

White lines or white lies?

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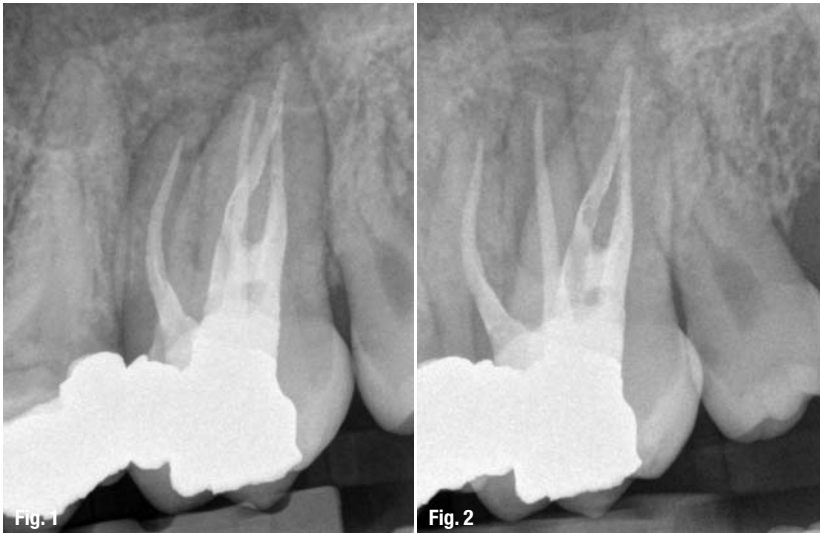


Fig. 1 _Parallel diagnostic radiograph.
Fig. 2 _Eccentric diagnostic radiograph.

With the recent development of new file systems—WaveOne from DENTSPLY Maillefer and RECI-PROC from VDW—endodontists have been having controversial discussions about their usefulness. This is partly due to the aggressive marketing of these products. Great emphasis is laid on simplifying the endodontic procedure. The thought behind this is that creating a simpler shaping protocol will allow the dentist to produce standardised shapes more easily and thus enhance the cleaning of these canals. However, endodontics is not, nor will it be, a simple procedure. There is no such thing as a perfectly round canal. In 1925, Hess already demonstrated that we should not speak of root canals, but rather of root-canal systems.¹

Many other studies have confirmed Hess's findings. Only a few months ago, a micro-CT study guide titled *The Root Canal Anatomy Project* became available online, offering high-resolution images of root-

canal systems, which clearly demonstrate the complexity of those systems.

If we take another approach to these new file systems, we have to ask ourselves: Do they deliver something new? And the answer is: No, they do not. They re-introduce the concept of reciprocating motion according to the balanced force technique by Roane.² This reciprocating motion does lead to less separation of files, which is an advantage of the current rotary systems.³⁻⁵ When looking at the final size that the Primary WaveOne file creates, we notice that it is similar to that achieved with a ProTaper F2 file (DENTSPLY Maillefer). Therefore, one WaveOne file creates the same shape as four ProTaper files (S1, S2, F1 & F2), which leads to a quicker preparation of the root canal.

The shortened preparation time allows more time for cleaning, but it would be delusional to think that this would happen in reality. As we live in an era in which time is money, quicker preparation will most likely result in less cleaning, thus increasing the number of suboptimal root-canal treatments (RCT). The new file systems also propagate the 'single-use' concept, which eliminates the possibility of cross-contamination or contamination with prions. Although the risk of contamination is very low when using sterilised instruments, it is true that with the pre-sterilised WaveOne files, the risk is zero.

Overall, the new reciprocating file systems have some advantages compared to older rotary files, but the practitioner should be aware that they only shape canals. They do not clean them!

This leads me to the title of this article...

Fig. 3 _Opening cavity.
Fig. 4 _Calcified pulpal tissue in the middle of the palatal canal.



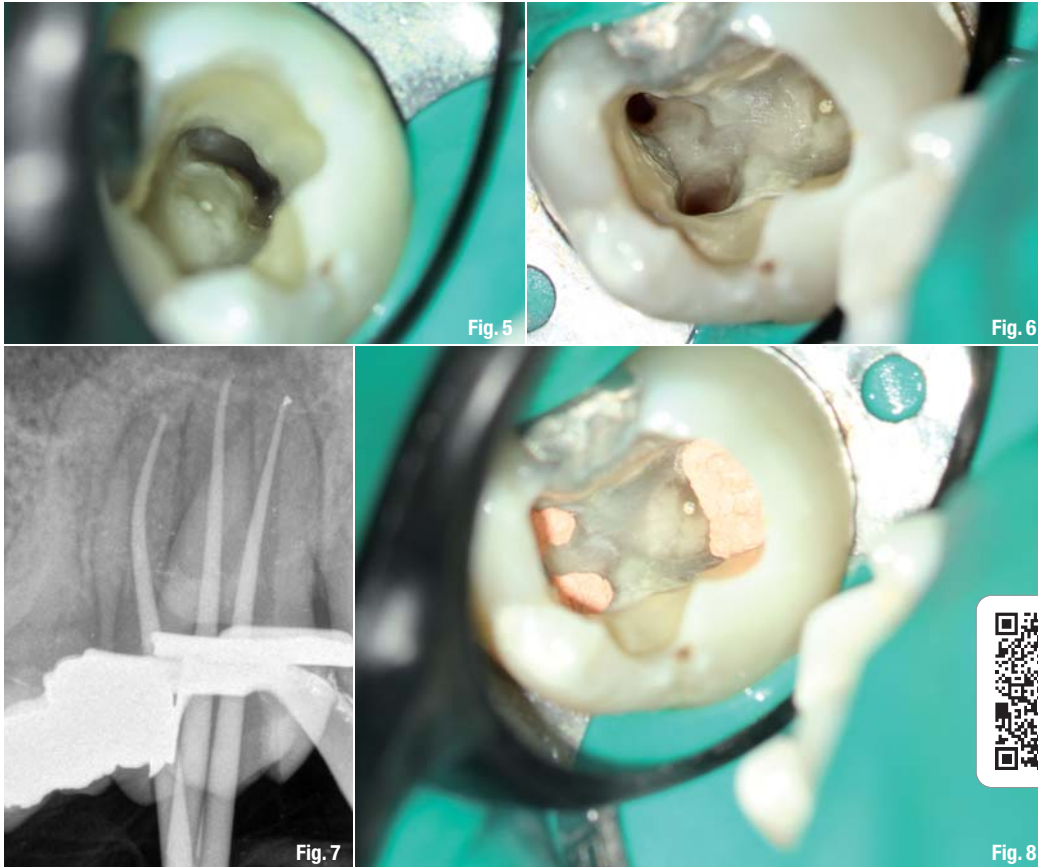


Fig. 5_ The cleaned palatal canal.
Fig. 6_ The cleaned buccal canals.

Fig. 7_ Gutta-percha cone-fitting.
Fig. 8_ The pulp chamber after obturation with gutta-percha.

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Most dental manufacturers bring gutta-percha cones and obturators on the market that correspond to the final finishing size of the conforming file system. The promoted obturation techniques are the single-cone technique and carrier-based obturation, both of which have shown to be more prone to leakage than warm vertical condensation.^{6,7}

This is without considering the studies that used the flawed dye-penetration test for micro-leakage. However, the discussion remains whether these techniques are better, worse or equal to warm vertical condensation, and it is not likely that it soon will be over.

Regardless of all this, the clinician is now presented with an 'all-inclusive' system for creating nice white lines on a radiograph and this in a quick and easy way, creating the illusion of perfectly executed RCT. Cleaning has become the bottleneck for treatment time and it is tempting to reduce the total cleaning time, which results in suboptimal RCT. This does not mean that all recent developments are for the worse. To the contrary, dentists should be prudent in their use. The only way to achieve this is to educate dentists properly about the basic fundamental principles in endodontics.

Case report

The following case report is used as an example of nice white lines on a radiograph. A 35-year-old male patient was referred to our practice. Tooth #15 had been treated by the referring dentist, who had found four canals, of which two were palatal canals, which is very rare. The referring dentist applied a standard cleaning protocol with sodium hypochlorite. At first sight, the treatment looked adequate (Figs. 1 & 2). However, the patient kept complaining about the tooth being sensitive when he was eating and he complained of spontaneous pain from time to time. The patient's medical history was non-contributory.

Clinical tests were performed (Table I) and together with the history and the radiographic findings we decided to retreat the tooth. The pulpal diagnosis was a previously treated tooth and the apical diagnosis was symptomatic apical periodontitis.

Table I_ Clinical tests.

	26	27	28
electric pulp test	positive	NA	positive
thermal test	positive	NA	positive
percussion	negative	positive	negative
palpation	negative	positive	negative
periodontal probing	normal	normal	deep pockets



Fig. 9_Post-op radiograph (parallel).

Fig. 10_Post-op radiograph (eccentric).

_Treatment

Initially, the tooth was isolated with a rubber dam and an opening cavity was created through the amalgam restoration (Fig. 3). The canals were located and the opening cavity finished. Using a ProFile 25.06 rotary file (DENTSPLY Maillefer) at 300 rpm, the gutta-percha was removed. No chloroform was

necessary, as it appeared that the canals had been filled using a single-cone technique. As mentioned above, this technique might not be an ideal obturation technique. However, a more striking problem became apparent. The two palatal canals were separated by a piece of calcified pulp tissue (Fig. 4). These pieces of tissue harvest an incredible amount of bacteria and if they are not removed, they can easily lead

to persistent infection. It is not always easy to distinguish the calcified tissue from (tertiary) dentine and if the dentist does not use magnification, it is practically impossible.

The calcified tissue was removed using ultrasound with ProUltra tips (DENTSPLY Maillefer). After the removal of the calcified tissue, there was only one very wide palatal canal left. Both buccal canals were also cleared from the gutta-percha and I searched for a second mesiobuccal canal but was not able to find one. From then onwards, complete cleaning and shaping were performed (see Table II for shaping sequence).

Cleaning was performed with 5% sodium hypochlorite and a final rinse with 10% citric acid for

about three minutes. Both fluids were ultrasonically activated at the end of the treatment, three times for 20 seconds. Passive ultrasonic irrigation was performed with the Irrisafe tip (Satelec), as it provides better results than manual dynamic or sonic activation, according to the literature. Figures 5 and 6 show the canals after they had been dried with paper points.

A control radiograph (Fig. 7) was taken, fitting gutta-percha cones in the canals. It appeared that a small piece of amalgam had fallen into the palatal canal and was stuck apically. I tried to remove it but was unable to do so. I eventually decided to leave it in place, since the effect on the final prognosis is negligible. The canals were obturated with gutta-percha and TopSeal (DENTSPLY Maillefer) using warm vertical condensation (Figs. 8–10). The difference from the original situation was very clear. The canals were now properly cleaned, shaped and obturated.

_Conclusion


White lines on a radiograph are a 2-D representation of obturated canals. These lines do not give away anything about the cleaning, shaping and obturating techniques applied. Hence, they do not tell us anything about the biology of the treated root-canal system. Endodontic files are just instruments that facilitate proper cleaning of the root-canal system. Emphasis should be placed on respecting this root-canal system and the fundamental principles of cleaning, shaping and obturating, rather than creating beautiful white lines in an easy and fast way.

Editorial note: A complete list of references is available from the publisher. A video of the case is available on www.dental-tribune.com/articles/content/id/6165 or simply scan the QR code with your smartphone.

palatal	mesiobuccal	distobuccal
Flexile 15	K-file 10	K-file 10
Flexile 20	Flexile 15	Flexile 15
Flexile 25	Flexile 20	Flexile 20
Flexile 30	ProTaper S1	ProTaper S1
ProFile 35.06	ProTaper S2	ProTaper S2
Flexile 35	ProTaper F1	ProTaper F1
	ProTaper F2	ProTaper F2
	ProFile 35.06	ProFile 35.06
	Flexile 35	Flexile 35

Table II_Shaping sequence.

_about the author
roots



Dr Rafaël Michiels graduated from the Department of Dentistry at Ghent University, Belgium, in 2006. In 2009, he completed the three-year postgraduate programme in Endodontics at the University of Ghent. He works in two private practices limited to Endodontics in Belgium. He can be contacted at rafael.michiels@gmail.com and via his website www.ontzenuwen.be.

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