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roots

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2 2009

_trends
Preparing larger apical diameters

_case report
Cutaneous sinus tracts

_research
Leakage resistance

dti] Dental Tribune International

D-RaCe

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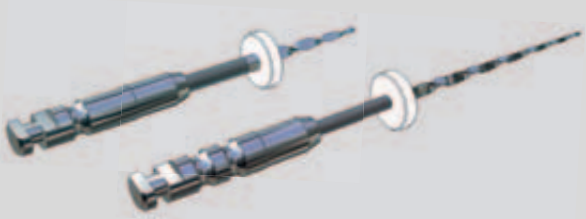

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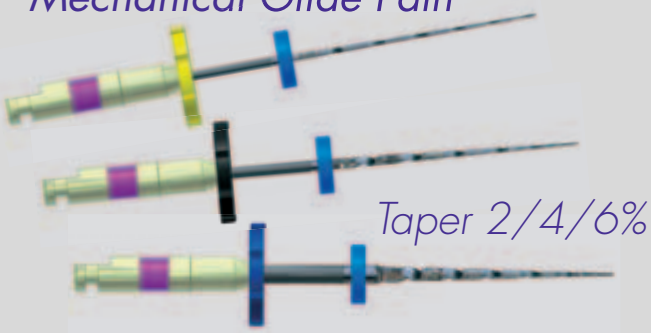
Mechanical Glide Path



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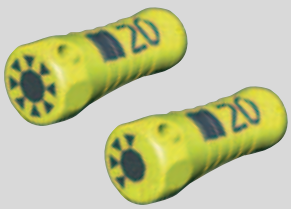

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Dear Reader,

Dr Karl Behr
Editor-in-Chief

_With your practice, you manage an enterprise on a daily basis. You are responsible for its financial outcome like every other businessperson. According to the latest financial forecasts, the global economy is declining, forcing many governments to revise their budgets and spending drastically.

You may wonder how we as dental specialists might be affected. Unlike many other business enterprises, our small- to medium-sized firms do not depend principally on the general economic situation. However, because of the sheer scale of the global financial and economic crisis, it will affect us too. Despite the crisis, we as employers are responsible for the cost-effectiveness and profitability of our practices. Our staff and suppliers expect to receive their salaries and payments every month. When the patients—our customers—stay away, we certainly have to react.

Every crisis presents a challenge. In tough economic times, we need a long-term vision, in order to brace ourselves for negative surprises. We have to develop our own strategies, just like politicians, managers or anyone bearing responsibility or aiming to achieve financial stability and success.

Your optimism and a high degree of flexibility are absolutely essential. A positive perspective and good prospects through innovations or new treatment concepts will ensure continued or even further growth of your practice. Give your practice a chance through fresh impetus! With your team, look for new strategies and develop an optimistic view on the future.

However, figures from the IDS 2009 in Cologne make me wonder whether the crisis has not yet affected the dental industry or rather whether dentists have already been acting as responsible businesspeople. In an area of 138,000 m², 1,820 exhibitors from all over the world presented over 1,100 product innovations. More than 100,000 visitors came to Cologne and placed a volume of orders that exceeded everyone's expectations.

I invite you to inform us how your practice is being affected by the current crisis and, more importantly, how you are managing the crisis with regard to your practice.

Good luck to you!

Sincerely yours,

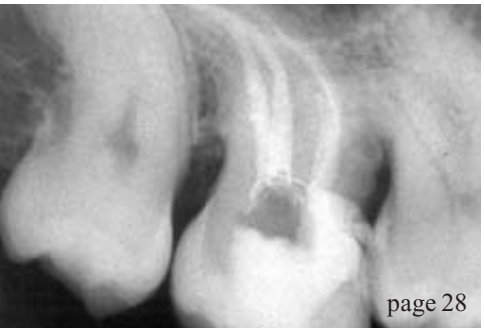
Dr Karl Behr
Editor-in-Chief

page 06


page 14


page 18

Cover image courtesy of Dr Eric Herbranson, 3D Interactive Tooth Atlas, Brown and Herbranson Imaging (www.eHuman.com).


page 28


page 36


page 42

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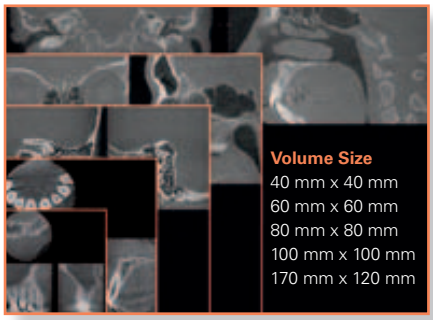

Thinking ahead. Focused on life.

MORITA

Preparing larger apical diameters: Clinical rationale and methods

Authors_ Dr Richard E. Mounce, USA & Dr Gary D. Glassman, Canada

_One of the most common endodontic questions we encounter when lecturing for general practitioners surrounds uncertainty about the ideal prepared master apical diameter (MAD). In essence, these clinicians want to know when they have finished shaping canals properly and when it is appropriate to obturate. In addition, there is uncertainty about how differing anatomy plays a role in choosing the MAD. In other words, would an upper first bicuspid buccal root be prepared to the same size as a lower molar distal root? This article has been written to answer these questions by providing a clinically feasible and literature-based method for preparing larger MADs.

The ideal MAD is a blend of three different considerations:

1. the recommendations of the endodontic literature;

2. the avoidance of iatrogenic events in the efficient creation of larger MADs; and

3. having the technical means to prepare larger MADs predictably and safely.

Fig. 1_The Twisted File (SybronEndo).

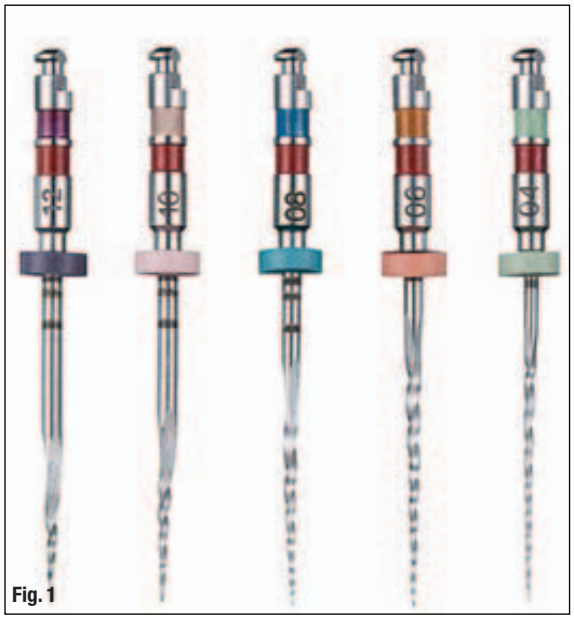

Fig. 1

These considerations are addressed in sequential order.

_The recommendations of the endodontic literature

A properly created and enhanced MAD implies that dentine is being removed circumferentially at the minor construction (MC) of the apical foramen. The creation of enhanced MADs relative to smaller ones is consistent with greater volumes of irrigation, better debris removal and better master cone fit. It is virtually unanimous in the endodontic literature that larger MADs create cleaner canals than their smaller counterparts. There is no literature that we are aware of that argues that smaller MADs provide cleaner canals.

_Avoidance of iatrogenic events in the efficient creation of larger MADs

Before presenting specific methods of MAD preparation, several practical considerations, principles, and concepts are elaborated upon to give context to the efficient creation of larger MADs.

1. The final canal shape should resemble a tapered funnel. The MC should be kept at its original position and size, i.e. it should be unaltered. The MC acts as a natural barrier to the extrusion of bacteria, pulp tissue, irrigants, sealer, and obturation material. The canal should remain in its original position and only be enlarged as described here. The taper and MAD should be appropriate, in order to achieve optimal irrigation and obturation hydraulics. The above goals should be achieved with a view towards avoidance of iatrogenic events. It is important to mention that the mutual goals of enhancing the MAD and leaving the MC at its original position and size are both technically possible and highly desirable. Enhancing the MAD means enlarging the canal preparation apically up to the MC (leaving the MC at its original position and size), but this enlargement does not extend beyond the narrowest diameter of the canal as it exits the root.

2. Mechanical canal enlargement should be recognised as one means of cleansing. Bactericidal

irrigating solutions are required along with the mechanical means to provide the optimal antimicrobial control. The endodontic literature fully supports the concept that irrigation is required to reduce bacterial counts beyond that which is possible by instrumentation alone. Optimal irrigation methods include the use of a heated solution; removal of the smear layer; alternating liquid EDTA with the primary antibacterial solution; ultrasonic activation; and use of an adequate volume, concentration and frequency of refreshment of the solutions.

3. Access should be straight line and all files, rotary nickel titanium (RNT) and hand K files (HKF) should be able to enter the canal without deflecting off the access walls. Leaving access walls that restrict insertion of RNT files predisposes the enlargement to blockage and iatrogenic events of all types. The cervical dentinal triangle should always be removed prior to canal shaping below the orifice level.

4. Patency must be achieved and maintained throughout the entire process of canal preparation. Loss of patency is the harbinger of iatrogenic events and less than optimal cleaning and shaping. Patency can be assured through the copious use of small hand files that are utilised as productively and efficiently as possible. HKFs should be pre-curved and inserted into the canal in the same direction of the expected root curvature. HKF curvature is optimally performed with EndoBender pliers (SybronEndo).

Fig. 2

Fig. 3

Fig. 2_The large pack configuration of the enhanced Twisted File sizes.
Fig. 3_The small pack configuration of the enhanced Twisted File sizes.

HKFs can be trimmed to a length that is clinically relevant for the indicated purpose; for example, if the HKF is too long for the given indication, the file will buckle, kink, bend and need to be replaced. HKFs that are not appropriate for the given canal do not allow the correct amount of pressure needed to break through blockages and traverse ledges. Pre-curved and trimmed HKFs create efficiency in canal negotiation compared with their longer and un-curved counterparts and can be reciprocated as described below.

5. We use the M4 Safety Handpiece (SybronEndo) attachment once the HKF reaches the estimated or true working length (Fig. 4). Reciprocation with the M4 is safe, efficient, and saves both time and hand fatigue. It is difficult to break files using this method. If the tip of the HKF is never more than 1 to 2 mm beyond the MC and the HKF size is #10 or less, transportation is virtually unheard of. The M4 reciprocates the HKF 30 degrees clockwise and 30 degrees counter-clockwise. The M4 is not used to drive the HKF to length to negotiate the canal and it is not used to break through a calcification. The placement of the HKF to the MC is done by hand after the HKF is pre-curved and cut to the appropriate length.

Clinically, a small HKF is inserted to the estimated or true working length and the M4 placed upon it under the rubber dam. The tip of the HKF should be taken to or slightly beyond the MC. This patency file is the only instrument that is taken beyond the MC. Deciding which HKF to reciprocate with the M4 is based on the degree of resistance that the canal gives to the advancement of the HKF; for example, the #6 HKF will easily reach the true working length, while the #8 will reach this depth but only with resistance. The #8 is placed to the MC and left at this level. The M4 is then placed onto the #8. With a vertical amplitude of 1 to 3 mm, the M4 is used in the canal for 15 to 30 seconds. As the M4 reciprocates the #8 (30 degrees clockwise and 30 degrees counter-clockwise), the canal will become minimally enlarged from the action of the file. The file will have progressively less resistance to vertical movement and reciprocate freely.

The M4 requires lubrication at all times, ideally a liquid solution of 2% chlorhexidine or 5.25% sodium hypochlorite. The use of a viscous EDTA gel in reciprocation is neither required nor advisable as removal of all the gel (particularly in the apical third) may not be possible using even the most strident irrigation protocol.

Fig. 4_The M4 Safety Handpiece (SybronEndo).

The M4 fits onto any electric motor with an E-type attachment and is used at 900 RPM on the 18:1 setting. After the #8 in this example has been used, the canal will become the diameter of a #10 HKF, and after irrigation and recapitulation a #10 HKF is inserted into the canal and reciprocated. Reciprocation of the M4 in the manner described will prepare the canal to the diameter of a #15 HKF, after which the canal is ready for RNT enlargement.

If the HKF is a size #15 or larger and particularly if the file is reciprocated short of the MC, transportation of the canal is a risk. Copious irrigation and recapitulation after the use of the M4, as well as working at the MC (i.e. at the true working length), will go far towards avoiding iatrogenic events of all types. It is noteworthy that the recommended use of reciprocation in this article is for the early enlargement of canals to make the glide path and not for the final canal preparation. Final canal preparation is made with RNT files in the manner that is suggested below. The use of reciprocation for the final canal preparation above a size #30 is consistent with apical transportation.

6. The correct working taper must be prepared for the given root anatomy. Roots that are more complex should be prepared to less taper than their simpler counterparts. Specifically, highly curved, calcified, and atypical anatomies are generally prepared to less taper than a root that is straight and appears easily negotiable radiographically. While a comprehensive discussion of what taper could and should be prepared in any given root system will be addressed later in this article, at this stage it should be remembered that different RNT systems have varying abilities to prepare larger tapers throughout the canal. Files that are manufactured by grinding have less flexibility and fracture resistance than those that are manufactured by twisting, such as the Twisted File (TF, SybronEndo; Figs. 1–3). Knowledge of the relative degree of taper that can be prepared with a given system is a prerequisite for choosing the desired taper, RNT file sequence and determining whether orifice openers might be used or are necessary.

The preparation of larger tapers in a complex root requires that the clinician always be aware of perforation risk. Removal of more dentine than necessary will weaken the root and place the tooth at excessive risk of subsequent vertical root fracture, even if the root is not perforated in the initial treatment.

7. The rationale for the final termination point of root canal irrigation, instrumentation and obturation varies greatly amongst clinicians. I use the MC for the final termination point in both vital and necrotic cases, with patency through the MC a paramount goal. Determining the position of the MC occurs as a function of correlating all of the different sources of information as to its position. For example, the clinician can estimate the initial working length from the preoperative radiographs. This initial length can be correlated to the place within the canal where the clinician feels a tactile 'pop' with the HKF as it passes through the MC. This length should be very close if not identical to the electronic length determined by using an apex locator. In addition, once the canal is prepared, if patency has been achieved and maintained, a paper point should be able to mark the exact location of the MC with a reproducible and small spot of moisture or haemorrhage. Correlating all of this evidence and taking electronic lengths at various junctures in the enlargement process can confirm the exact position of the MC. When enlarging canals, the working length gets shorter depending on the length of the canal and degree of curvature. It is important to check the working length frequently to avoid over instrumentation apically from this shortening.

8. Instrumentation sequences vary greatly depending on the clinician, the anatomy and the system being used. With RNT files, there are two primary canal preparation objectives, the 'basic preparation' (getting a .06 or .08 tapered #25 RNT to length) and then the 'enhanced preparation' (preparing a MAD larger than a size #25 in this example) that ideally should follow. It is noteworthy that the initial diameter of the MC as reported in the literature is approximately .28 mm on average across all root anatomy. Any MAD below this size is likely to leave portions of the apical canal untouched, resulting in a compromise in the ultimate canal cleanliness. Said differently, if the clinician stops apical preparation at the MC following achievement of the basic preparation and fills at this MAD, they are arbitrarily imposing onto the root a diameter that may be clinically irrelevant.

Crown-down instrumentation implies that the canal is prepared with larger tapers and tip sizes and decreasing progressively to smaller tapers and tip sizes. With the sequence, each successive file is inserted further apically than its predecessor. For example, after shaping the orifice, crown-down instrumentation is demonstrated by a sequence of .06 files that are used from #40 to 35 to 30 to 25 to 20 and finally #15 tip sizes. This sequence can be repeated until the desired taper and tip size is taken to the MC, be that a size #20 or 25.

Alternatively, the clinician could use a variably tapered sequence of files—using a pack of K3 VTVT (SybronEndo) RNT instruments, for example—moving apically. Such a sequence might be .10/25,

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