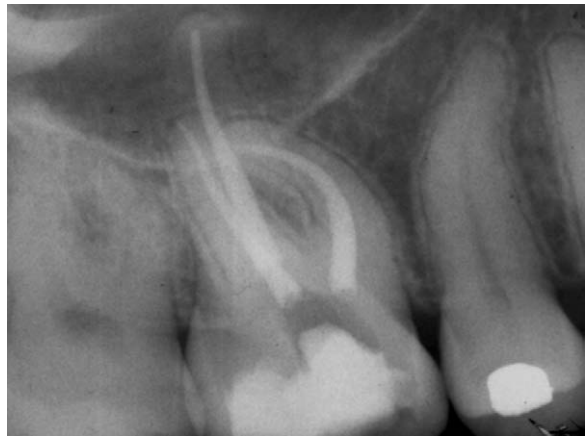

Fig. 17. Maxillary molar with long but gentle curvature of MB root.

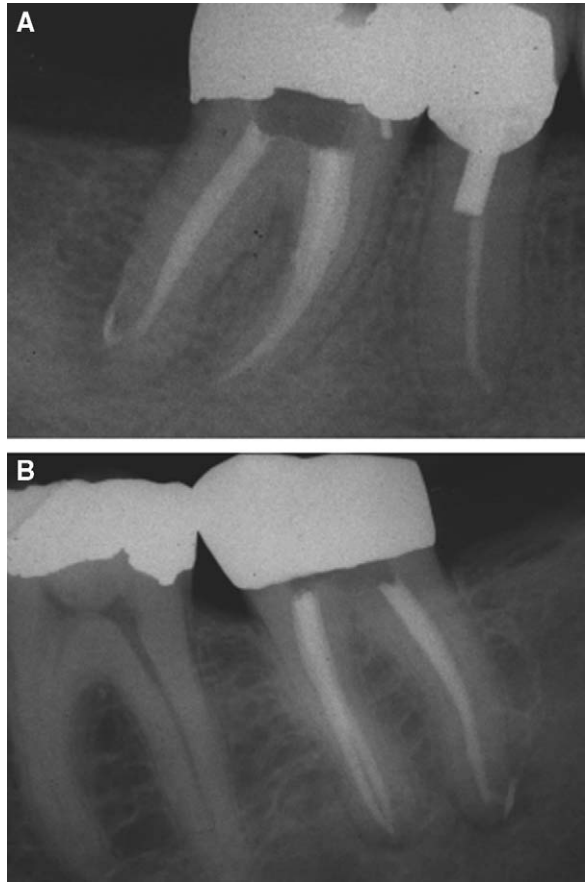

Fig. 18. (*A*,*B*) Mandibular molars with lateral canals filled in apical third of distal root.

inability to properly seat two master cones side by side in the palatal canal.

Another case where the warm vertical technique was necessary was a mandibular bicuspid with a trifurcation of its canal (Fig. 15). Three separate master cones were used, with each cone being burned out apically to the trifurcation, allowing room for the next master cone to be seated. After the three master cones were placed and the System B used to leave three apical plugs of gutta percha, the whole system was back filled with the Obtura II.

A few more cases such as this maxillary molar with four canals (Fig. 16) and another maxillary molar with a long gentle curve (Fig. 17), depict the results obtainable with the above described obturation technique. These two mandibular molars (Fig. 18) have small lateral canals in the apical third, and with the warm vertical technique using a thermoplasticized (semi-solid) form of gutta percha, you will see a higher incidence of filling such lateral canals.

There are many approaches to solving a problem. Similarly, in endodontics, there are several ways to instrument and to obturate the root canals.

Practitioners often develop their own ''hybrid'' technique, using ideas from several colleagues. The purpose of this chapter was to share a technique of obturation, with the hope that others may incorporate some aspects into their own style.

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