Warm gutta percha revisited: classic technique meets new technology

Dr. Sam Kratchman discusses new choices for warm gutta-percha equipment

In the article "Filling Root Canals in Three Dimensions,"[1] Dr. Herb Schilder stated that while there was merit in all obturation techniques available at that time, "when used well," "vertical condensation of warm gutta percha produces consistently dense, dimensionally stable, three-dimensional root canal fillings." This landmark article gave birth to a paradigm shift in not only a variety of warm gutta-percha techniques, but in a new approach to cleaning and shaping canals, as well as irrigation protocols.

In addition to the classic "Schilder technique" of obturation, there is Steve Buchanan's "continuous wave of condensation" technique,[1] and variations thereof. Vertical condensation of gutta percha is now one of the most trusted obturation methods of our time. It is taught in most of the graduate endodontic programs in North America, and in a growing number of undergrad programs as well. Its success rate is well documented.[2]

James Dyson, inventor of the Dual Cyclone bagless vacuum cleaner said, "After the idea, there is plenty of time to learn the technology." In the 44 years since Dr. Schilder published that groundbreaking scientific article, there have been advances in equipment and instrument technology, enabling these techniques to be more predictable and operator friendly. This article will focus on some of the new armamentarium available, while paying attention to the important basic principles.

The ideal shape conducive to warm gutta-percha techniques must be balanced with maintaining the integrity of the root and tooth structure in the "treat the whole tooth" approach to root canal therapy.[2] A continuing tapered canal preparation with either a .04 taper or .06 taper paying careful attention to the proper apical diameter and shape would appear to be the most conducive to a successful obturation with thermoplastic gutta percha (Figure 17). Maintaining a conservative shape, without sacrificing coronal and middle thirds of root structure is now easier with the availability of smaller instruments such as a series of .04 taper heat carriers and pluggers, for new heat sources, as well as smaller nickel-titanium pluggers used for condensing gutta percha in the apical third.

Advances in warm gutta-percha equipment

For those using any thermoplastic gutta-percha technique, the most common products have been the Touch'N Heat or System B™ (Sybron Endo) to down-pack the apical third, and the Obtura (Obtura Spartan®) for the backfill. While these units have served the profession well for over 20 years, there have been some vast improvements recently in technology. One of the issues with endodontic technology over the past 20 years is that each piece of equipment comes with a cord and takes up valuable counter space. The new Alpha A2 Heat source and Beta injectable gutta-percha gun (B&L Biotech/Clinician's Choice) (Figure 1) are cordless units that have answered that challenge. Both units are outfitted with a lithium ion battery that gives 4 hours of continuous operation on a single charge. Some might argue that rechargeable equipment means down time for recharging. With the Alpha and Beta units, this is simply not the case. During any obturation, the heat source and injectable units are used for seconds at a time, so 4 hours of use means days, even weeks (depending on how many cases you complete on average) without the need to charge. Also, with these newer-type batteries, there is no memory, so if the operator prefers, the unit may be returned to the charge cradle after each use. When the battery dies (usual lifespan about 2 years) the dentist can replace it himself, with no need to send out to a technician. The main benefit to these cordless devices is their extreme portability; they can be taken from operatory to operatory with ease, without dragging a 4-to-6 foot cord.

Figure 1: Alpha A2 and Beta cordless obturation units

Dr. Kratchman received a BS in Biology and a DMD from Tufts University in Boston, Massachusetts. He currently serves as an associate professor of endodontics and the assistant director of graduate endodontics in charge of the microsurgical portion of the program. He has authored several articles and chapters on endodontics and intentional replantation for the *Microsurgery in Endodontics* textbook, and the Dental Clinics of North America. He also developed a patented instrument called the S Kondenser for the obturation of root canals. He also maintains three private practices, limited to endodontics, in Exton, Ardmore, and West Chester, Pennsylvania.

Figure 2A: Alpha A2 in charge cradle

Figure 2B: Alpha A2

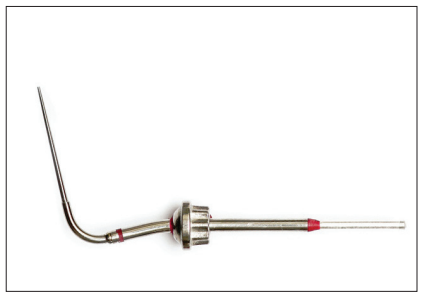

Figure 3: BL plugger tip size 55 / .06 taper

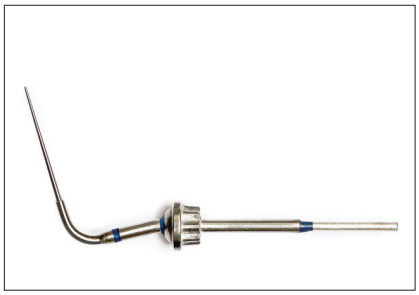

Figure 4: BL plugger 30/.04

Figure 5A: Available pluggers and tips, Alpha A2

Figure 5B: Plugger stand

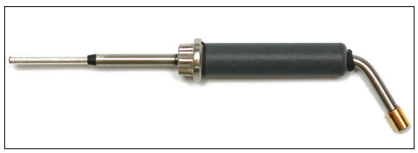

Figure 6: Thermal test tip for Alpha A2

Figure 7A: Beta obturation gun in charge cradle

Figure 7B: Beta obturation gun

The Alpha A2—apical third

Similar in principle to the System B, this cordless heat source (Figures 2A and 2B) has four different temperature settings, and when activated by the touch button on the handpiece, reaches its pre-set temperature within 2 seconds, and cools almost as quickly. A challenge in using down-packing devices is that the angle of the plugger or heat carrier entering the canal is always slightly different, which is especially challenging on upper molars requiring the operator to twist his or her hand into uncomfortable positions. The tips on the Alpha unit snap into a hexagonal fitting (Figure 3), so there are several angles to approach the canal with, eliminating wrist and hand strain. The Alpha has the traditional .55 mm diameter pluggers, in .06, .08 and .10 taper, but also comes with a choice of much smaller sizes, such as 30/.04 (Figure 4) or larger sizes like as large as 60/.12 (Figures 5A and 5B). The only disadvantage to smaller plugger sizes is that they are more delicate so a lighter touch is required. Older heat source devices, such as the Touch'N Heat, provided heat to the tip very quickly, but the temperature continues to rise the longer the operator depresses the heat control. Newer devices, such as the Alpha A2, heat to a pre-set temperature and maintain that temperature accurately. The more precise the temperature, the better control you have over the down-packing phase of the warm vertical or continuous wave techniques. This feature is also advantageous if the unit is used for a heat vitality test (Figure 6).

The Beta (backfill)

Once the most critical phase of the obturation, which is the apical third, is complete, the rest of the obturation process is quick and easy, thanks to injectible devices. The Beta obturation gun (B&L Biotech/Clinician's Choice) (Figures 7A-7C), a cordless device, is a small, ergonomically designed gun that is easily operated by even the smallest hands. As with previous generations of this type of device, the gutta percha is shaped in pellets (Figure 8) (Resilon™ pellets are commercially available), which load into the top of the Beta unit (Figure 9), and a plunger pushes the pellet into a heating chamber, where the gutta percha is heated to your choice of four pre-set temperature settings; 150, 180, 200 and 230 degrees Celsius. Gutta percha is available in three different viscosities; the most commonly used are the soft and regular type. The soft gutta percha is usually used when the smallest diameter (25 gauge) needles are selected. Otherwise, the regular type is preferred as it flows nicely, usually through a 23 gauge needle. Needles (Figure 10) that deliver the thermoplasticized gutta percha into the canal are made of a silver alloy, the best for conducting heat. Silver alloy also makes the needles easy to bend without kinking, using a precision bending tool (Figure 11). Needles are available in three sizes (20, 23 and 25 gauge) with the 23 gauge the most commonly used. It is good to keep at least a small amount of all three sizes handy for conventional cases; 23 gauge needles for most cases, 25 gauge for small canals, and 20 gauge for large

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Figure 8: Gutta percha pellets for Beta unit

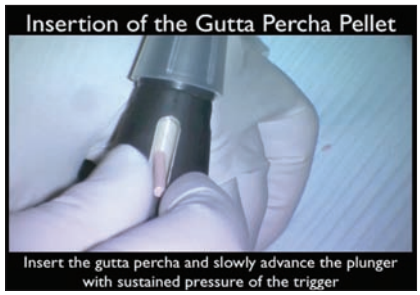

Figure 9: Inserting gutta percha into Beta


Figure 10A: Needles for Beta gun

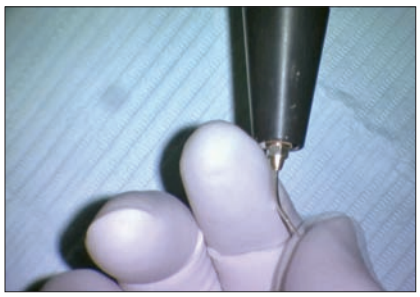
Figure 10B: 360° swivel needles

Figure 11A: Bending the needle

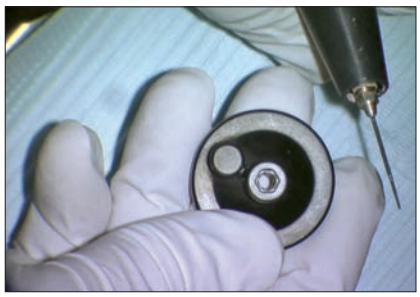
Figure 11B: Installing needle

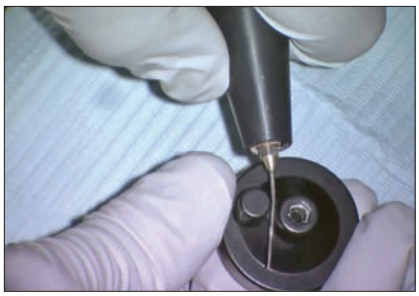
Figure 11C: Bending needle

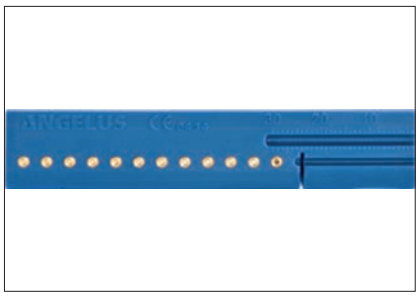
Figure 12: Intermedium gutta-percha gauge


Figure 13: Set of BL Condensers

canals or resorption cases. Needles come in a variety of lengths; most likely 24 mm is the only length you will need. Other lengths are 22 mm, 26 mm, 28 mm, and 50 mm for veterinary use. The most outstanding new feature in the Beta unit's needles is their ability to swivel 360 degrees (Figure 10). This is a huge advantage as it allows the operator to instantly change the angle of entry for any canal, making backfilling of molars much easier than before. It has been noted that other backfill devices, such as the Elements obturation unit (Sybron Endo) have backfilling devices that are motor controlled, rather than operator/trigger controlled. Both have their advantages, but trigger type gutta-percha guns do allow for better tactile control, and of course, have no cords!

Technique

As previously mentioned, the canal shape that is created will determine the choice of plugger. Some studies and observations indicate that a dense apical fill is more likely if you can pre-fit your pluggers to within 4 to 5 mm from working length (WL).[2] Both the heated plugger on the Alpha unit and your hand plugger(s) should be pre-fit and stops set prior to the fitting of the master cone. The choice of gutta-percha cone to use as your master cone depends on the taper of your preparation and the apical diameter. A clever tool to assist with the cone fit, especially if you choose to not use pre-sized cones or prefer non-standardized cones, is a gutta-percha gauge such as the Intermedium (Clinician's Choice) (Figure 12). This allows you to customize a non-standardized or tapered cone to a precise apical diameter. Once the cone gives you the desired fit, and you have good apical tug back, you are ready to "cement" the cone into place with your sealer. Sealers such as the zinc oxide-eugenol (ZOE)-based Pulp Canal Sealer™ (Sybron Endo) or resin based sealers like AH Plus® (Dentsply) or EndoREZ® (Ultradent) work well with warm gutta-percha techniques. A new generation endo sealer, MTA Fillapex® (Angelus, Brazil), an MTA based sealer, also performs well with heated techniques, and shows promise due to its ability to stimulate regeneration of adjacent tissues, its low solubility, and its excellent sealing ability. The sealer can be introduced with the master cone or delivered from the apex up using the Skini Syringe / NaviTip® (Ultradent). Once the master cone is in place, a radiograph should be taken to insure precise cone fit. The master cone is then seared at the orifice of the canal, and gently condensed with a larger stainless steel plugger such as the SS end of the BL Condenser. The Alpha A2 tip is then activated to 230°C and placed into the gutta percha moving down the canal. After about 3 seconds of apical pressure and heat, the heat on the unit is turned off (move finger off button), but firm apical pressure is maintained for 10 seconds more. At this point, the heat is again activated, while still maintaining apical pressure, and then the plugger is twisted a quarter turn and withdrawn bringing with it all of the middle and coronal gutta percha, leaving behind the 4 to 5 mm apical plug of gutta percha. At this point, a plugger is used to make sure that the apical mass is as dense as possible. This also compensates for any shrinkage that might take place as the gutta percha cools. A new series of double ended pluggers, the BL Condensers (B&L Biotech/Clinician's Choice) (Figure 13) are perfect for this. They have a NiTi .04 taper plugger on one end for the down pack, and a larger stainless steel plugger on the other

Figure 14: Condensing the backfill material

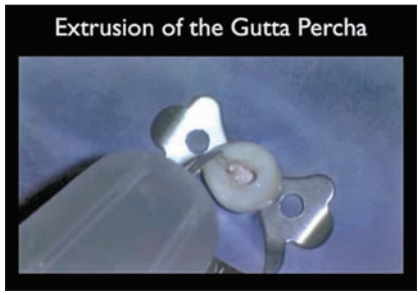

Figure 15: Backfill

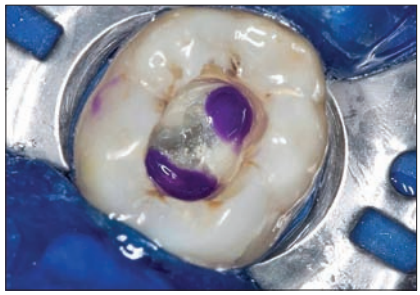

Figure 16A: PermaFlo Purple over orifices

Figure 16B: PermaFlo Purple over chamber floor

Figure 17: Completed obturation (Image courtesy of Dr. Gilberto Debelian, Norway)

end to condense the coronal third of the obturation (Figure 14). In the apical third, a NiTi plugger serves two purposes. First, it will negotiate any curve without binding and, second, because NiTi has memory, the plugger will maintain its shape after several uses. Small stainless steel pluggers deform very easily.

Once the apical gutta-percha mass is condensed, it is time to backfill the canal. The Beta unit, loaded with heated gutta percha, is brought into the canal and delivered through the needle. The needle is preferably placed in contact with the down-packed gutta percha, held there for 3 seconds to reheat the apical plug of gutta percha, preventing voids, and the trigger is depressed. Once the canal is filled to the orifice (Figure 15), the larger stainless-steel end of the BL condenser is used (Figure 14).

Protecting your work

To insure a seamless link between the root canal procedure and the permanent restoration of the tooth, immediate restoration is the best policy. Where temporization is necessary, ensuring a coronal seal is crucial to long-term success. Taking a few minutes to lay down an effective coronal seal protects your three-dimensionally obturated root canal from coronal leakage. A simple procedure is to clean the pulp chamber of all remnants of gutta percha and sealer with a MicroEtcher (Danville Materials), administer an adhesive layer with an adhesive such as MPa™ (Clinician's Choice), then apply a 1.5 mm layer of flowable composite, such as PermaFlo® Purple (Ultradent) (Figures 16A and 16B).

We owe a debt of gratitude to Dr. Schilder, Dr Buchanan and others who have given us the ideas. Forty-four years later, we are still learning the technology and techniques, but we indeed have what we need for efficiently obturating root canals, creating the base for permanent restorative success of the endodontically treated tooth. EP

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