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Magnification in Endodontics:

What, When and Why

Course description

This course reviews the types of magnification aids available, when they should be employed and why they are of benefit in clinical endodontics.

Abstract

Magnification and endodontics go hand in hand. This course will review various forms of magnification and discuss how and when they play a significant role in root-canal treatments. It will also discuss why it is helpful and important to use magnification aids during endodontics and their return on investment clinically and financially.

Learning objectives

After completing this course, the reader should be able to:

- know about the forms of dental magnification available for endodontic procedures
- understand the different capabilities of dental loupes and microscopes
- understand the clinical benefits of magnification
- know when it's ideal to use magnification in endodontics
- know why magnification should be incorporated into endodontic practice
- understand the return on investment of magnification in endodontics from clinical and practice management perspectives.

by Manor Haas, DDS

Manor Haas, DDS, MSc(D), FRCD(C), is a certified specialist in endodontics in Toronto. He is extensively involved in continuing education to dentists and has lectured and offered endodontic and magnification workshops internationally. Haas is a fellow of the Royal College of Dentists of Canada and is on staff at the University of Toronto Faculty of Dentistry and the Hospital for Sick Children. He maintains a full-time private practice limited to endodontics and microsurgery, and has used loupes and microscopes for 20 years. For more information, visit haasendoeducation.com.

Disclosure:
Dr. Haas declares that neither he nor any member of his family has a financial arrangement or affiliation with any corporate organization offering financial support or grant monies for this continuing dental education program.

Introduction

We've all heard the saying, "If you can't see it, you can't treat it." In clinical endodontics, that holds very true.

Imagine yourself standing atop a tall building, looking at the sidewalk below. That's you, using only your eyes to look into a tooth. Now imagine standing on the sidewalk, looking down with a powerful floodlight. That's you, looking into a tooth while using enhanced magnification and illumination.

These techniques can help you perform more root canals (especially the ones you couldn't before,) find all the canals (including MB2) more frequently, more easily and more quickly; and locate hairline fractures. This will help your practice and your patients.

My intention here is to enlighten readers about the forms of magnification on the market, when to use them and why they're of great benefit to your clinical endodontics, your patients and your practice.

Surgitel Aero 2 Silver EVK350 TTL Micro LED

Surgitel Flak2 Black TTL EVX250 MicroLED

Surgitel ErgoMax Silver TTL EVK550 MicroLED

Section 1: The "what"

The "what" in endodontic magnification pertains mainly to dental loupes and microscopes. What's key in magnification is not just how much larger the tooth appears, but how well it is lit.

In other words, imagine the endo access you have to look into. Without magnification, it's a tiny black hole. With magnification, it's a larger hole, but it's still a black hole. The key is to include illumination to get rid of that endo black hole and be able to see inside (see Table 1, pg. 106).

Dental loupes

Loupes have been available for years. What has recently improved in loupes, from a practical perspective, is their weight (important for operator comfort), field of view and depth of field, and the variety of frames available (important for comfort and style). The difference in quality of lenses among the reputable brands is arguably unnoticeable. The angle of the magnifying lenses in loupes could be at a fixed position in the lenses, or variable if you use flip-ups.

Loupes offer two add-ons: The first and most important involves enhanced illumination, the second is video capturing. Both options can be easily loupe-mounted and have become smaller and lighter over time.

The loupe headlights may be connected to a portable battery source by cable (companies offering this feature include Surgitel and Designs for Vision), or have a built-in mini-battery source, making them wireless and self-contained (offered by Designs for Vision and Firefly, among others).

The trend for headlights has been moving toward smaller, lighter and brighter light sources—however, you should keep in mind the light color they provide (natural vs. white) and their battery working time.

As far as I'm concerned, investing in a light source is priceless and a must for endodontics. That is, unless you enjoy the frustration of working in a dark hole.

The recent introduction of loupe-mounted, mini video cameras is bringing endodontics to a new level. Their limitation, however, is that they can't capture images on a micro level (such as inside pulp chambers or canals), which is required in endodontics.

Dental microscopes

Dental microscopes are considered the ultimate in magnification, illumination, ergonomics and image capturing—with the right setup, that is. There's no form of magnification that can match a good microscope's capabilities. And using it would place you at the very top of a pyramid of dentists.

A misconception is that microscopes are really expensive and out of reach for most practitioners. Indeed, with the many features available, they may become expensive—which I'll discuss more in an ROI section later—but the beauty of microscopes is that they are modular. With models by companies such as Global Surgical and Carl Zeiss, you can start with a basic microscope and add features such as image-capturing or ergonomic-enhancing components if or when you wish.

The benefit of microscopes is not just the very high magnification, but also the direct illumination they provide. Unlike loupes with an overhead light, in microscopes the light source is directly aligned with the line of sight. This means ideal, shadow-free high illumination in tight and small spaces, such as pulp chambers and canals. (See "clinician view" images in Table 1, pg. 106.)

Some microscopes have features that enable the operator to work more comfortably. This is achieved by optics that increase

OPMI Pico Carl Zeiss Meditec, AG

OPMI PROergo

the depth of field—eyepieces/binoculars that are farther from the vertical optics of the microscope head and, in turn, farther from the patient; and the ability to swing the vertical part of the microscope head left and right, while maintaining a straight operator neck position. These mean less leaning forward to look over and past the patient's upper lip (important when working on mandibular teeth or maxillary posterior teeth), less left-and-right tilting of the neck and overall better ergonomics. (See "operator posture" images in Table 1.) As fantastic as loupes are and as much as I encourage their use, they unfortunately can't offer these ergonomic capabilities.

Image capturing is another modular option in many microscopes and is easy to achieve through a digital SLR camera or full high-definition 1080-pixel video camera. The more you incorporate microscopes into your practice and want to document the inside of the tooth, the more likely you'll be to include image capturing.

Finally, microscopes can accommodate any operatory configuration. They can easily be fixed to a wall, floor or ceiling, or mobile on a wheel-based floor stand. There are even ceiling-mounted arms available (from companies such as Global Surgical) that are long and mobile enough to be mounted between two open-concept operatories and serve both.

Section 2: The "when"

I'll start off with one word: always! There's absolutely no reason why magnification could or should not be used during every root-canal procedure.

Remember my analogy of looking

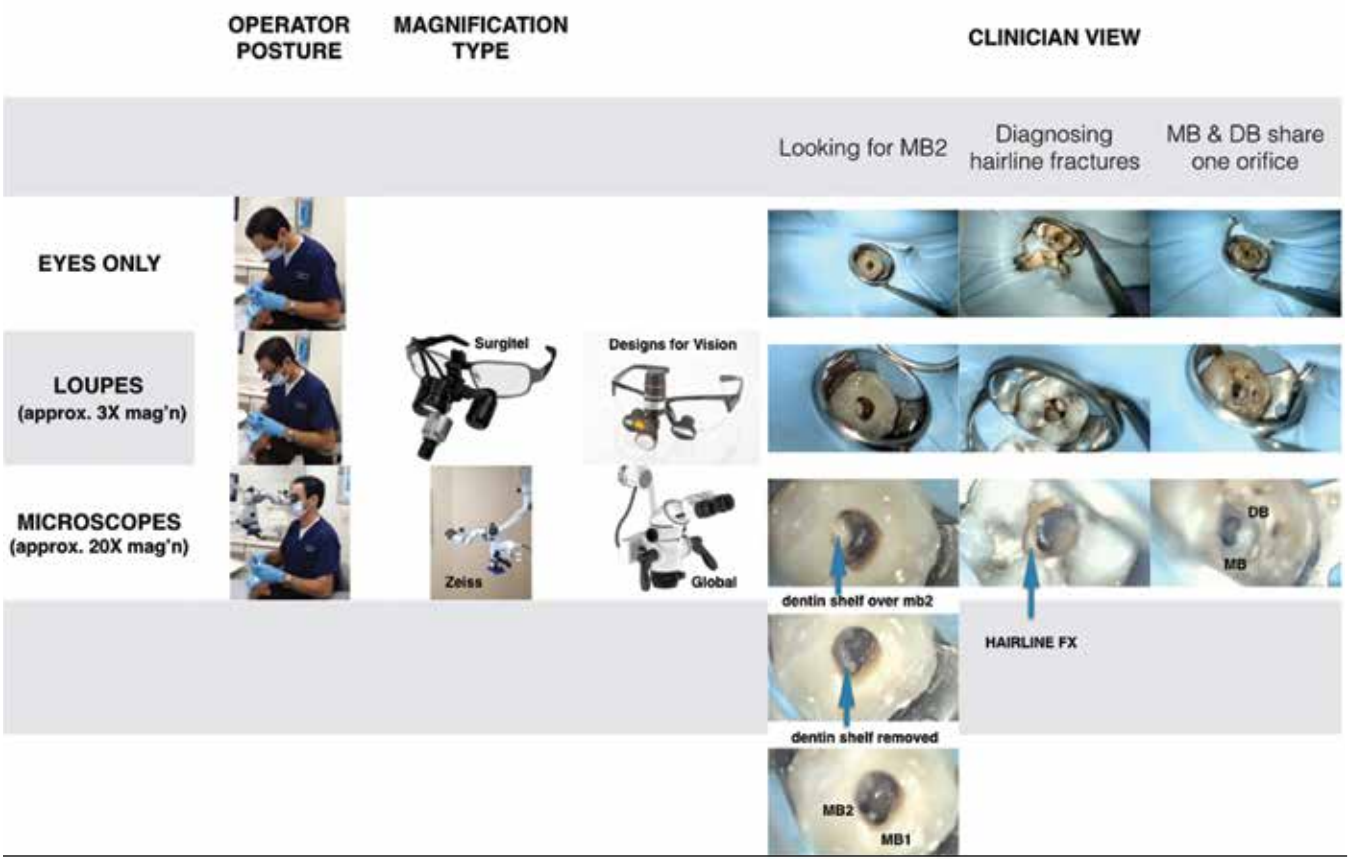

Table 1

into that black hole of an endo access and searching for hairline fractures and tiny canals? The only question is which form of magnification should be used. Loupes work well for simple endodontic cases, such as maxillary anteriors and/or root canals in young patients with large canals, and when there's no suspicion of a vertical fracture.

I am a huge advocate of enhanced illumination. So if you plan to use dental loupes, please invest in a good headlight. Without it, you won't have a chance at seeing anything in that dark endo access.

Microscopes are excellent for all endodontic cases and a must for complex cases, such as posteriors or cases with MB2 canals, teeth with crowns that limit the lighting into the endo access, calcified teeth, teeth with unusual anatomy (such as C-shaped root configurations) or when you suspect hairline fractures.

Microscopes also work well in cases that require documentation by means of photographs or videos, especially on a micro level, such as pulpal floor fractures or calcified canals (Fig. 1).

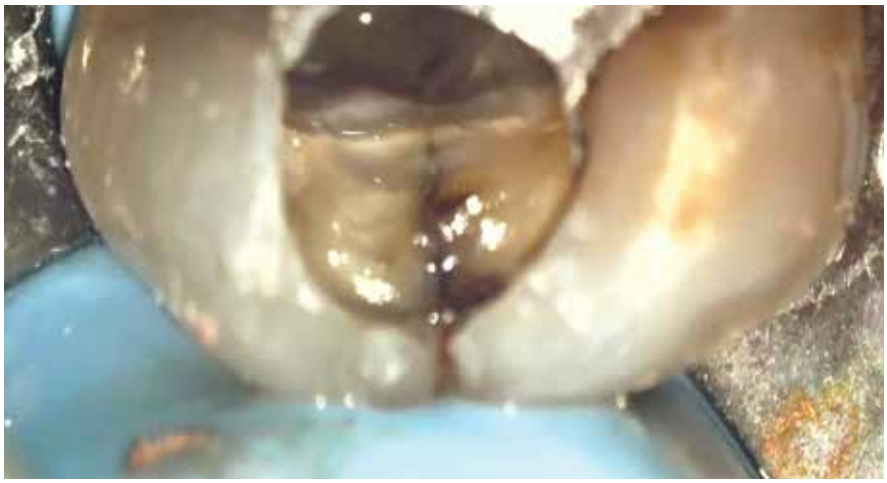

Fig. 1: Vertical fracture reaching the pulp floor

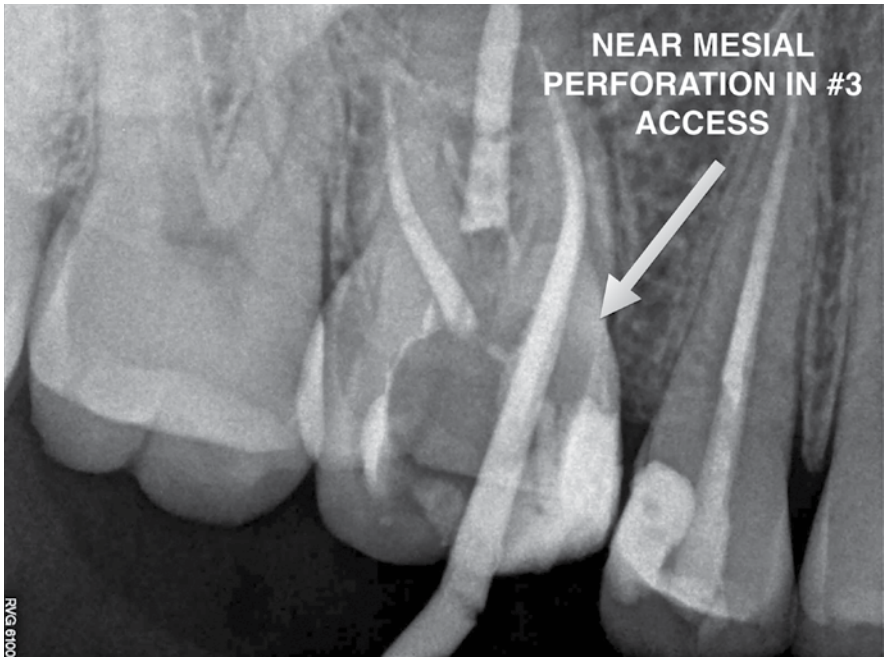

Fig. 2

Section 3: The "why"

To be blunt, why not use something that:

- enables you to see things you couldn't otherwise, such as calcified canals, hairline fractures and internal calcifications like pulp stones
- improves your procedure and helps your patient
- reduces the time and effort in looking for calcified canals and MB2s
- lets you perform more root canals in less time and more comfortably
- benefits your practice and pays for itself in no time? (See "ROI" section below.)

The use of magnification during endodontics will also help reduce the chance of procedural errors. These include incomplete root-canal treatment due to unidentified canals and, perhaps more worrisome, perforations during access preparations and while looking for canals.

Fig. 2 is an example of a near-mesial perforation while performing the access and looking for the MB1/MB2 canals. In other words, enhanced magnification and illumination will help you stay out of trouble.

Finally, do you have disability insurance? Of course you do. We all do. And why?

Designs for Vision's LED DayLite WireLess and WireLess mini headlights

Because we're so prone to postural injuries. So if you want improved ergonomics, use loupes. If you want ideal ergonomics, use microscopes. Maybe that way you'll save a fortune on added disability insurance and enjoy a longer and more comfortable career.

Practice management and return on investment (ROI)

I sincerely love Dentaltown's motto: "Real dentistry for real dentists." That's us! Since I am a private practitioner who, like most of you, faces the reality of sustaining and hopefully growing a dental practice, I must address the practice management side of magnification.

Of course, first and foremost we want to help our patients and perform the best root canals possible. So if what matters to you is improving your root canals, then no matter what the cost, it's worth stepping up to magnification, or perhaps jumping from "loupes only" to "loupes with headlights" or to dental microscopes.

It's certainly reasonable and fair to question the financial ROI of such instruments. In general, loupes have become fairly inexpensive, as have headlights. Loupes should last you forever, so over time they're one of the cheapest purchases you'll ever make and as far as I'm concerned, need no justification. It's microscopes that I find I have to really explain the ROI for. But microscopes, too, will last you forever. Microscope lenses don't deteriorate or require updates—even the light sources available nowadays can last an exceptionally long time.

For the price of a couple of reputable digital X-ray sensors, you can buy a great microscope. So look at the ROI of a microscope over the span of your career. Your sterilizer, dental chair, digital X-rays and handpieces will need expensive maintenance and/or replacements. Microscopes (and loupes) will not. And unlike any other instrument in your office, a microscope can be upgraded.

Global Surgical and Carl Zeiss have ensured that their microscopes can have features added as new technologies become available. For instance, HD cameras were not around years ago, but microscopes from years ago can still be fitted with such state-of-the-art image capturing. This gives you peace of mind in your investment.

Ergonomic features of microscopes (reviewed in Table 1 and in the companion video online at Dentaltown.com) are priceless if they help your day-to-day comfort and lengthen your career.

The image-capturing options for microscopes have a huge ROI. A photo is worth a thousand words, and an HD video shown to a patient is worth a million.

Ask yourself this: What's the ROI of wooing or awing your patient by simply doing

better root canals, thanks to the instruments I'm reviewing here? Which dentist would you, as a patient, prefer to be treated by or pay a bit extra to be treated by? The one using old-school, eye-only magnification? Or the one using the impressive-looking loupes with headlight? Or better yet, a state-of-the-art microscope with image capturing?

Every time I explain to my patients what I performed inside that pulp chamber and show that hairline fracture via HD-quality videos, they're in awe and are appreciative. Their trust in you and their impression of you and your practice will only improve. Your patients will be more likely to refer friends and family to you. Well, wouldn't you, if you were the patient?

Quite simply, performing root canals with magnification translates into good old-fashioned marketing that comes from just doing better endo. No free whitening or half-off cleanings will be needed to bring in patients.

Also, consider that the use of enhanced magnification and illumination can enable you to perform procedures you may not have been able to do otherwise. For instance, a calcified molar that you may have referred out for treatment, you may now be able to perform yourself and keep in-office. Keeping one or two such cases a month could quickly pay for those loupes and headlight, or even a microscope.

Pardon my business bluntness, but this is a reality in private practice. If considering enhanced magnification from a business perspective will help you justify the purchase of high-end loupes and headlights or a microscope, then so be it and good for you. Because in the end, you, your patients and your practice will benefit.

Choosing the right magnification

Now that we've reviewed the forms of magnification and their applications and benefits, you should think about which suits you and your practice best. Table 2 simplifies the things to consider.

What it comes down to is the following: If you mainly perform simple root canals with large canals, then dental loupes with a good headlight may suffice. On the other hand, if you perform any number of more complex root canals (such as posteriors, crowned teeth or calcified cases) then you should seriously consider dental microscopes.

Furthermore, if you wish to educate your patients or document your cases by means of high-quality and easy-to-capture photos and/or videos, then a microscope with the option for image capturing is the right choice for you.

Conclusion

I hope you now appreciate that there's more to using dental loupes with enhanced lighting or dental microscopes than just having them make an endo access look bigger. Why not make your life and root canals easier, be more likely to stay out of trouble, benefit your patients and help your practice grow? Do you want to keep looking down at the sidewalk from atop that building roof? Or do you want to transform your practice by using magnification in endodontics? ■

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WATCH MORE ABOUT MAGNIFICATION ONLINE

Dr. Manor Haas discusses more about the nuts, bolts and functionality of dental loupes and microscopes in endodontics in his new video, "Magnification Online." To watch the video, go to dentaltown.com/magnify.

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1) Which of the following forms of magnification benefits clinical endodontics:
- A) Intraoral camera
- B) Operating very close to the tooth with the naked eye
- C) Dental microscopes
- D) 20/20 eyesight

2) Enhanced magnification and illumination should be used during all root-canal procedures.
- A) True
- B) False

3) Which of the following is true:
- A) Magnification enables you to perform procedures you otherwise couldn't
- B) Magnification is useless in clinical endodontics
- C) Magnification is only recommended for posterior teeth
- D) Loupes and microscopes have a short lifespan

4) Which of the following is true about dental loupes:
- A) They can't support a headlight
- B) They can't be used without a headlight
- C) They need to be replaced frequently
- D) Loupes can support a head-mounted video camera

5) Which of the following is false?
- A) If using dental loupes, incorporate a headlight for root canals
- B) If using dental loupes, don't incorporate a headlight for root canals
- C) Use at least 3x magnification loupes for endodontic procedures
- D) Dental loupes have become inexpensive

6) Which of the following could not be diagnosed with a dental microscope?
- A) Pulp stones
- B) Hairline fractures
- C) Perio pocket depths
- D) Complex internal anatomy (i.e., C-shaped canals)

7) Dental microscopes are often modular in design.
- A) True
- B) False

8) Which is false about dental microscopes:
- A) They enable you to perform more root canals
- B) They are a good return on investment
- C) They are not ergonomic
- D) They may last you for many years

9) Which of the following is true about magnification in endodontics?
- A) It will make you spend more time looking for canals
- B) It will reduce the chance of procedural errors
- C) It will make it more difficult to find all the canals

10) Which of the following is true:
- A) Magnification without illumination is always enough to look for calcified canals or fractures
- B) Illumination into the endo access, along with magnification, is important
- C) Dental headlights cannot be mounted on the loupe frame
- D) Dental headlights do not come in wireless versions

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Magnification in Endodontics

by Manor Haas, DDS

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