

SAF SYSTEM




ReDentNOVA
Minimally Invasive Endodontics

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SAF - Self Adjusting File

The SAF is a hollow file designed as an elastically compressible, thin-walled pointed cylinder, composed of a thin nickel-titanium lattice.

The SAF is used as a single instrument to achieve complete 3D root canal shaping and cleaning.

The SAF is available in three standard lengths:

21 mm, 25 mm and 31 mm

and two diameters: **1.5 and 2 mm**.

The SAF 1.5 mm is designed for canals with initial apical size of ISO 20-40.

The SAF 2 mm is designed for use in wider canals, with initial apical size of ISO 35-60, commonly found in retreatments, upper incisors, canines & younger patients.



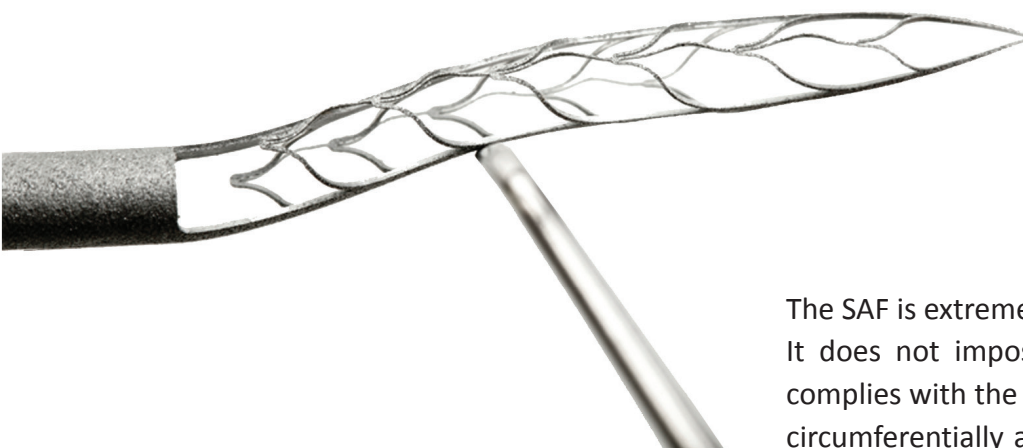
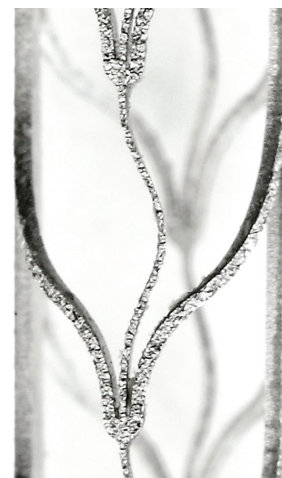
SAF 1.5 mm

SAF 2 mm

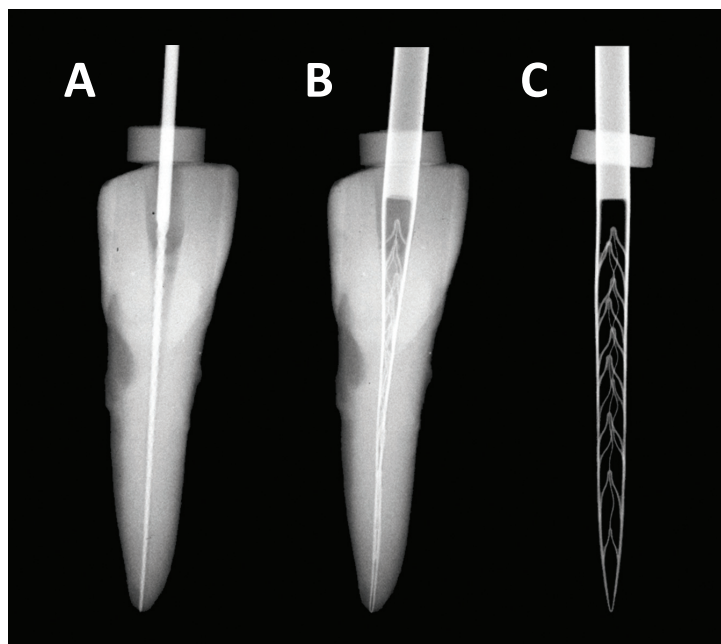
Mode of Operation

Attempting to expand, the SAF applies light continuous pressure along the entire circumference of the root canal wall.

Operated with a gentle vertical vibration (0.4 mm, 5,000 rpm), the abrasive surface of the file achieves a gradual enlargement of the root canal.



The SAF is extremely flexible and compressible. It does not impose its shape on the canal but rather complies with the canal's original shape. This is true both circumferentially and longitudinally. The long axis of the canal is kept in its original place.



The hollow design enables the SAF to be elastically compressed along its cross-section, as shown in the following image.

- (A) #20 K file inserted into a canal.
- (B) SAF in the same canal.
- (C) SAF at free state.

RDT3 Handpiece Head

The RDT3 handpiece head provides the SAF with a 0.4 mm impact movement and up to 5,000 rpm drive speed required for performing endodontic treatment. Low torque rotation motion is integrated in order to ease the insertion of the file into the root canal.

The RDT3 head was designed to sustain prolonged exposure to sodium hypochlorite.



RDT3-NX

X-Smart / EndoMate / EndoSequence



RDT3-NX NSK

Incl. WaveOne / Reciproc



RDT3 KaVo

Incl. WaveOne / Reciproc

RDT3 head compatibility list:

Kavo INTRA surgical 3620 N (1:1)
Kavo INTRA surgical 3624 N (4:1)
Kavo 20K (1:1)
Kavo 20LP GENTLEpower LUX (1:1)
Kavo 7LP GENTLEpower LUX (2.7:1)
Kavo 29LP GENTLEpower LUX (7.4:1)
Osada CS-132 (1:1)
Osada CS-031 (2.7:1)
Osada CS-032 (7.4:1)
MK-Dent LS2011 (1:1)
CHIRANA 120L (1:1)

RDT3-NX head compatibility list:

NSK low-speed EC C100-008 (1:1)
X-Smart (Tulsa Dentsply)*
EndoMate DT (NSK)*
EndoMate TC (NSK)*
EndoMate TC2 (NSK)*
EndoSequence (Brassler)*
EndoSequence II (Brassler)*

*** Adaptor needed: NSK FC C873 Direct drive (1:1) quick-coupling**



VATEA Irrigation System

No pressure irrigation

The VATEA is an irrigation system with an integral pump that can be adjusted to different flow rates (1-10 ml/min).

The SAF's hollow design allows for continuous irrigation of the root canal through its lumen.

The endodontic file's movement within the canal helps to continuously exchange the irrigation solution throughout the procedure by its agitation.



Self contained portable system

The VATEA irrigation system is portable and operates on either electrical power or rechargeable batteries that can provide up to 4 hours of work when fully charged.

The VATEA has the capacity to store 400 ml of fluid.

Irrigation is toggled using a foot pedal.



Product description

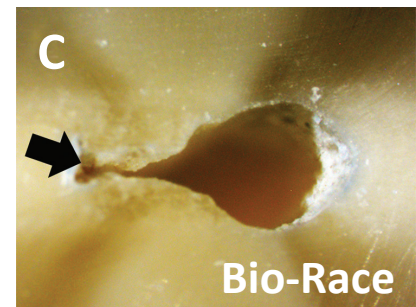
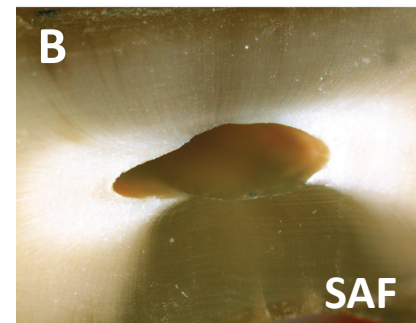
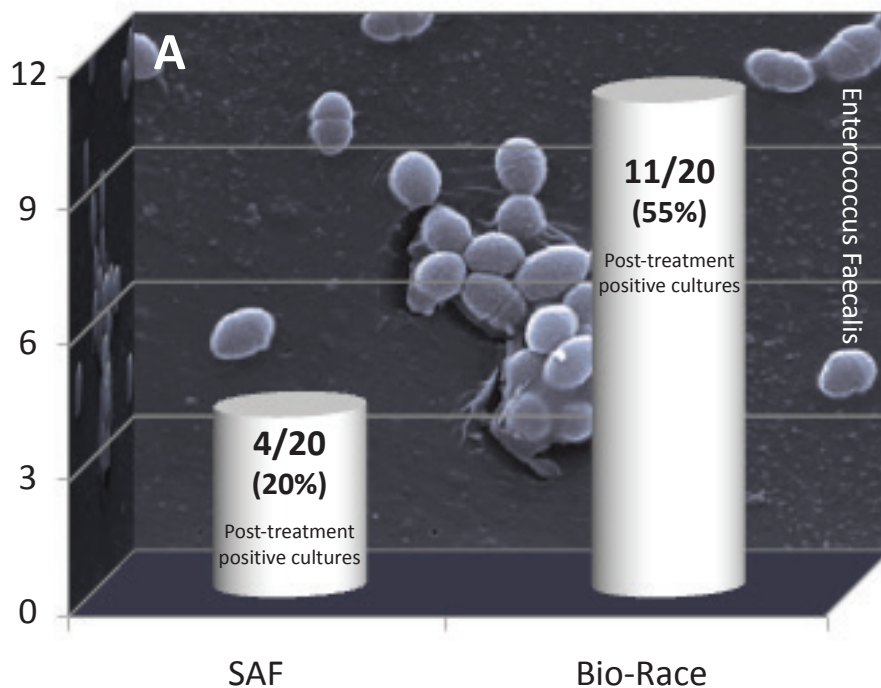
A positive displacement peristaltic pump prevents fluid retraction which could result in patient cross-contamination.

User interface includes two control buttons to adjust the flow rate, a large LCD screen, and an integral time indication.

The VATEA is supplied with an A/C adapter to recharge the battery pack and disposable silicon tubes.

Microbiological Analysis

Comparing ability to disinfect oval-shaped root canals:
Self-adjusting file versus rotary instruments



* Images courtesy of Prof. José F. Siqueira

A recent independent study by Prof. Jose Siqueira from Estácio de Sá University, Brazil, indicated that in oval canals the SAF SYSTEM was found superior to rotary Ni-Ti files used with needle irrigation (NaOCl).

(A) 55% of the canals treated with the rotary files still resulted in positive cultures after 10 minutes of operation.
Only 20% of the canals that were treated using SAF for 5 minutes resulted in such cultures.

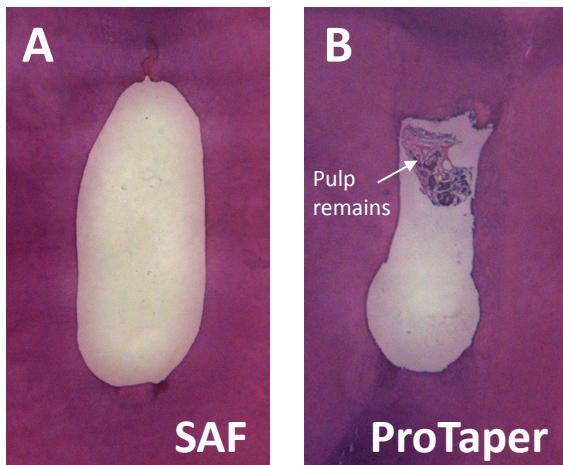
(B) Cross-section of oval canal instrumented using SAF.

(C) Cross-section of oval canal instrumented using rotary files (Bio-Race).
Note the uninstrumented area (arrow).

* Adapted from Siqueira et al, *J Endod* 2010; 36:1860-65

Histological Analysis

Preparation of oval canals - Remaining pulp tissue



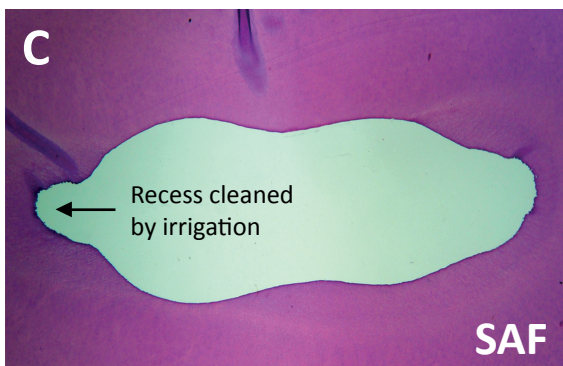
A histological analysis comparing SAF vs. rotary instrumentation of canals with oval cross-sections.

(A) SAF preparation; (B) ProTaper preparation

Note the typical “key-hole” appearance (lower part) of oval canals instrumented using rotary files (B).

Also note how the **SAF preparation (A) is uniform and clean of pulp tissue**, whereas the rotary preparation (B) left remaining pulp tissue in the uninstrumented area (arrow).

Cleaning recess areas

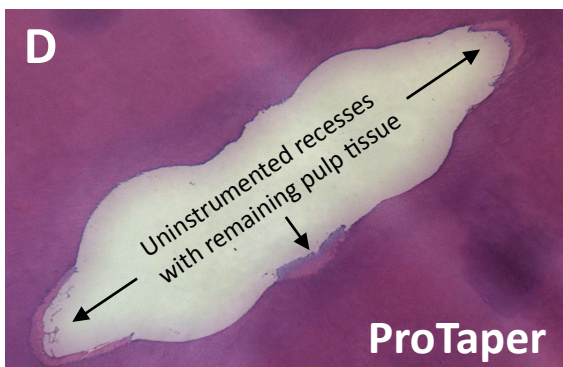


A histological analysis comparing SAF vs. rotary instrumentation of canals with recess areas.

(C) SAF preparation; (D) ProTaper preparation

Recess areas are nearly impossible to instrument, therefore a chemomechanical approach is necessary to effectively clean them from remaining pulp tissue and calcified debris.

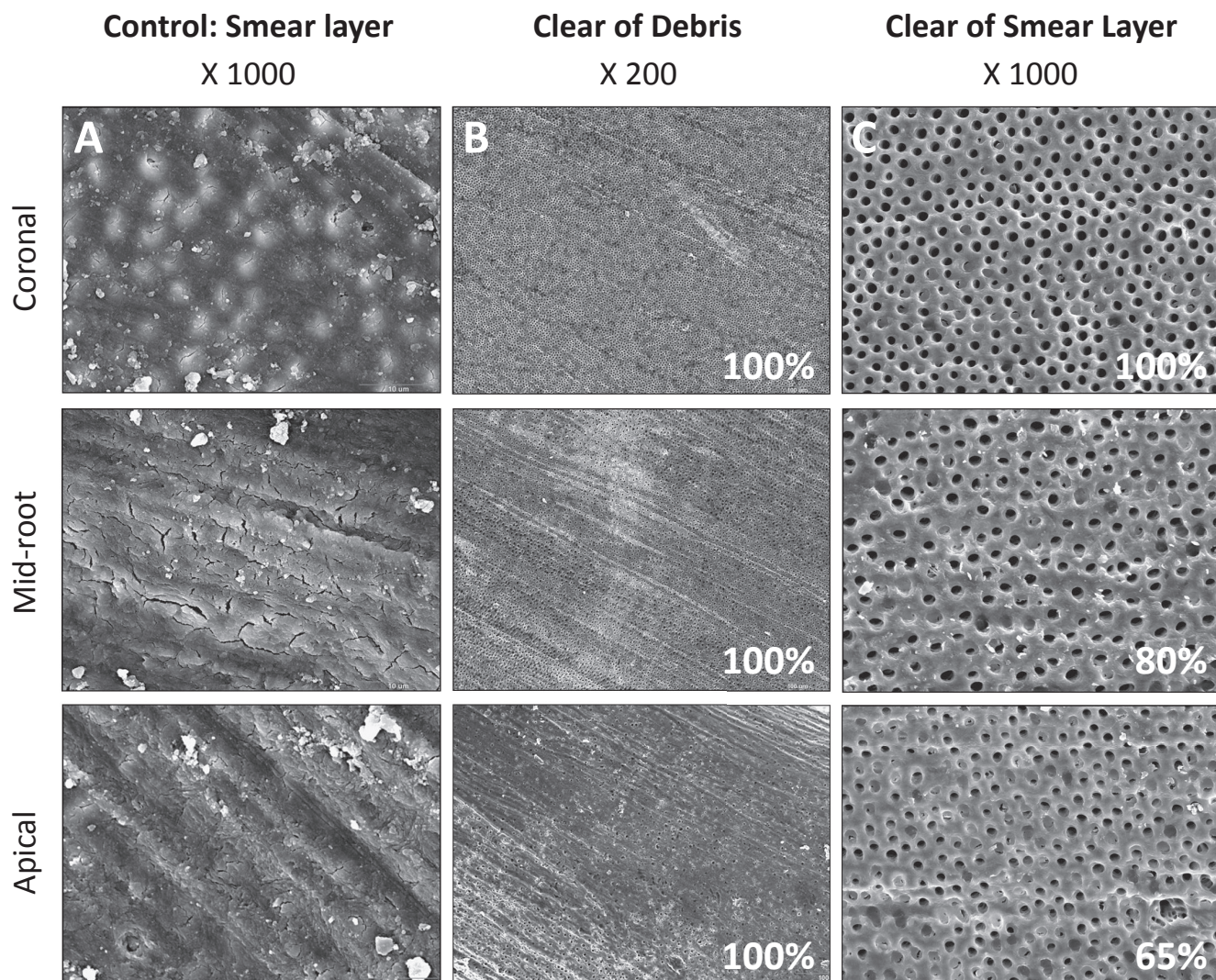
Note how **SAF instrumentation combined with continuous sodium-hypochlorite irrigation is able to efficiently clean even recess areas**.



Results

There was significantly greater residual pulp tissue left after ProTaper system instrumentation versus SAF instrumentation (21.4% vs 9.3%, $P < .05$).

SEM Analysis



Evaluation of root canal wall cleanliness using scanning electron microscopy (SEM):

The SAF operation with a continuous flow of irrigants (sodium-hypochlorite and EDTA), results in root canals **free of debris and almost free of smear layer**.

(A) Positive Control: smear layer and debris in all parts of the root canal.

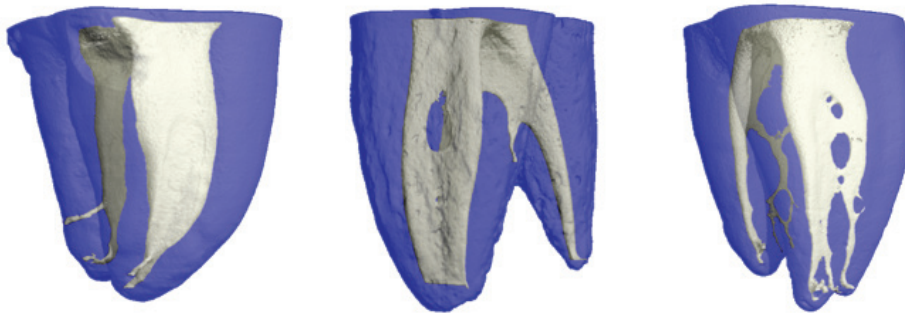
(B) Root canal following SAF instrumentation: no debris in any part of the root canal.

(C) Root canal following SAF instrumentation: no smear layer in any part of the root canal.

* Adapted from Metzger et al, *J Endod* 2010 Apr;36(4):697-702

Micro-CT Analysis

Root canal anatomy



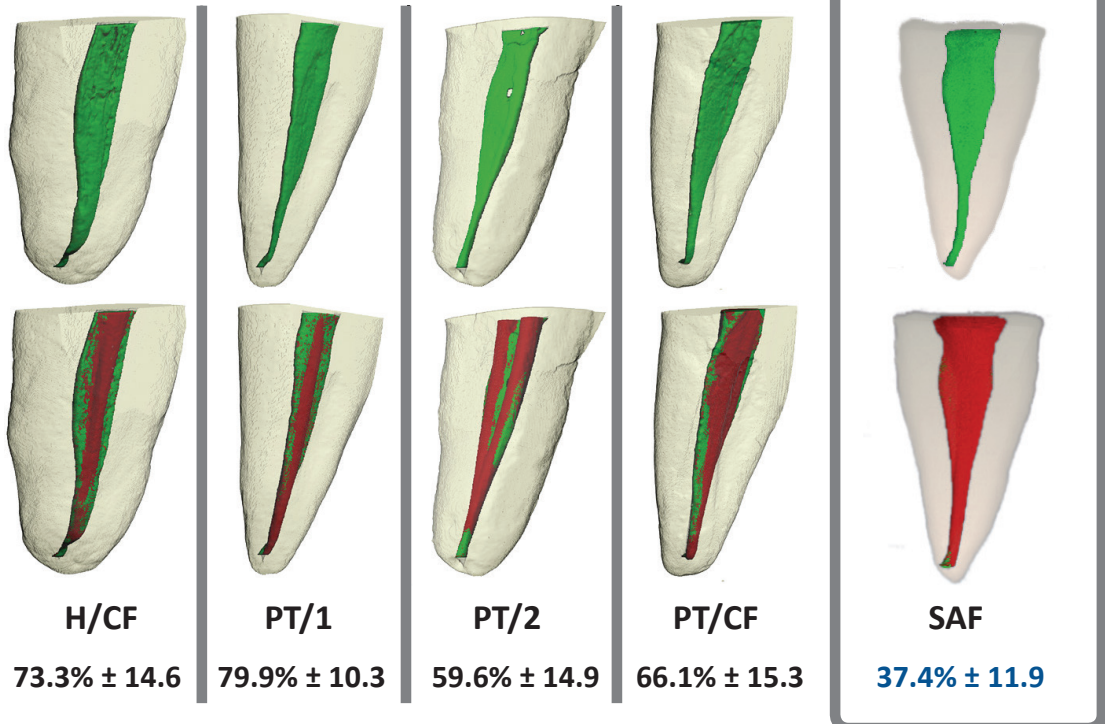
Data from μ CT Scans (3D X-ray).
Note the irregular canal systems typical to lower molars.

Preparation of oval-shaped root canals

μ CT analysis: SAF vs. rotary files - distal root of mandibular molars.

Green:
Preoperative surfaces

Red:
Postoperative surfaces



- * H/CF - Treated in circumferential filing motion using **Hedström** files #40
- * PT/1 - Treated as a single canal using **ProTaper** #F4
- * PT/2 - Treated as two canals using **ProTaper** #F4
- * PT/CF - Treated in circumferential filing motion using **ProTaper** #F4
- ** SAF - Treated with **SAF**

* Adapted from Paqué et al, *J Endod* 2011;37:517–521, ** *J Endod* 2010;36:703–707

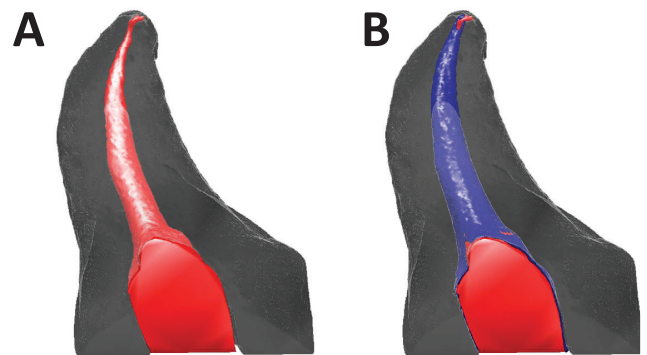
Preparation of curved canals

A μ CT analysis of SAF instrumentation in a palatal root of a maxillary molar with a curved root canal morphology.

Red: Before treatment (A)

Blue: After treatment (B)

Note how the long axis of **the canal is kept in its original place and a high ratio of canal wall treated.**



Adaptation to challenging root canal morphologies

A μ CT analysis of SAF instrumentation in a first mandibular molar with extreme root canal anatomy.

(C) Two views presenting a curved flat canal with a mesial, spoon-shaped concavity reconstructed from μ CT.

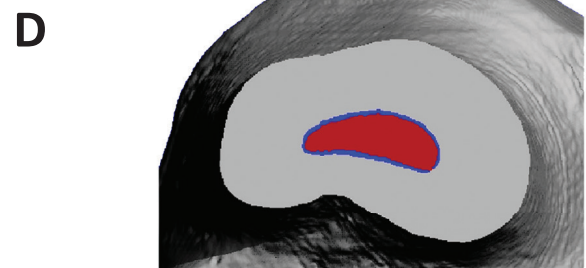
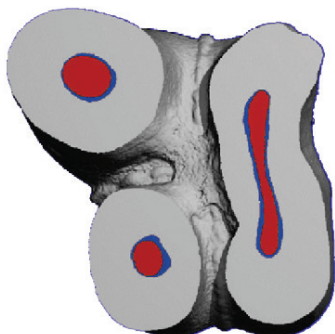
(D) Cross-section at 6 mm from the apex.



Additional Case:

Distal root of lower molar, presenting a flat oval cross-section.

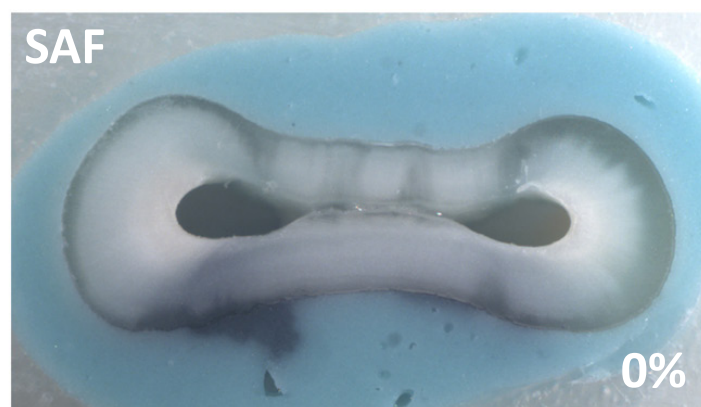
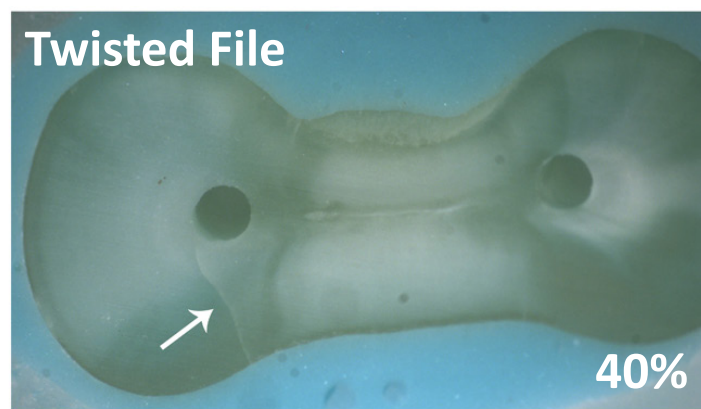
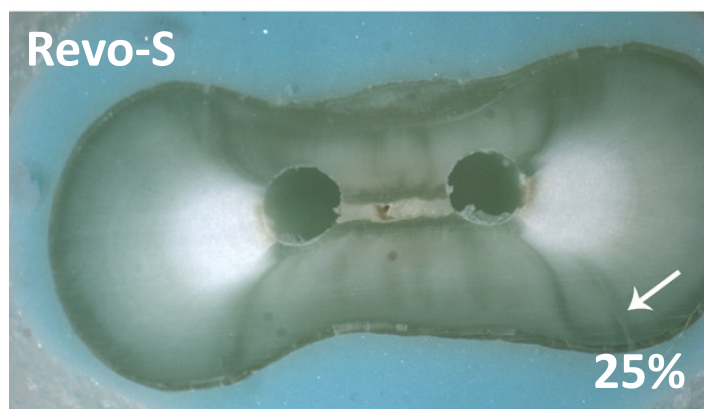
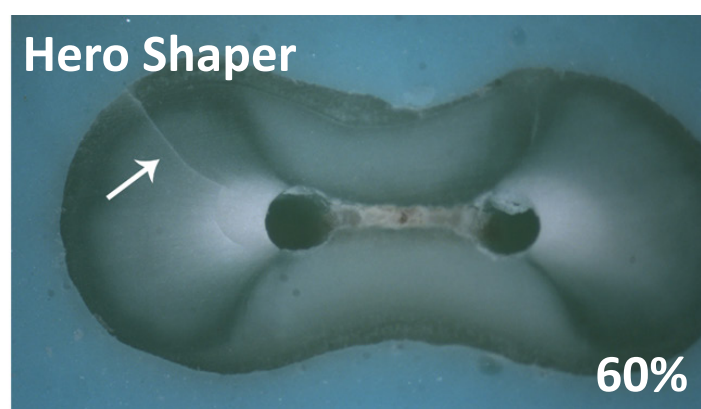
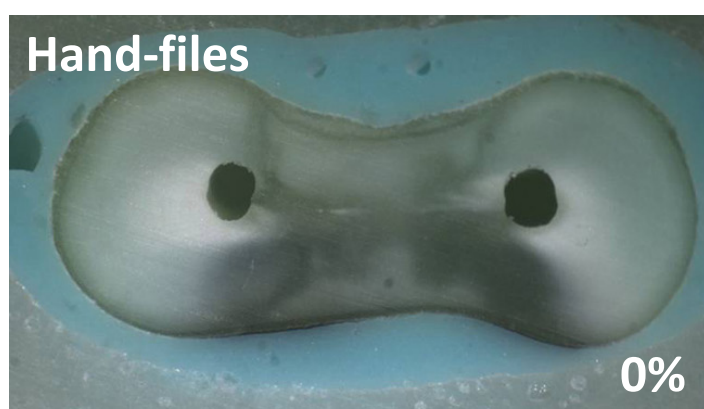
Note how **the file adapted itself and removed a uniform layer of dentin** along the cross-section of the root canal.



No Micro-cracks Formation

Dentinal Microcrack Formation during Root Canal Preparations by Different NiTi Rotary Instruments and the Self-Adjusting File

Conclusion: "...NiTi instruments tend to induce various degrees of dentinal damage during root canal preparation. On the other hand, the SAF file and hand instrumentation present satisfactory results with no microcrack defects."



Root Canal Obturation

The quality of root canal preparation and root canal obturation in canals treated with rotaray versus self-adjusting files

μCT analysis

Three-dimensionally reconstructed μCT images of root canal preparation and obturation.

(A) A flat root canal prepared with the SAF file.

(B) A flat root canal prepared with a rotary file.

(C) A good root canal filling adaptation with **98.1% of the canal wall in contact with the root canal filling material.**

(D) A poor root canal filling adaptation with only 68.9% of the root canal wall in contact with the root canal filling material.

Red: root canal surface before treatment

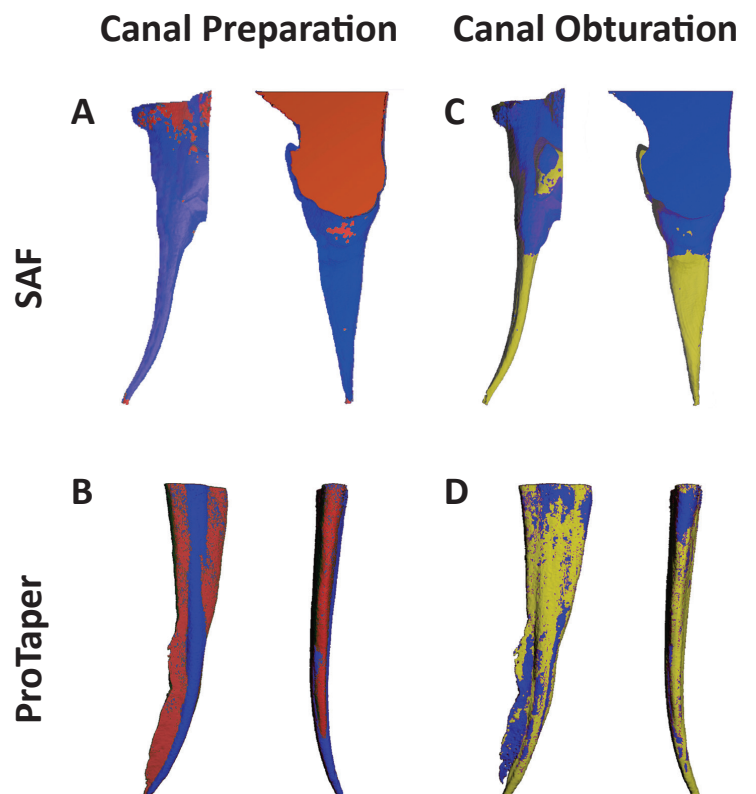
Blue: root canal surface post-treatment

Yellow: area touched by the root canal filling

Right: buccal view

Left: distal view

(resolution = 18 μm)



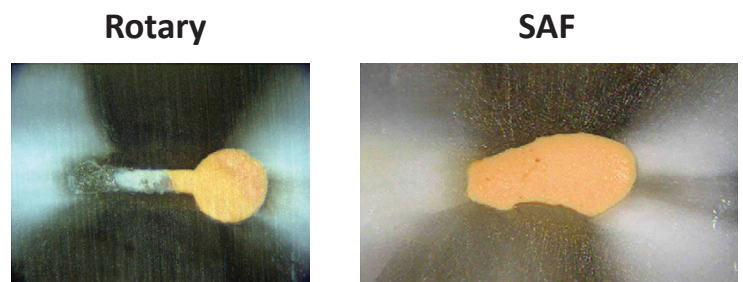
* Adapted from Metzger et al, J Endod 2010; 36:1569-73

Cross-sections

Cross-sections at 4 mm from the apex.

Note the untreated recess full of debris at the rotary-prepared canal, that prevented the flow of the gutta-percha and sealer.

In the SAF-prepared flat root canal, the entire circumference of the canal was prepared, thus allowing **root canal filling penetration into the buccal and lingual areas of the canal.**



* Adapted from Metzger et al, J Endod 2010;36:679-690

Clinical Cases

Root canal treatment of 1st mandibular molar with 4 canals



Note penetration of obturation material into clean lateral canal and isthmus area (arrows).

* Case courtesy of Dr. Michael Solomonov, Tel-Aviv, Israel.

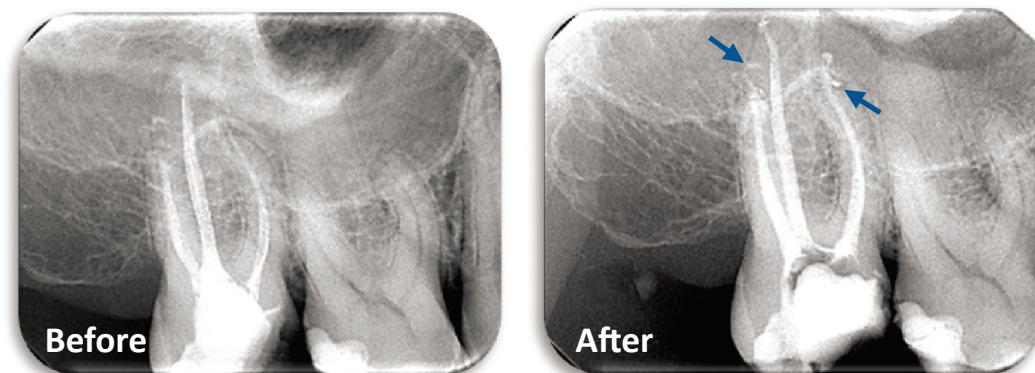
Root canal treatment of 2nd mandibular molar



Note penetration of obturation material into clean lateral canal in a mesial root with an oval cross-section (arrows) .

* Case courtesy of Dr. Michael Solomonov, Tel-Aviv, Israel.

Root canal re-treatment of 2nd maxillary molar



Note how the S-shaped curvatures of the canals are preserved (arrows) .

* Case courtesy of Dr. Martin Levin, Chevy Chase, Maryland, USA.

Product List



- SAF 1.5 / 21 mm - 1.5162112100 (10 pack)
1.5162112030 (3 pack)
- SAF 1.5 / 25 mm - 1.5182512100 (10 pack)
1.5182512030 (3 pack)
- SAF 1.5 / 31 mm - 1.5213112100 (10 pack)
1.5213112030 (3 pack)
- SAF 2.0 / 21 mm - 2.0162115100 (10 pack)
2.0162115030 (3 pack)
- SAF 2.0 / 25 mm - 2.0182515100 (10 pack)
2.0182515030 (3 pack)



**RDT3-NX NSK
Compatible**
NX30016600



**RDT3 KaVo
Compatible**
AS30016600



Endodontic Training Model
Curved canal with oval cross-section
EN-300-168-00



VATEA Irrigation System
AD-702-010-010



Foot Pedal
RDN-MCH0035



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