

Apical microsurgery: the REB and REP

Part four of a six-part series

By John Stropko, DDS

The amount, or degree, of the root-end bevel (REB) is of utmost importance and should be precisely planned in advance after considering the overall crown/root ratio, presence of posts or other obstacles, the root anatomy and the periodontal status of the tooth. According to previous research, 98 percent of canal system ramifications occur in the apical 3 mm.¹

If the bevel is long (traditionally 25 degrees to 45 degrees) an excessive amount of root structure would have to be removed to include the apical 3 mm on the palatal, or lingual, part of the root's apical canal system (especially in roots with multi canals). If the bevel is closer to 0 degrees, the lingual 3 mm is easier to remove; more root structure can be conserved, improving the crown/root ratio. With a long bevel, there is also an increased risk of completely missing some important palatal or lingual anatomy, especially if the operator is in any measure trying to be conservative in order to preserve as much

crown/root ratio as possible (Fig. 1).

The long bevel creates a spatial problem that is generally impossible for the operator to overcome while trying to visualize the true long axis of the canal system (Fig. 2). The longer the bevel, the greater the tendency is for the operator to leave more of the palatal, or lingual, aspect of the root intact. Because it is difficult to visualize the long axis of the tooth, the resultant retroprep is not as likely to be within the long axis of the canal.

This concept is of utmost importance and is the primary reason that, on occasion, the retroprep unintentionally perforates to the lingual or palatal (Figs. 3a, 3b).

Another important consideration is, with a bevel as close to 0 degrees as possible, the cavo-surface marginal dimensions (bet you haven't heard that term in awhile!) of the root end preparation will be considerably decreased. Therefore, the restoration will be easier to place and have less chance of leakage.

The root anatomy is especially important when there are more than two canals in one root. This occurs most commonly in maxillary bicus-

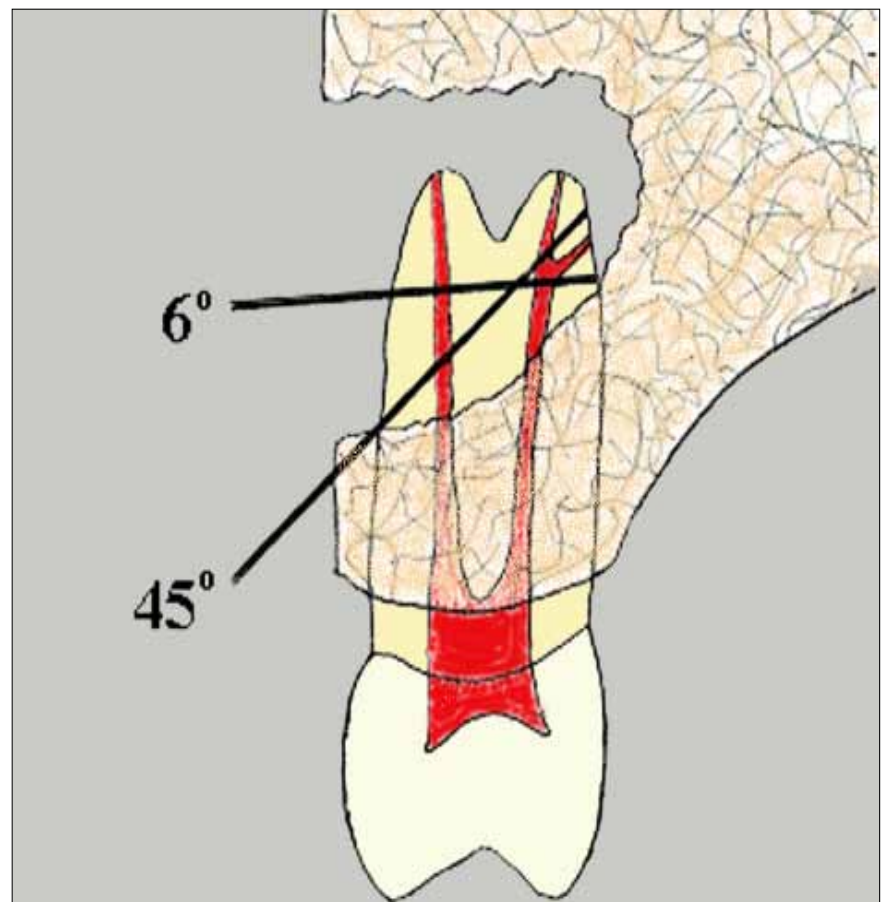


Fig. 1: Illustration of the effect that different bevel angles have on root length and including the missing of potential lingual anatomy. (Photos/Provided by Dr. John Stropko, unless otherwise noted.)

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3-D imaging and endodontics: educated guess becomes scientific decision

By Harout Barsemian, DMD

As an endodontist, I was trained to get to the root of the problem. While this is literally my job and my passion, in the past it has also been a source of frustration. Conventional 2-D images did not provide enough data to make scientific decisions regarding diagnosis and treatment planning.

With some 2-D images, rather than diagnosing, it felt like I was just guessing. My recent investment in a 3-D medium field-of-view cone-beam scanner (Gendex GXCB-500™) has changed my frustration into realization and enabled me to become a more conscientious practitioner.

An endodontic diagnosis depends upon many factors, such as the experience of the clinician, anatomical limitations such as thickness of the cortical bone, positioning of the



Fig. 1: Pre-op and post-op (two months post-treatment) 2-D periapical X-rays showing healing of endodontically treated first molar

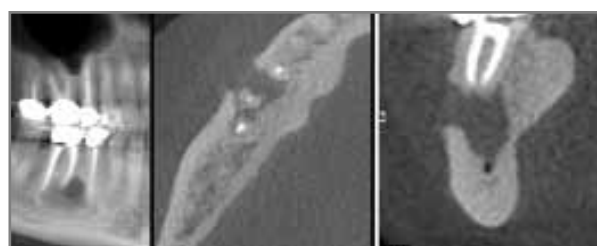


Fig. 2: 3-D scan views — partial of reconstructed pan, axial view and mesio-distal cross-sectional slices revealing extent of destruction from infection to the inferior alveolar nerve and through the buccal cortical bone.

apical abscess to the cortical bone, zygomatic bone and sinus and proximity of neighboring teeth. With 2-D X-rays, often these structures are superimposed on one surface.

Research in the endodontic field indicates that CBCT showed significantly more lesions (34 percent) than periapical radiography. In some infection cases, general dentists often delayed treatment due to lack of supporting evidence on a 2-D X-ray. With 3-D views, we can make an immediate scientific decision. For example, many endodontic patients who suffer from chronic sinusitis find that the ideology is really related to the teeth. Sadly, many have already given up on treating the problem and have learned to live with their post-nasal drip forever.

After implementing the cone-beam system, not a day passes when

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pids and in the mesial roots of nearly all molars. It has been shown that as many as 93 percent of the MB roots of the max. First molars have a second (MB2) canal.² However, the operator has to be constantly aware that multiple canals can occur in any root, no matter what tooth is being operated on. If there is an isthmus present, it can usually be seen with the OM if the root has been adequately beveled and stained with methylene blue.

The refinement of the bevel is best accomplished with a surgical length 1171 carbide-tapered fissure bur (Brassler) in a 45-degree handpiece (SybronDental). These handpieces have no air exiting from the working end, which nearly eliminates the possibility of an air emphysema, or air embolism, beneath the flap.

A standard high-speed handpiece should never be used for the above reason. On occasion, the refinement of the bevel can cause additional bleeding due to some enlargement of the crypt. The operator should address any newly created crypt management problem before proceeding any further. *Remember that it is of utmost importance to fully complete one step before proceeding to another!*

After the REB is refined and crypt management is completely under control, the apical surface is rinsed and dried with a Stropko Irrigator (www.stropko.com). The clean and dried surface is then stained with methylene blue. It is important to allow the methylene blue to remain on the tooth for just a short period of time before gently rinsing and drying again to enable inspection of the stained surface.

Normally, a fresh, white piece of Telfa is reinserted for better lighting. If there are any fractures, presence of isthmus tissue or accessories present, the staining will greatly enhance the operator's ability to visualize them. Also, the methylene blue will stain the periodontal ligament and enable the operator to be sure the apex has been completely resected. (Fig. 4) If there is an accessory canal present, the easiest answer is usually to bevel past it and restain. Or, on occasion, the accessory can be "troughed out," leaving the bevel as is.

When two canals are present in the same root, it is necessary to prepare for an isthmus between the two canals even if the staining didn't reveal one. It has been shown that in the mesiobuccal roots of the maxillary first molars with two canals, the 4 mm section displayed a partial or complete isthmus 100 percent of the time.⁵ This combined with the finding in the same root in maxillary molars, that two canals present clinically at least 93 percent of the time in the mesiobuccal root of the maxillary first molar, lends importance to always prepare isthmus area of the REB.²

Although staining doesn't always reveal the presence of an isthmus, it may lie just below the surface, only to be exposed during the remodeling process of the surface of the beveled



Fig. 2: Long bevel with round bur preps, demonstrating angulation and orientation problems, courtesy of Dr. Gary Carr.

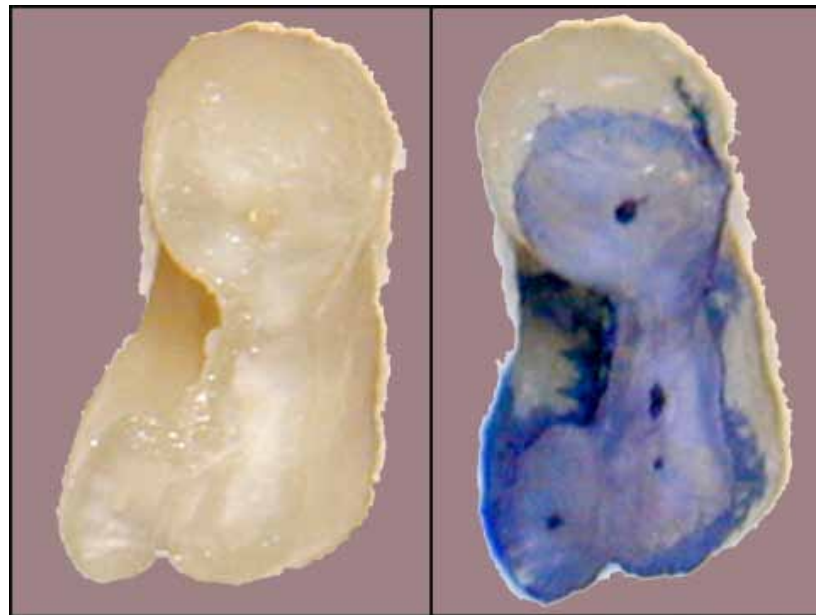


Fig. 4: Staining allows the operator to be sure of complete root resection, and to see if there is an isthmus, accessory or fracture present.

root that normally takes place during the healing process. (Fig. 5) The rule is to always prepare an isthmus when there are two canals in one root.

The preparation of the root-end preparation (REP) is best accomplished using ultrasonics. There are many different ultrasonic units available. For the most part, they are all dependable and have a good service record. There are multitudes of ultrasonic tips to choose from. The newer diamond coated and vented tips (ProUltra Tips from DENTSPLY Tulsa Dental or KIS Tips from Obtura/Spartan) are much more efficient and especially good at removing gutta percha.

The most important consideration is not the brand of the ultrasonic unit or type of tip but how the instrument is used. The tendency for the new operator is to use the ultrasonic in the same manner (pressure-wise) as the handpiece. The secret is to start at a low power setting and use an extremely light touch! The lighter the touch, the more efficient the action of the tip will be.

The correct amount of coolant is also important. If too much spray is used, visibility and cutting efficiency are both decreased. If too little spray is used, the necessary amount of cooling will not be available and overheating and/or micro cracks can be the result.

The occasional left and right, variously angled tips are necessary on occasion, but in most cases, the anterior type tips will suffice. If the canal is large and/or filled with gutta



Figs. 3a, 3b: Inadequate and acute 45-degree bevel clearly shows how perforations can occur and canals can be missed. Fig. 3a is the surgeon's view from the buccal. Fig. 3b is what actually occurred but was completely missed by the operator.



no chance of "slipping off" while preparing the isthmus in a very thin root. On occasion, if the walls of the prep become too thin, further beveling may be necessary.

Occasionally throughout the REP process, it is important to use the Stropko Irrigator to rinse and dry the REP to be sure it is kept within the long axis of the canals and all debris is being removed as planned. Various sizes of micro-mirrors, or an Endoscope, are used to periodically inspect the preparation and confirm accuracy.

A pre-cut and pre-bent 25 gauge endodontic irrigating needle (Monoject) works well for this purpose. The notched end is removed by rapidly bending the end one-third back-and-forth with a Howe Pliers. The needle inserted into the Stropko Irrigator is then bent similar to the ultrasonic tip to be used for the REP (Fig. 7). Always keep in mind that cleanliness and dryness are essential for good visibility when using the OM.

Of particular interest is the buccal aspect of the internal wall of the REP. Dr. Rubinstein was the first to point out that often this area is not debrided due to the angulation of the ultrasonic tip within the canal system during the REP. If there is some gutta percha "streaming up" the side of the wall, and the preparation is finished, the best thing is to take a small plugger and fold the gutta percha coronally so the wall is clean once more. It is usually futile to try to "chase after" the gutta percha with an ultrasonic tip.

The ideal REP should be: 1.) within the long axis of the canal system, 2.) have parallel walls, 3.) be at least 3 mm in depth (including the isthmus portion of the preparation), 4.) adequately extended to include any buccal/lingual variations of the canal system, 5.) be clean (free of a smear layer) and 6.) dry and ready to accept any type root-end filling material.

After completion of the REP, it should be rinsed and dried once more with the Stropko Irrigator. The REP is re-inspected, using micro-mirrors and the varying powers of the OM and/or Endoscope, to be sure it is clean and within the long axis of the canal system. At this time, the REP is etched with blue 35 percent phosphoric acid gel (Ultra-Etch by Ultradent) to remove the smear layer. After 15-20 seconds, the REP is thoroughly rinsed and dried with the

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Stropko Irrigator and re-examined with the OM.

If all is as desired, a 15-second rinse with 2 percent chlorhexidine will help eliminate any residual organisms present. One more gentle rinsing and drying with the Stropko Irrigator and the REP is ready for the root-end fill (REF).

In the next issue, we will discuss the final two parts remaining to achieve predictable apical microsurgery. Part 5 will discuss "Retrofill materials and techniques." Part 6 will discuss "Sutures, suturing technique and healing."

To read Parts 1-3 again, visit www.dental-tribune.com/articles/content/scope/specialties/region/usa/id/929. 

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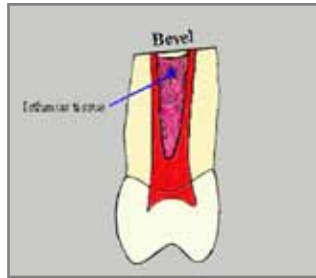


Fig. 5: An illustration of an isthmus, lying just below the surface that would not be evident, even after staining with methylene blue

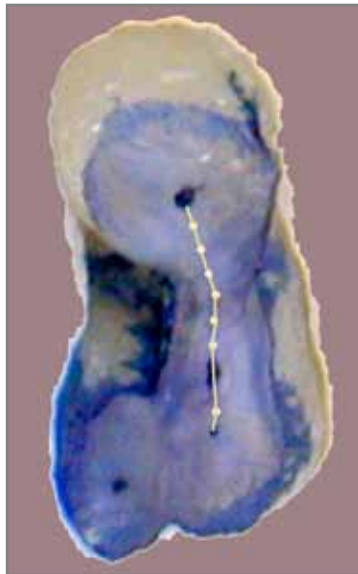


Fig. 6a: The series of 'dots' permit easy and accurate preparation of an isthmus in a root end that is very thin.

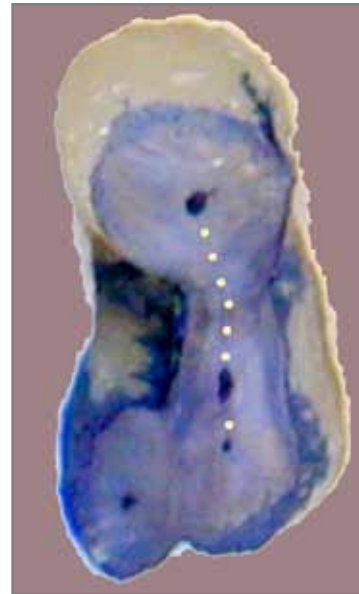


Fig. 6b: While still dry, the 'dots' are connected until there is a shallow, but definite 'tracking groove.'

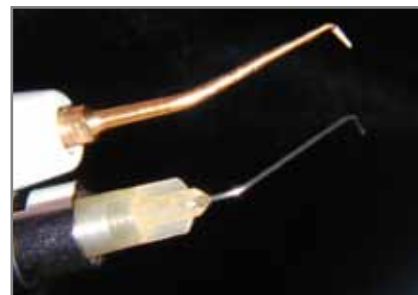


Fig. 7: A modified and pre-bent needle is used to clean and dry the REP for good vision.

About the author



Dr. John J. Stropko received his DDS from Indiana University in 1964, and he practiced restorative dentistry for 24 years. In 1989, he received a certificate for endodontics from Boston University and recently retired from the private practice of endodontics in Scottsdale, Ariz.

Stropko is an internationally recognized authority on micro-endodontics. He is the inventor of the Stropko Irrigator, has published in several journals and textbooks and is an internationally known speaker. He is the co-founder of Clinical Endodontic Seminars and was an instructor of microsurgery for the endodontic courses presented at the Scottsdale Center for Dentistry. Stropko, and his wife, Barbara, currently reside in Prescott, Ariz. You may contact him at topendo@aol.com.

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