

Alone? ... Not Really

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The Melding of Technologies

Minimally Invasive CEREC® Crown Preparation using the Er:YAG Laser

MARK COLONNA, DDS

Today's technology allows us to do certain things with patient care that years ago seemed unfathomable. We used to perform multiple appointment endodontics and multiple appointment crown restorations with a laboratory, while using valuable chairtime to our disadvantage.

Today we can actually perform all of these procedures in one appointment within a couple of hours, using the proper magnification, illumination, CAD/CAM, and laser technologies.

Not only has this enhanced the profitability of these procedures but, more importantly, the *quality*, predictability and timeliness of the treatment outcome, ultimately benefiting the patient. We thought this only existed in our mind's eye years ago, but the following case shows how this actually works today using advanced technology.

One last note: at no time was a rotary instrument used in this case, neither at high nor low speed. All procedures were performed exclusively with the ER:YAG Laser. The only hard implements that came into contact with the tooth were the root canal hand files used to extirpate and enlarge the root canal space prior to obturation.

PATIENT HISTORY

Our patient, a 58-year-old male who was visiting my city but works in Los

- » Figs. 1-2: irreversible pulpitis.
- » Fig. 3: Opaquing of pre-op.
- » Fig. 4: Imaging of pre-op.



Angeles, was experiencing a "tooth-ache." Upon radiographic examination of tooth number 21, we discovered a small disto-occlusal alloy with recurrent decay underneath, leading to an irreversible pulpitis (Figs. 1-2).

The patient's health history was un-

remarkable and we proceeded to place the Isolute and take our preliminary correlation pictures with our CEREC CAD/CAM computer (Figs. 3-4). We also used the Global G6 microscope to further examine the tooth under various magnifications, as to assess what



type of damage and wear the tooth had, and to help us determine what type of crown design and porcelain to use for our final coverage post endodontics.

I cannot emphasize enough the need for proper magnification in practicing dentistry, especially using lasers. It is critical that the operator be able to see what is happening when the laser is interacting with the oral tissues (Figs. 5-6).

Notice with the “naked eye,” which is not magnified, very little detail is seen. At 4.5x or more magnification, the clinician will be able to really see what is happening for diagnostics and treatment. Note that we will be treating the wear facet on the buccal area of the tooth.

After we had taken our correlation images, we proceeded to place the rubber dam for complete isolation to perform the laser root canal procedure.

Now, there are actually a couple of ways to proceed here. One way is to perform the crown preparation and mill the restoration while we perform the endodontics. The other way is more conventional, and this is what we decided to proceed with.

We performed the endodontics, placed our buildup material, and then prepared the tooth for our CEREC restorations. Here’s how it went.

LASER ENDODONTICS

Using the Er:YAG Laser (Lares/Fotona Powerlase AT), and utilizing a



- » Fig. 5: “Naked eye” pre-op.
- » Fig. 6: 5.5x magnified.
- » Fig. 7: Exposed nerotic tissue.
- » Fig. 8: Final obturation.

“tipless” hand piece, I was able to create access into the root canal chamber and expose the nerotic tissue (Fig. 7). We performed the minimally invasive endodontics utilizing hand instruments and subsequent disinfection with the Er: YAG Laser.

We then obturated according to the endodontic standard of care (Fig. 8), and then placed our build up restoration. Again, no rotary instrumentation was used at any time.

- » Figs. 9-10: The peripheral rim of enamel.
- » Fig. 11-12: The reduction taking place axially and forming the shoulder margin concurrently.
- » Fig. 13: A pulse from the tipless hand piece.
- » Fig. 14: Tipped hand piece with quartz tip.



RESTORATIVE PROCEDURE WITH ER:YAG LASER AND CEREC

Once the endodontics was completed, we were ready to begin the restorative phase using the Er:YAG Laser and CEREC.

Using the tipless hand piece, I first removed the occlusal surface to expose the peripheral rim of enamel (Figs. 9-10). By exposing the DEJ, one can direct laser energy down the axial walls and create a very smooth and predictable crown preparation.

The laser energy is easily controlled and directed by aiming the beam directly where you would like to ablate the tooth. There are also controls on the laser itself which can be used to set the amount of laser energy, air and water that one would like to use to prepare the tooth.

The preparation parameters are the same ones taught by most CEREC instructors as far as size of margin, type of margin and how much overall tooth reduction one must have for adequate porcelain thickness. My reference to CERECdoctors.com has helped me to understand how much tooth to prepare with the laser.

Figs. 11 and 12 show the reduction taking place axially and forming the shoulder margin concurrently. The laser has variable hz (pulse repetition) rates,



With today's available technologies, namely the Er:YAG Laser, CEREC 3D CAD/CAM and the dental microscope, **the ability to perform endodontics and full prosthetic coverage in a single appointment and without rotary instrumentation, is now a reality.**

as well as variable pulse duration settings. When understood, these rates can facilitate how smooth or coarse, and how quickly one can prepare a tooth for a porcelain restoration. The Lares/Fotona laser can actually prepare a tooth as fast as, and in some cases faster than, a high speed drill with all the different settings at my disposal. This is espe-

cially true for smaller premolar preparations restored with the minimally invasive CEREC 3D. Even margin type is not an issue, as I have prepared both chamfer and butt margins quite easily with the laser.

Fig. 13 demonstrates a single pulse from the tipless hand piece which is 900 microns in diameter, almost 1 mm,

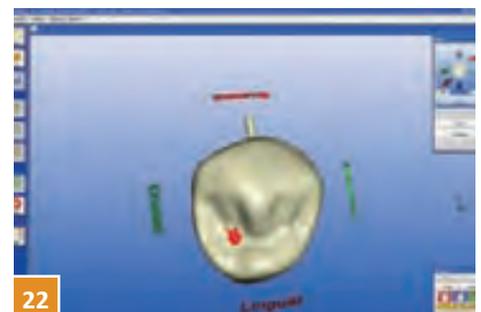
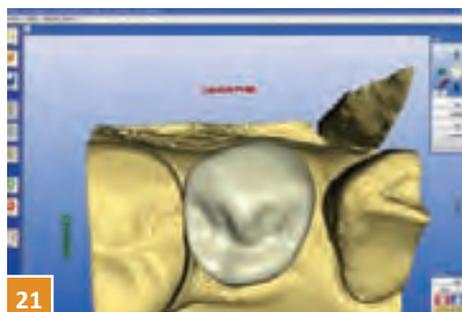
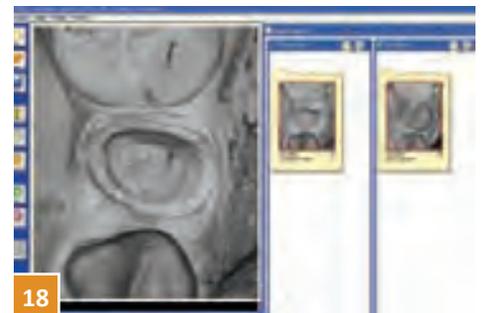
for the perfect size butt margin placement. After “roughing in” the margin with this hand piece, I used the tipped hand piece (Fig. 14) with an 800 micron quartz tip and a very high hz, creating a very smooth margin for our final image with the CEREC camera. This tip can be used in contact with the tooth as well, affording the operator some tactile sensation like one would have when using a high speed rotary hand piece.

One final step, and a nice advantage to using a laser, is soft tissue management. Along the distal of the preparation, the margin went just slightly below tissue level. I was able to use a special tip to “trough” the tissue and expose the margin. Note that the field remains bloodless for proper image reading with the CEREC 3D camera (Fig. 15).

At this stage, we were able to image the preparation with the CEREC 3D camera and design our restoration. Following are the photos of the final preparation, all achieved using the Er:YAG Laser and without any rotary instrumentation. The margins were very sharp and readable by the CEREC 3D camera (Figs. 16-17). We then proceeded to design the restoration in Correlation (Figs. 18-22).

We designed the crown using a Vita Block and milled in “endo” mode. Milling took approximately 12 minutes and the patient got the opportunity to watch his crown manufactured. We like to show the patient how their restorations are being made, and in addition to the laser, and microscope, the “wow” factor really kicks in as they see that their tooth was never really touched by anything other than laser energy. We also like to show them the final restoration itself, during try-in and cementation (Figs. 23-25).

We finalized the “fit” by staining and glazing chairside and then placing the



crowns in our Ivoclar oven to bake the crown to its final luster.

CONCLUSION

With today’s available technologies, namely the Er:YAG Laser, CEREC 3D CAD/CAM and the dental microscope, the ability to perform endodontics and

- » Fig. 15: Exposed margin.
- » Fig. 16: Occlusal view.
- » Fig. 17: Buccal view.
- » Fig. 18: Optical image of preparation.
- » Fig. 19: Preparation model.
- » Fig. 20: Defining the margin.
- » Fig. 21: Proposal.
- » Fig. 22: Final restoration ready for milling.



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full prosthetic coverage in a single appointment and without rotary instrumentation, is now a reality.

With the exception of an endodontic file, the tooth in this case presentation was never touched by an instrument throughout the entire treatment process. Years ago, this seemed like a myth but today is a reality with the fine technological instrumentation available.

Patients appreciate the minimally invasive nature, and conservation of their tooth structure along with how these procedures are performed.

We must continue to strive to “think outside the box” when it comes to technology and its purposes. After all, we too are patients and I would like



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- » Fig. 23 (far left): Try-in.
- » Fig. 24 (above): Final restoration immediately after cementation.
- » Fig. 25 (left): Close up of margin.

to think that we also want to have the best treatment modalities available for ourselves. This kind of advancement in dentistry will only serve to make our patients more trusting and willing to give themselves the appropriate treatment, and value its worth!