Ten Myths About Endodontics: “Fact Versus Pulp Fiction”

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Ten Myths About Endodontics: “Fact Versus Pulp Fiction”

About the Author

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Disclosure: Dr. West is the co-inventor of ProTaper, WaveOne, and Calamus technologies, in addition to ProGlider (DENTSPLY Tulsa Dental Specialties).

Introduction

The late Drs. Sam Seltzer and I. B. Bender are quoted as saying, a long time ago, that the pulp is a “is a big issue about a little tissue.”¹ Their quote is just as applicable today as it was decades ago. There seems to be as much study and research about a 15-mm piece of tissue as any piece of tissue in the human body. So what is the big issue?

Fundamentally, endodontic biology and treatment are as basic today as they were in the Seltzer and Bender days. And, the theory of focal infection created pharmacology as the stepchild to clinical endodontics, which then led to the simple biology of endodontics: eliminate the source of endodontic disease, and lesions of endodontic origin (LEOs) will heal or will be prevented where they do not exist. This simple and richly supported biologic pathway is sometimes lost in today’s endodontic art and science. I have identified 10 endodontic myths that have crept into (or back into) endodontic literature and endodontic thought processes and treatment considerations in recent years.

The purpose of this inquiry is to evaluate 10 common myths that influence daily endodontic decision-making plans. There are more controversial areas; however, I hope this article will serve as a starting point to separate endodontic fact from folklore fiction. In all endodontics there is, of course, only one accurate diagnosis and, while there may be several treatment plans, the successful endodontic clinicians of the future must do the right thing every day by asking the question, “What would you [the clinician] do if you were the patient?” And, if we were to ask the patient the same question, they will always ask the clinician consciously or wonder unconsciously, “What would you do if it were you?” Some myths, though widely believed, may not be the truth when challenged under the experimental model, involving both the lab bench and the clinical reality. Myths can interfere with the essence of predictability during the process of saving an endodontically diseased tooth in the simplest form of daily endodontic treatment. It has often been my personal experience that if the scientific observations are different from the clinical observations,

Figures 1a and 1b. Myth No. 1: “Large lesions extending the length over several teeth have a diminished capacity to heal.”

(a) A large lesion of endodontic origin (LEO) extending from mandibular right premolar to mandibular left premolar.

(b) Post-treatment healing at 2 years.
then something is wrong with the science. My first of the 10 endodontic myths that will now be explored is just such an example.

**ENDODONTIC MYTH NO. 1**

**“Large Endodontic Lesions Extending the Length of Several Teeth Have a Diminished Capacity To Heal”**

What are the factors that promote endodontic healing? Remove the disease source. This fact is simple, and it is profound. Get highly skilled at the mechanics of endodontics and enjoy enormous endodontic success. Mother Nature has little regard for the size of the LEO as a deterrent to healing. The only clinically meaningful determinant is that the LEO is contained within the attachment apparatus; and, the periodontal vector is a sequela of the LEO; and that the gingival crevice sinus tract probes in a precipitous fashion (Figure 1a). You may say, why? It is because, if the resulting endo-perio lesion probes precipitously versus conical, the sinus tract draining “waterfall” is simply wider than narrower. Healing biology treats a narrow or wider sinus tract that results from a necrotic pulp in the very same way: Nature rewards the clinician and patient by predictably healing, after cleaning and disinfecting the entire root canal system of necrotic debris, including bacteria, biofilm, and detached collagen. Based on results, the large endodontic lesion clinically heals, regardless if the endodontic lesion is lined with epithelium, is a granuloma, or is an abscess (Figure 1b). Clinicians who have performed endodontics day-in and day-out know this myth size to be false.

*My clinical reality* is that large LEOs*do* heal. It is the quality of the *endodontic seal* that determines endodontic healing, not the size of the lesion. Large or small, the rationale for endodontics remains the same biology.

**ENDODONTIC MYTH NO. 2**

**“The Root Canal System Is Impossible To Disinfect”**

Experiments and studies in the 1970s by Gary Grey, then an endodontic resident at Boston University Graduate Endodontics, demonstrated that an hour per canal of manual canal serial filing and reaming, followed by confirming patency, followed by recapitulation (sequential re-entry of previous files and reamers) and Gates Glidden drills with copious sodium hypochlorite irrigation produced clean histologic root canal radicular preparations (Figure 2).

While current irrigation protocols, irrigation solutions, and activation systems are improving the effectiveness and
predictability of root canal system disinfection, studies suggest that 100% disinfection cannot yet be achieved due to biofilm structure, evolving resistant bacterial strains, and anatomic culs-de-sac that are unreachable and protected from current cleaning and irrigation technique.\textsuperscript{4,5} The future of disinfection may very well rely on nanotechnology, laser, and/or techniques and tools not yet thought of.

**My clinical reality** is that root canal systems can be effectively and sufficiently cleaned if the clinical time and proper technique are practiced. Can endodontics do better? Always. Of the classic endodontic triangle of (1) disinfection, (2) preparation, and (3) obturation, disinfection is a main focus of current endodontic investigation and holds enormous promise for the “little tissue.”

**ENDODONTIC MYTH NO. 3**

“Minimally Invasive Endodontics Is the New Endodontic Benchmark”

Minimally invasive endodontics (MIE) is today’s new buzzword in endodontics. First of all, there is nothing new about being conservative; however, what does conservative mean? What is MIE? MIE can be considered a broad term including vital pulp treatment, revascularization, coronal access, radicular canal shaping, and safe obturation techniques. However, smaller accesses, for example, generate a potentially dangerous limited view of the pulp chamber, reduced lighting, and magnification. Endodontic mechanics are hard enough to perform even in unrestricted access let alone through “peep” holes.

Second, the word conservative in endodontics used to mean nonsurgical retreatment versus surgery. However, if nonsurgical retreatment were to risk ferrule loss, or damage the tooth or restorative structure, and/or aesthetics of an existing foundation and crown, then a surgical endodontic seal could very well be considered conservative. Surgery would especially be conservative if the LEO was only apically present. In addition, if the endodontic preparation shape is too slender (such as in the old silver cone days) and/or not sufficiently funnel shaped, then the capacity for 3-D cleaning, shaping, and obturation is lessened and, while the coronal tooth structure is preserved, the prerequisite of filling the root canal system in unmet. This is, of course, a false sense of security and a misuse of the words conservative and MIE. To save the crown and to lose the LEO is biologic suicide. Some recent endodontic literature suggests that most current endodontic shapes are too large and weaken the restorability of the tooth, and yet all the data is derived from facial views of overzealous shaping of precious ferrule measured by viewing a finished result from the typical buccal view. Restorative literature verifies the essential part of ferrule preservation is facial and lingual and should be measured in the buccal-lingual axial cone beam view. Nonetheless, the final endodontic preparation should take into consideration the final circumferential ferrule in order to preserve post-endodontic restorability (Figure 3).

**My clinical reality:** With all due respect and in my humble opinion, using today’s access, cleaning, and obturation techniques, the pendulum is swinging in the wrong direction. Modern straight-line unfettered access and appropriate shapes for the root that house them does not compromise success.
**ENDODONTIC MYTH NO. 4**

*“Short Endodontic Fillings Have a Better Prognosis Than Long Endodontic Fillings”*

While most studies suggest it is better to be short than long, the reality may come down to the definitions of *long* and *short* (Figure 4a). Is it a vertical measurement or a 3-dimensional measurement? Dr. Herbert Schilder was the first to make a length versus volume distinction as early as the 1970s by suggesting that “most overfillings are in reality, *overextensions* of underfilled canals.” Schilder further defined *overfill* as sealed in 3-dimensions and surplus material. When you think about it, why is “overfilling” a clinical outcome anyway? It is because the geometric relationship between canal shape and conefit do not match, due to failure to create deep funnel canal radicular preparation, or a “false tugback” conefit. Consequently, there is lack of obturation control with subsequent material beyond the undersealed physiologic terminus. In fact, the only way to fill an endodontic preparation is to either fill it or overfill it (Figure 4b). Any vertical or horizontal root canal system filling, that is neither filled or overfilled, is *not* filled.

**My clinical reality** is that the only way to create the 3-D endodontic seal is to in fact create the 3-D endodontic seal or overseal. Anything short of the 3-D endodontic seal is undersealed, simply having the *capacity* to create or not prevent LEOs.

**ENDODONTIC MYTH NO. 5**

*“Multivisit Endodontic Treatment Is More Successful Than Single-Visit Endodontic Treatment”*

The general thinking behind multi-endodontic visits is that they provide an opportunity to place an intracanal medicament, such as calcium hydroxide placement, for killing remaining bacteria. We already know that sodium hypochlorite kills all bacteria within 30 seconds, including the AIDS virus. Well-shaped canals are clean canals, and shaping facilitates cleaning, and 3-D obturation incarcerates any remaining bacteria (Figure 5a). In addition, and perhaps more importantly, the optimal time to *know* the critical relationship between conefit and shape validation is at the conefit visit. Shaping is finished when the conefit fits (Figure 5b). The clinician will never know the shape better than right now at the end of endodontic mechanics.

**My clinical reality** is that the best time to cement a crown is when the crown fits. The best time to pack the root canal system is when the cone fits. The only clinically valid contraindication is if the patient's endodontic tooth were still symptomatic.
ENDDONTIC MYTH NO. 6
“Previous Endodontics Has One or Two Strikes Against It and, Therefore, the Tooth Should Be Removed and Typically Replaced With an Implant”

In reality, the same predictability and proper concomitant mechanics have the same treatment rationale as original endodontic treatment, although a higher skill set and a higher degree of intention are required. However, when a nonsurgical retreatment results in the removal of too much tooth structure, rendering the tooth unrestorable, an endodontic third strike does warrant removal and replacement. But, this error is not inevitable since careful disassembly management, prior to new shaping, is imperative and can be predictably achieved. In addition, endodontic treatment, including retreatment, has success levels comparable to implants, and also with better patient acceptance7-9 (Figure 6).

My clinical reality is that the capacity for successful endodontic retreatment is the same as the capacity for endodontic nonsurgical treatment: 100% capacity. The only difference is the technical skills frequently need to be taken to another level.

ENDDONTIC MYTH NO. 7
“Maxillary Molars Have Four Canals More Than 90% of the Time”

If you ask any endodontic audience what percentage of maxillary molars have 4 canals, most feel obliged to say more than 90%. The clinical reality and the literature suggest a significantly different expectation: that, while most teeth demonstrate a fourth chamber orifice, less than half of these orifices lead to separate canals (Figure 7).10-13 So keep looking diligently, but do not beat yourself up if you cannot “follow” the canal to length as it may very well unite or cross with MB1. Nonetheless, a significant lateral portal of exit (POE) could emanate from the coronal portion of MB2, so don’t give up carefully following into MB1; and, if this were the case, then shape it and pack it with the same precision as MB1.

My clinical reality is that maxillary molars must be treated as if they possess 2 or more separate mesiobuccal canals. However, the fact is that as many as half do converge one way or another. This is no reason not to successfully find, follow, and finish these canals as they may converge and then emerge separately again. In addition, a significant POE may branch from the converging canal itself.
EN DODON TIC M YTH N O. 8
“Endodontically Treated Teeth Discolor in the Aesthetic Zone”
Why do some endodontically treated teeth discolor? Discoloration is due to insufficient coronal seal, failure to properly remove necrotic tissue, failure to finish obturation one to 2 mm apical to the cemento-enamel junction, or the failure to clean sealer and/or obturation material from the pulp chamber access (Figure 8a).

*My clinical reality* is that, if properly restored, endodontically treated teeth do not readily re-discolor, since microleakage will be prevented or significantly delayed. In fact, if the same focus, technique, and attention to detail is placed on access finishing as the original access cavity, such as layering the access restorative materials and employing a proper polishing protocol, then endodontically treated teeth will retain their restored color (Figure 8).

EN DODON TIC M YTH N O. 9
“Endodontically Treated Teeth Are Weaker”
The teeth that require endodontics are weakened before the endodontics due to caries and/or previous caries and large and deep restorations (Figure 9a). The endodontic access, like removing the top of the Duomo from the Santa Maria del Fiore Cathedral (in Florence, Italy) has little influence on the strength of the structure. The endodontic access is almost insignificant compared to the damage of restorative procedures (Figures 9b and 9c).

*My clinical reality* is that the microscope-designed endodontic access cavity and root canal radicular preparations do not cause a tooth to be weaker post-endodontic treatment. “Weakness” is caused, instead, by what happens to the tooth before endodontics is needed: caries, subsequent restorative cavity preps, followed by the restoration itself.

EN DODON TIC M YTH N O. 10
“The Ni-Ti System That I Use Makes the Biggest Difference”
Every instrument company in the world reports that they make the best Ni-Ti shaping system. At last count, there are more than 40 systems, but they seem to come and go frequently. They can’t all be right, can they? So what and where is the
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truth? It is my thinking that the best Ni-Ti system cannot make a “bad” dentist a “good” dentist. However, the best Ni-Ti system can make a “good” dentist a “great” endodontic clinician.

I have been an endodontic clinician and educator for more than 35 years. What I love about my work is that I am still learning and still improving my performance. I am as passionate about the processes and results as I was when I started. Now, if you have read this article this far, it is at this time that I am obligated to share something: Ni-Ti has made the biggest difference. It is amazing how far improved Ni-Ti design has come in the last 5 years, but without a doubt, the foremost and most recognizable name in endodontic shaping has and continues to be ProTaper [DENTSPLY Tulsa Dental Specialties]. Why? ProTaper has 3 critical distinctions: (1) it produces predictable and reproducible deep shape for easy 3-D obturation; (2) it is the only system that understands the targeting role of Shapers for shaping coronal restrictive dentin and the role of Finishers to finish “connecting the dots of the radicular continuously tapering funnel” from apical constriction to canal orifice while maintaining MIE preparations (Figures 10a to 10c); and (3) the shaping sequence is safe, super-efficient, and simple since it is always the same. And yet some clinicians experienced the Finishers as too efficient and, given new metallurgies, not flexible enough. Problem solved! The new ProTaper Gold (DENTSPLY Tulsa Dental Specialties) allows Shapers and Finishers to easily and safely crawl down canals and carve deep shapes that are consistent and appropriate for MIE endodontics, while at the same time providing perfect funnel preparations for easy 3-D cleaning and obturation15 (Figures 10d to 10f).

My clinical reality is that there is no doubt that the clinician is the greatest variable in endodontic success. However, when the best Ni-Ti concepts and geometries are embraced by clinicians who are dedicated to being their best, the best happens.

LESSONS LEARNED

Preparing this article reinforced 4 lessons that I have learned along the way.

1. Diagnosis. Proper diagnosis is key in deciding the exact mode of endodontic treatment or if endodontic treatment is in the patient’s best interest.

2. Treatment Planning. The value of developing an experienced team of specialists cannot be overestimated. Interdisciplinary collaboration gives the patient the best treatment plan choices and decisions.

3. Endodontic Mechanics. An understanding of the physiology and biology of endodontic healing and success is imperative. In this way, misleading myths will play a reduced role and endodontics will retain its rightful place in providing optimal oral health.

4. Appropriate Endodontics. The author of this article has treated endodontic patients for nearly 40 years, and it is clear that endodontics has improved during this time period. Endodontics is now less invasive. Endodontics is more precise. When possible, nonsurgical endodontic retreatment should be chosen over surgical retreatment if restorative structure or anterior aesthetics is not compromised. There are some extremely difficult cases that are best treated with removal and replacement. However, well-planned and well-executed endodontics will reduce trauma to the patient, facilitate endodontic success, and improve post endodontic predictability and stability. When the right tooth is chosen, when the right endodontics is done right, endodontic myths vaporize and improved biologic, structure, functional, and aesthetic outcomes become an attainable norm for the dentist and his or her interdisciplinary team.

REFERENCES

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   a. True     b. False

2. Of the classic endodontic triangle of (1) disinfection, (2) preparation, and (3) obturation, disinfection is a main focus of current endodontic investigation and holds enormous promise for the “little tissue.”
   a. True     b. False

3. With today’s composites and resin cements improving in strength, the final endodontic preparation does not need to take into consideration the final circumferential ferrule in order to preserve post-endodontic restorability.
   a. True     b. False

4. Any vertical or horizontal root canal system filling which is neither filled nor overfilled, is not filled.
   a. True     b. False

5. We already know that sodium hypochlorite kills all bacteria within 30 seconds, but not the AIDS virus.
   a. True     b. False

6. If the same focus, technique, and attention to detail is placed on access finishing on the original access cavity, then endodontically treated teeth will retain their restored color.
   a. True     b. False

7. The teeth that require endodontics are weakened before the endodontics due to caries and/or previous caries and large and deep restorations.
   a. True     b. False

8. In the author’s opinion, the clinician is the greatest variable in endodontic success.
   a. True     b. False
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