Scouting the root canal with dedicated NiTi files

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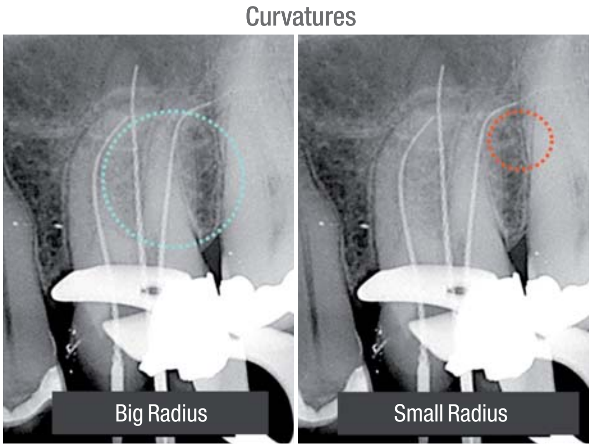


Fig. 1

Fig. 2

Fig. 1_A large curvature radius is noted (blue) in the mesiobuccal (MB) canal and a small curvature radius (red) in the distobuccal canal. Metal fatigue of NiTi files will increase with small radius curvatures.

Fig. 2_Obliteration (Case I) and abrupt coronal curvatures and/or coronal constrictions (Case II) can contribute to metal fatigue of NiTi files.

_The introduction of nickel-titanium (NiTi) rotary instrumentation has made endodontics easier and faster than with hand instrumentation. In addition, root-canal preparation is more consistent and predictable. However, fracture of NiTi files remains a major risk. Fracture results from either cyclic or torsional fatigue.[1–8]

In clinical practice, cyclic fatigue will increase in curved canals (the smaller the curvature radius or double curvature the higher the risk) and torsional fatigue in small and obliterated canals (tip lock; Figs. 1–3). The type of NiTi files (design, taper, size) and the instrumentation technique (crown-down or step-back, brushing or pecking motions) may overcome these anatomic challenges and prevent file separation. Another major clinical technique for reducing the risk of NiTi file separation is to perform coronal enlargement and manual pre-flaring to create a glide path before using NiTi rotary instruments (Fig. 4).[9–11] It has been shown in the literature that establishing a glide path by coronal pre-flaring and manual canal scouting is a fundamental clinical step for safer use of NiTi rotary files. Berutti et al.[12] have shown that creating a manual glide path with a #20.02 manual stainless steel (SS) file decreases the frequency of NiTi rotary file separation by six times. However, creating a glide path and coronal pre-flare with small SS files (#06–08) in curved, constricted or obliterated canals will result in several clinical complications, such as file deformation, buckling, separation and the need to use several instruments (Fig. 5). This is because SS small-diameter files are highly flexible, often leading to torsional fatigue and flute deformation. In addition, straightening of the original canal can occur with the use of even these small files in severely or double-curved canals.

Recently, FKG Dentaire introduced its Scout-*RaCe* and *RaCe* ISO 10 files, NiTi rotary file systems for mechanical pre-flaring and creating a glide path to replace SS hand filing at this phase of canal preparation. It has been demonstrated that the use of these NiTi

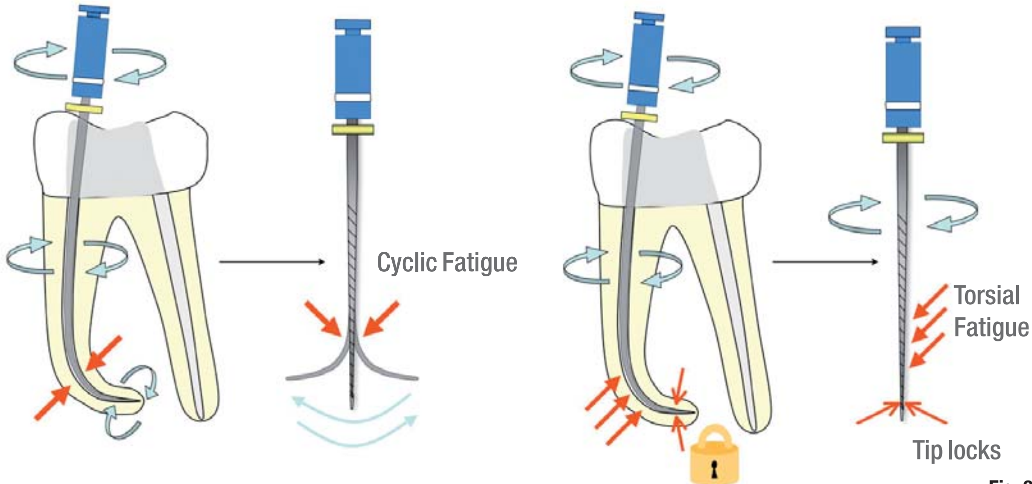


Fig. 3

Fig. 3_Cyclic fatigue of NiTi files will increase as a result of a small curvature radius, which is further exacerbated by keeping the file in the same position while rotating or inflexible files. Torsional fatigue will increase as a result of canal constriction and obliteration, exacerbated by flexible files (unwinding), and excessive vertical pressure.

instruments prior to the main NiTi rotary files better retains the original canal anatomy, with less modification of canal curvature and fewer canal deviations compared with manual pre-flaring performed with SS K-files.[8, 12] In addition, challenging canals that would take a considerable amount of time to initiate with SS files can be completed quickly with this new technology.

In this case report, we will present the indications and protocols for the use of Scout-*RaCe* and *RaCe* ISO 10 files (Fig. 6).

_Scout-*RaCe* files

This system consists of three NiTi files with a *RaCe* flute design (alternating cutting edges), which is considered to be a non threading design owing to its alternating pitch from parallel to spiralled zones.[14–17] The surface of these files is electropolished in order to remove all irregularities produced during grinding. The tips are non-cutting and rounded. They are produced in lengths of 21 and 25 mm with a 0.02 taper. They have a triangular cross-section and come in sizes #10 (purple), 15 (white) and 20 (yellow). These files have two silicon stoppers, one called SMD (safe memory disc), which lies close to the handle and is yellow, indicating the taper of the files (0.02), and a smaller stopper that indicates the length of the files (red = 21 mm and blue = 25 mm). These files are used in severe single or double-curved canals and they will primarily scout the canals with minimal coronal flare (Fig. 7).

Clinical protocol for Scout-*RaCe* files (severe single and double curvatures):

1. If possible, use a #06 or 08 K-file file to reach the estimated working length (WL). Confirm the length with an electronic apex locator (EAL).
2. Irrigate with NaOCl.
3. With gentle strokes at 600 rpm, widen the canals with the #10, 15 and 20 Scout-*RaCe* instruments to full length. Since these files are very flexible, avoid excessive pressure to prevent buckling. Irrigate the canals with NaOCl between files and clean the files if used for more than four strokes. Use a #15 K-file to obtain a smooth glide path and confirm the WL with an EAL.
4. Continue with the main NiTi sequence (Bio*RaCe*, Sequence files, etc.; Figs. 8 & 9).

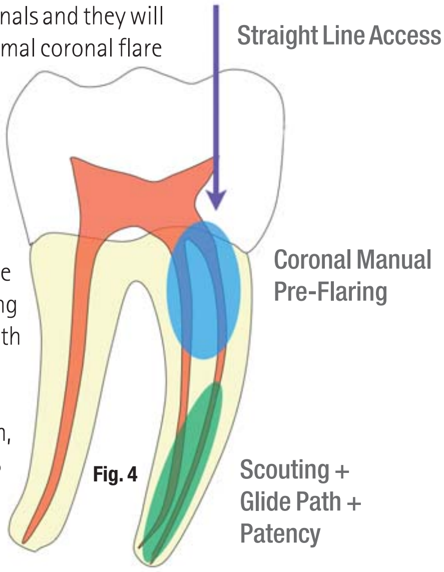


Fig. 4

Fig. 4_The risk of NiTi separation is reduced by straight-line access, coronal pre-flaring and the establishment of a glide path.

Fig. 5

Fig. 5_Manual scouting with SS files.

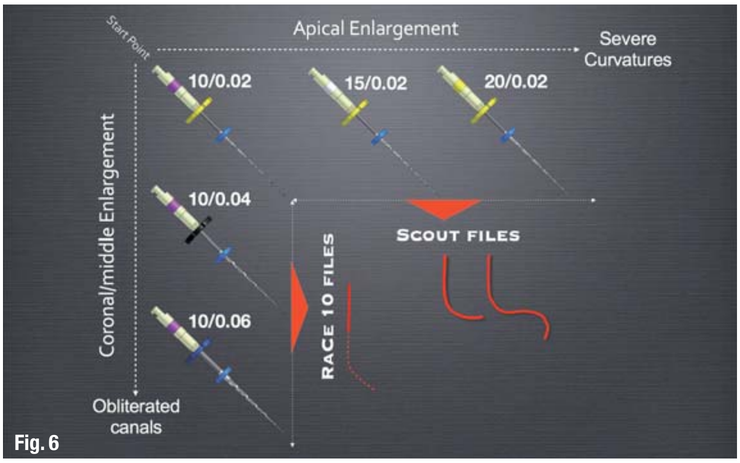


Fig. 6

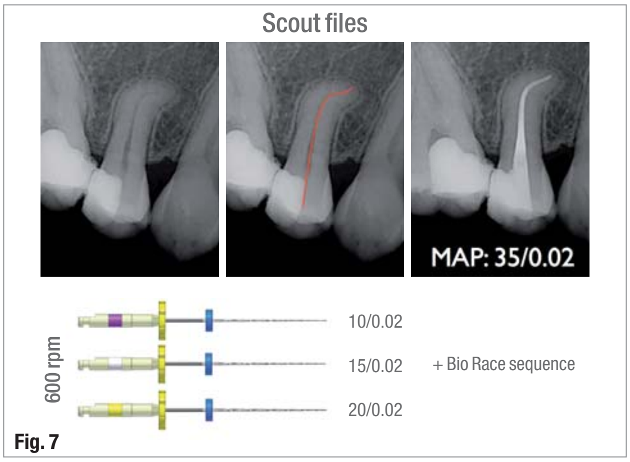


Fig. 7

Fig. 6_Scout-*RaCe* and *RaCe* ISO 10 clinical applications and protocol. The Scout-*RaCe* files are used in severely and double-curved canals, whereas the *RaCe* ISO 10 files are used in obliterated and calcified canals.

Fig. 7_Clinical case of a maxillary premolar with an S-shaped curvature. The glide path created by Scout-*RaCe* files allowed the NiTi sequence to be followed without straightening the canal or file separation.

_*RaCe* ISO 10

This system consists of three NiTi files with the same *RaCe* flute design as described above. They are produced in lengths of 21 and 25 mm. The difference between Scout-*RaCe* and *RaCe* ISO 10 is that these files progressively increase in taper but maintain the same apical diameter of 0.10 mm. These three files come in size #10 and tapers of 0.02, 0.04 and 0.06 (Fig. 6).

The SMD silicon stopper is yellow for the 0.02 taper files, black for the 0.04 taper and blue for the 0.06 taper. The colour of the small silicon stopper indicates length as with the Scout-*RaCe* files. These files are meant to be used in constricted and obliterated canals, as well as in abrupt coronal curvatures. These files, like the Scout-*RaCe* files, will also scout the canals but because of the progressive increase in taper will primarily perform coronal flaring (Fig. 10). The #10.04 and 10.06 *RaCe* ISO 10 files are more rigid than the #15 and 20 Scout-*RaCe* files, and that is why they are for use with vertical pressure for constricted or obliterated and curved canals (will not buckle as easily as Scout-*RaCe* files) and are not ideal for double and severe curvatures.

Clinical protocol for *RaCe* ISO 10 files (constricted or obliterated canals):

1. Use a #06 or 08 K-file to reach the estimated WL. Confirm the length with an EAL. Remove the file and verify that the curvature is not severe by inspecting the file's surface.

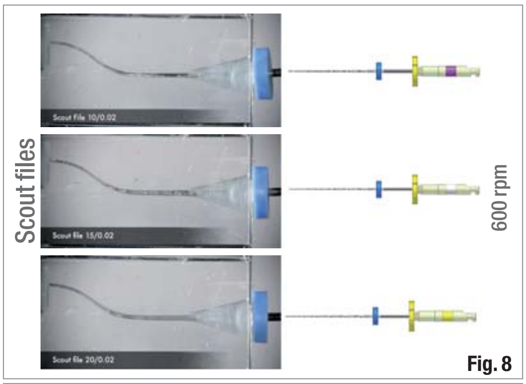


Fig. 8

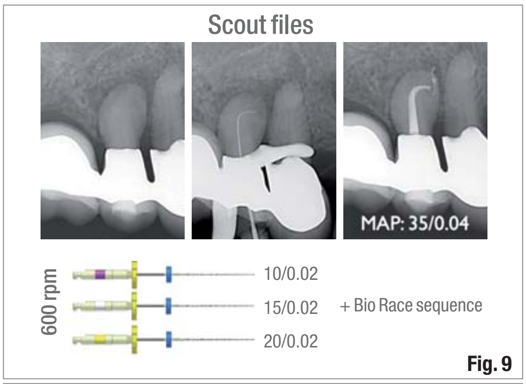


Fig. 9

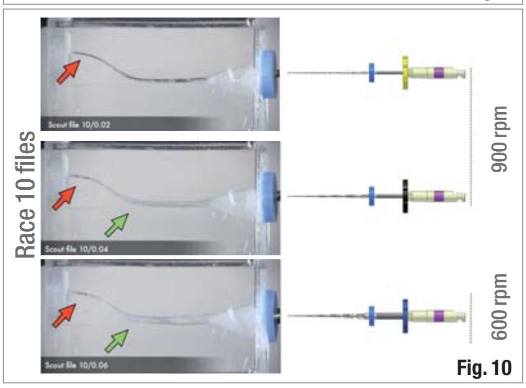


Fig. 10

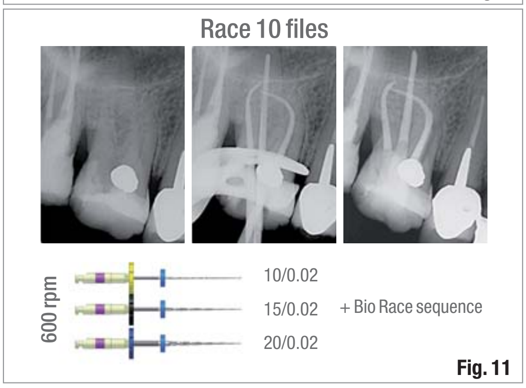


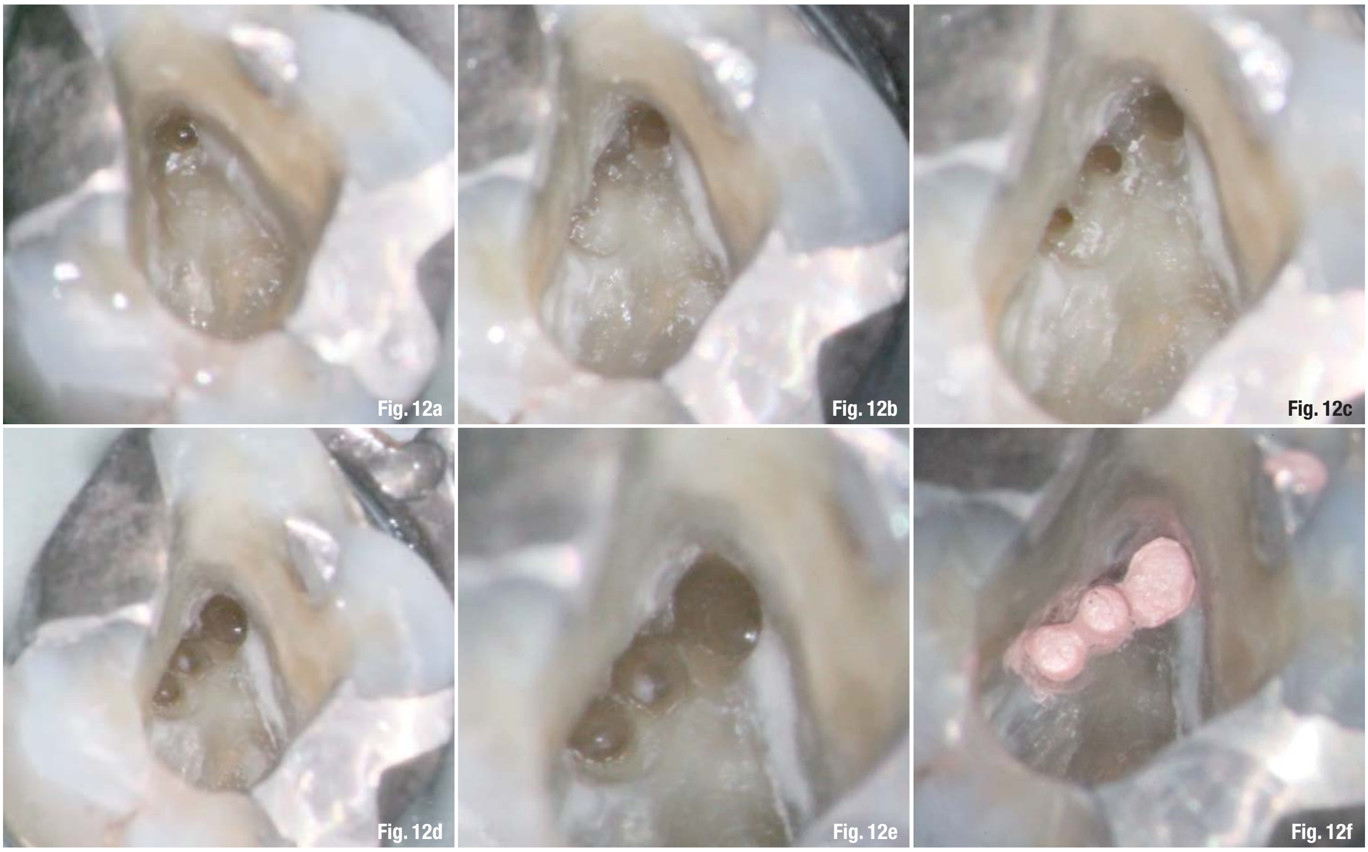
Fig. 11

Fig. 8_Scout-*RaCe* files are extremely flexible because of their small 0.02 taper. Note that these files will not remove dentine from the coronal part of the canal and will mostly create apical enlargement.

Fig. 9_Clinical case of a maxillary premolar with a severe curvature.

Fig. 10_*RaCe* ISO 10 files will remove mostly the coronal and middle part of the canal (green arrows). The tip for the #10.04 and 10.06 files will work freely (red arrows) after the #10.02 has reached the WL.

Fig. 11_Clinical case of a maxillary molar with a severe curvature and obliterated MB canals. The *RaCe* ISO 10 files have enough rigidity to move through the obliteration while retaining the curvature of the canal. Coronal space is produced because of the increasing taper of the files.



2. Irrigate with NaOCl.
3. With gentle strokes at 900 to 1,000 rpm, widen the canal to WL with the #10.02 and 10.04 instruments. If necessary, continue with the #10.06 file at 600 rpm.
4. Irrigate the canals with NaOCl between files and clean the files if used for more than four strokes. Use the #15 K-file to obtain a smooth glide path and confirm the WL with an EAL.
5. Continue with the main NiTi sequence (Bio*RaCe*, Sequence files, etc.; Fig. 9).

_Conclusion

Scout-*RaCe* and *RaCe* ISO 10 NiTi rotary files offer the following advantages over SS files for attaining initial flaring and glide path:

_improved speed and efficiency;
_less initial canal transportation in both experienced and non-experienced hands;
_predictable patency;
_limits the need for the initial use of multiple SS files in constricted and severely curved canals;
makes severely and double-curved canals predictable for the traditional NiTi instruments that follow.

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

Fig. 12_Clinical images of the access cavity of the case presented in Figure 11, taken through an operating microscope. All three MB canals were obliterated. Pre-op preparation, only the MB1 canal is visible (a). Initial preparation of the MB1 canal with *RaCe* ISO 10 files and after having troughed with ultrasound over the other MB canals (b). Following preparation of all three MB canals with all *RaCe* ISO 10 files (c). Following preparation of all canals with Bio*RaCe* NiTi files to #40.04 (BR5; d). Close-up following complete preparation (e). All three MB canals obturated (f). The final X-ray is shown in Figure 11.

_about the authors

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Dr Debelian received his DMD degree from the University of São Paulo, Brazil, in 1987. He completed his specialisation in Endodontics at the University of Pennsylvania, Philadelphia, USA, in 1991. He completed his PhD studies at the University of Oslo in 1997. He is an adjunct visiting professor in the postgraduate programmes in Endodontics at the University of North Carolina at Chapel Hill and the University of Pennsylvania. Dr Debelian maintains a private specialist endodontics practice in Bekkestua, Norway.

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