

Is rotary NiTi the new paradigm?

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Fig. 1 Photograph of a K-file. Note the high number of flutes that are more horizontal in orientation, therefore contributing to poor design under function.



Fig. 1

_Does rotary NiTi deserve the title of a new paradigm? In order to be determined to be a "paradigm" it must represent a fundamentally new model. In the case of endodontics, this new model of instrumentation differentiates itself from the old model by being employed in a crown-down fashion rather than the traditional step-back used with K-files.

Furthermore, the crown-down technique is used with rotary NiTi to minimise the engagement along length, making rotary NiTi somewhat less vulnerable to breakage, but at the same time requiring an increased amount of time for recapitulation. The introduction of a new model constituting a paradigm shift not only implies superiority of the new model, but clearly defines the old system as inferior, out of date and lacking the fundamental intelligence that is incorporated into the new model.

What is most peculiar about this "paradigm shift" is its dependence on the old model. Rotary NiTi cannot be used unless the glide path is first created using the K-files.¹ Realising that the new model is dependent upon the old model leads to some possible insights. The shortcomings of the old model are still present and the new model at best does not resolve the old model's shortcomings. Moreover, rotary NiTi is

not without its own shortcomings. K-files, for all their limitations in apical negotiation, distorted shaping, impaction of debris and loss of length, rarely break during usage. Rotary NiTi, on the other hand, has made the dentist constantly aware of its vulnerability to torsional stress and cyclic fatigue, stresses that routinely occur when shaping with rotary NiTi.

Those supporting the benefits of this new model state that crown-down has the advantage of pushing less debris peri-apically, making endodontics more predictable. There is little in the endodontic literature that supports this viewpoint and its supposed benefits.

An automated rotating crown-down approach to shaping canals that is still dependent upon the poorly designed K-file is really a dual system of canal shaping with each portion of the system compensating for the weaknesses of the other. The K-files engage the canal walls excessively, producing a poor tactile perception of what the tip of the instrument is encountering. This limitation can lead to ledging, blockages and apical transportation. For this reason, their use is limited as much as possible before employing rotary NiTi.

Those using rotary NiTi must use the K-files to create a clear pathway from the canal orifice to its apex because the tip of rotary NiTi instruments is vulnerable to breakage if its tip locks and binds apically.

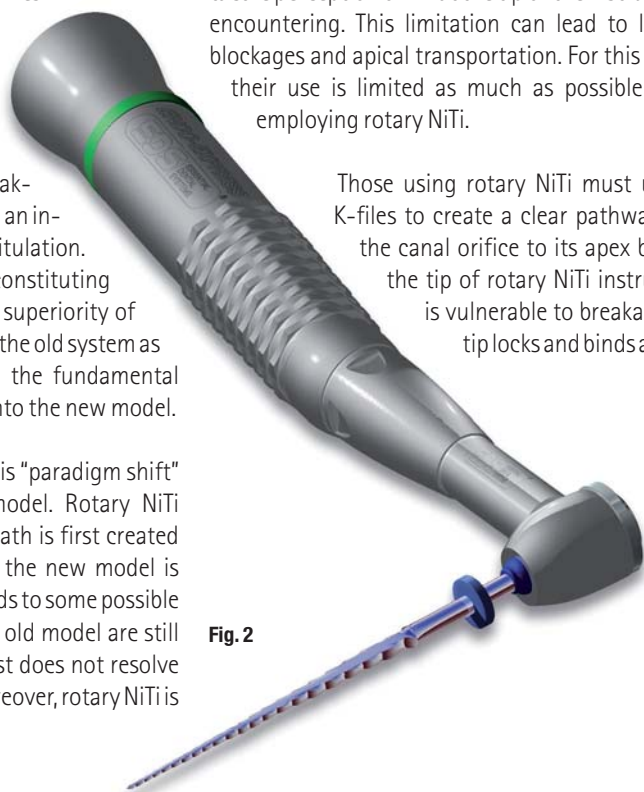


Fig. 2

Fig. 2 Illustration of a relieved reamer used in a reciprocating handpiece.

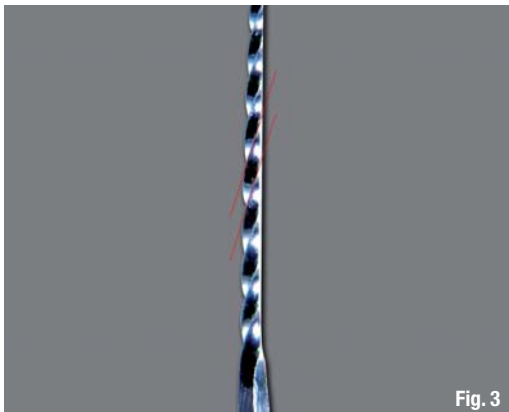


Fig. 3

with half the number of flutes and twice as vertically oriented, will efficiently shave the dentine using the same watch-winding stroke.

Fig. 3 Photograph showing the vertical flutes and flat of a relieved reamer.

It is only when the canal pathway is completely clear along its entire length that the rotary NiTi instruments can be used without fear of torsional stress. Even then, a clear pathway does not eliminate all the stresses that rotary NiTi will bear.

Rotation around a curve creates cyclic fatigue, shortening the life of the NiTi instruments, with cyclic fatigue accelerated, the greater and the more abrupt the curve being negotiated.² Compensation for this vulnerability comes in two forms. The poorly designed K-files (Fig. 1) may be used to shape the canals further before switching to rotary NiTi or the NiTi instruments may be used to shape more conservative preparations, not based on the biological needs of the canal, but the metallurgical limitations of the NiTi instrument.

Perhaps the best way to illustrate the sleight of hand in the marketing of rotary NiTi is to consider a simple alternative: the use of relieved reamers rather than K-files, instruments that work so well that they can be used from start to finish. Whereas K-files engage when a watch-winding motion is used and only remove dentine on the pull stroke, the reamers,

These instruments engage less along length, are significantly more flexible and shave rather than cut more efficiently. As long as patency is maintained, these instruments will remain centred when being negotiated apically and have the ability to work all the walls upon withdrawal of the instrument.³ For the most part, these instruments do all the shaping. It is not a dual system because there is no need for another system to compensate for any weaknesses. The strengths that relieved reamers (Fig. 2) bring to shaping canals, whether used in a manual watch-winding motion or in a 30° reciprocating handpiece, are constant throughout the entire procedure (Fig. 3).

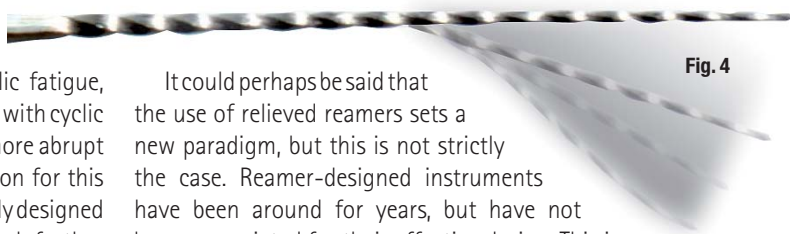


Fig. 4

It could perhaps be said that the use of relieved reamers sets a new paradigm, but this is not strictly the case. Reamer-designed instruments have been around for years, but have not been appreciated for their effective design. This is understandable because they have rarely been taught in the dental schools.

Fig. 4 Photograph illustrating a relieved reamer lacking the snap-back qualities of its NiTi counterparts.

Somewhere along the way, K-files became the instrument of choice in institutions of higher learning and so became ossified over the years without proper justification. It was really the advent of rotary NiTi that eventually highlighted the shortcomings of K-files. That a system as expensive and vulnerable as rotary NiTi is dependent upon initial instruments of such poor design makes one realise that the edifice of endodontics based on K-files is unsupported. To be dependent upon a poor design makes no sense.

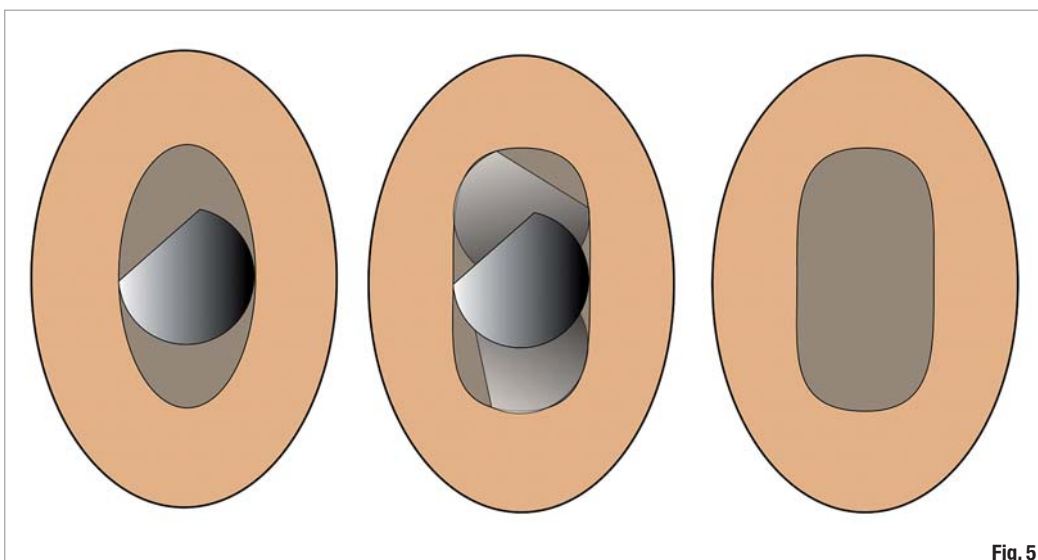


Fig. 5

Fig. 5 Illustration showing an asymmetrical instrument's ability to distinguish and clean an oval-shaped canal.

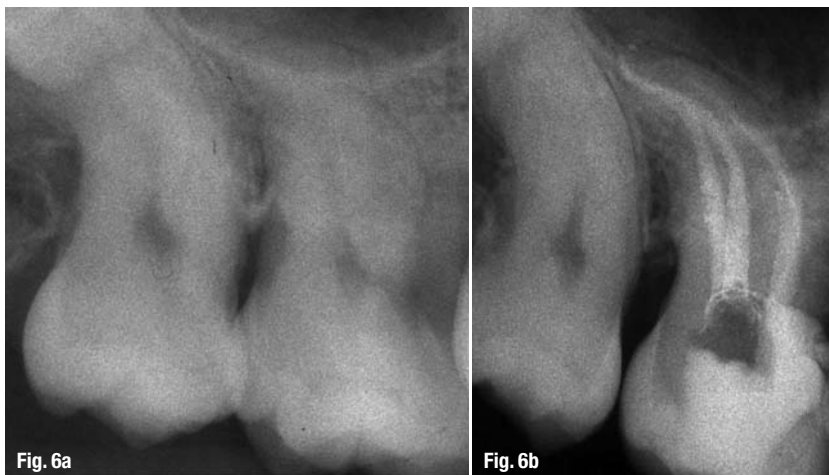


Fig. 6a

Fig. 6b

Figs. 6–8 Radiographs illustrating the clinically excellent results obtained using relieved reamers in a reciprocating handpiece.



Fig. 7



Fig. 8

If we simply brush away the use of K-files, the subsequent use of rotary NiTi and all the marketing that has gone along with its establishment as the new paradigm, we are left with simple, inexpensive yet highly effective tools that allow endodontics to be performed with none of the procedural stress associated with K-files. Relieved reamers provide the dentist with the following advantages:

- virtually invulnerable to breakage;
- can be used six to seven times before replacement;
- will not break even if inadvertently used many more times;
- can be negotiated apically with far less resistance than K-files;
- more flexible, less engaging and more effective at removing dentine from the canal walls than K-files;
- do not snap back to the straight position like rotary NiTi (Fig. 4);
- record curvatures;
- are confined to a tight arc of motion;
- stay centred when negotiating apically;
- can be used against any and all walls when being removed from the canals;
- can differentiate between a tight canal and a solid wall (Fig. 5);
- can differentiate between a round and oval canal;
- can shape even a highly curved canal to a minimum of 35 without canal distortion;

- have a cutting tip that pierces rather than impacts dentinal tissue and debris;⁴
- can be used both manually and in a 30° reciprocating handpiece;
- on average cost 90% less than rotary NiTi on a per-use basis.

What any dentist might want to ask himself is whether he is listening to the sizzle or tasting the steak. The significant number of dentists who, while being lured by the sizzle, are desperately waiting to experience the steak, only to be disappointed by the shortcomings inherent in any rotary NiTi system, is amazing.

For anyone who has made a major investment in rotary NiTi, it may be difficult to accept that there is a simpler, more effective and far safer means of shaping canals that costs a fraction of what rotary NiTi costs.

These alternative systems do not have to be called a paradigm shift. Rather, the paradigm shift must happen in our minds, allowing the ability to judge systems based on their performance rather than the promise of that performance.

For examples of cases that highlight the clinically excellent results using the alternative method discussed in this article, see Figures 6 to 8.

Knowing that nothing beats the old adage that the proof is in the pudding, I make my long-standing offer to anyone who wishes to experience the superior effectiveness of relieved reamers to K-files, K-flex files and rotary NiTi to take the free one-on-one two-hour workshop I give in our New York endodontics practice.

If you are interested, call +1 212 582 8161 and ask for Evelyn to schedule the workshop, which is generally held on a Tuesday or Thursday from 7 to 9:30 pm. The address is 119 W. 57th St.—a safe part of town for out-of-towners who may have any trepidations.

Editorial note: A complete list of references is available from the publisher.

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FURTHER DATES

Spring Academy 2012 // 2 & 3 March 2012 // Heidelberg, Germany
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