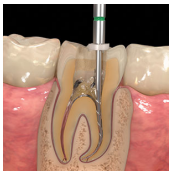
Rotary endodontics and latest advances

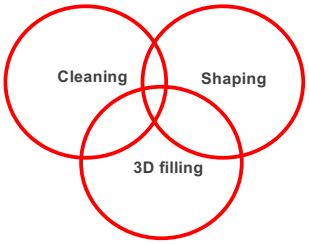


Dr. Saaid Al Shehadat

Year4
17/9/2019

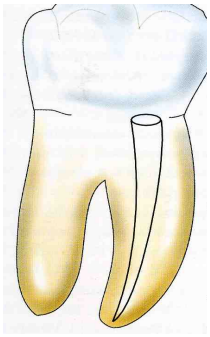
Main concept in root canal treatment

Success depends upon the entire cleaning and shaping of the canal system prior to do the 3D filling of the canal



Root canal preparation

Finally leads to a clean and disinfected canal with a continuously tapering conical shape



Techniques of cleaning and shaping

I
- Apical coronal techniques
  - standardized technique
  - step – back technique

II
- Coronal – apical technique
  - step down technique
  - crown down pressureless technique

III
- Double flare / hybrid technique

IV
- Balanced force technique

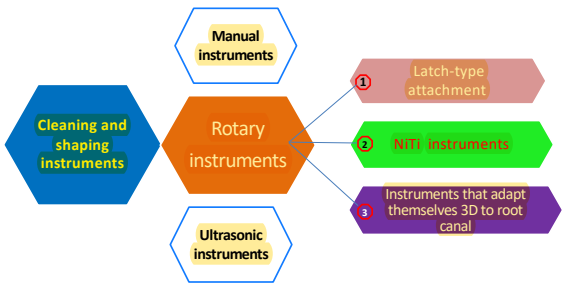
V
- Endosonics

VI
- Lasers

VII
- Non instrumentation technique (NIT)

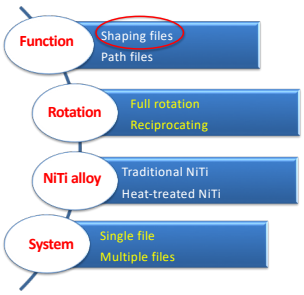
PRIYANK PAREEK

Classification of Instruments Used for Cleaning and Shaping the Root Canal



Modified from Cohen's *Pathways of the Pulp*. 10th edition, 2011

NiTi Rotary Instrumentations



Types of rotary system available in market

- **Profile,** Dentsply Tulsa Dental Specialist
- **Profile GT,** Dentsply Tulsa Dental Specialist
- **Protaper,** Dentsply Tulsa Dental Specialist
- **BT RaCe,** FKG Dentaire
- **M2 R system,** VDW GmbH
- **FlexMaster,** VDW GmbH
- **Revo S,** MEDIDENTA
- **Hero Shaper,** Mico- Mega
- **Hero 642,** Micro- Mega
- **K3,** SybronEndo
- **Twisted files,** SybronEndo
- **Quantec SC,** SybronEndo
- **Quantec LX,** SybronEndo
- **FlexiCON,** FlexconeTM
- **WaveOne,** Dentsply
- **WaveOne Gold,** Dentsply
- **Reciproc,** VDW
- **Reciproc Blue,** VDW
- **TruAnatomy,** Dentsply Sirona
- **One Shape,** Mico- Mega
- **Two Shape,** Mico- Mega
- **One Curve,** Mico- Mega
- **Fanta,** Dental Materials

NiTi Rotary Instrumentations

Similarity

1- NiTi alloys

2- Needs specific engine motor

3- rotation

4- Crown-down technique

5- Primary design

Difference (Design)

All NiTi Instruments are:
- Made from alloy
- Require engine motor (hand piece)
- Follow same rotation (full/reciprocating)
- Use the Crown-down technique

Similarity

NiTi alloys

Traditional alloy

(Nitinol 55%, Nitinol 60%)

Recently

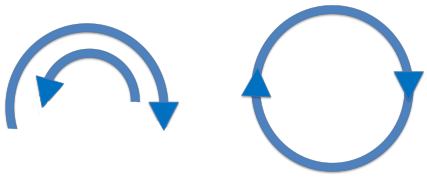
Heat-treated alloys

Increase flexibility

Increase resistance to cyclic fatigue

Similarity

Motion



Reciprocation **Rotary**

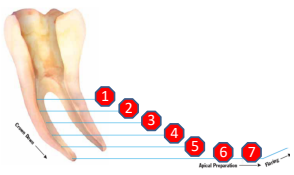
Similarity

Slow-speed and controlled torque motor (torque: 2-4 N.cm, speed:)

Instruments	r.p.m. recommended
Profile	150 to 300
ProTaper	150 to 350
HERO	300-600
Race	Up to 600
FlexMaster	280 (150 to 300)
Sequence	500- 600
Twisted File	500

Similarity

The technique for use is crown-down, with copious irrigation.

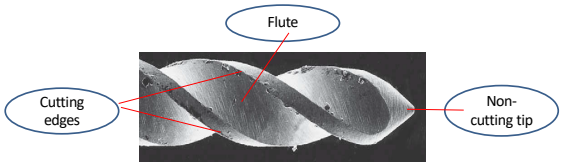


Similarity

Primary design

4- Usually non-cutting safe tips

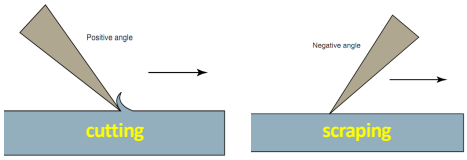
5- The working part consists of cutting edges (sharp edges or radial lands) and flutes



Similarity

Action

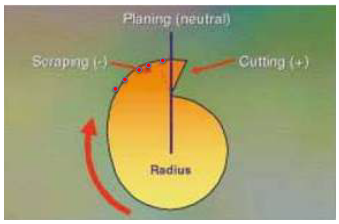
The angle formed by the cutting edge and the surface to be cut is either positive (cutting) or negative (scraping)



Similarity

Rake angle

The angle formed by the cutting edge and the surface to be cut is either positive (cutting) or negative (scraping)



Differences

Different

- Sizes
- Tapers
- Cross-section design
- Tip design
- Rake angle
- Number of spirals/mm
- Helical angles
- Others

- **Increase:**

Flexibility, resistance to cyclic fatigue, resistance to torsional fatigue, cutting efficiency, removal of debris coronally..

- **Decrease:**

Thread tendency, Extrusion of debris out of apex, canal transportation, number of files in the system ...

Sizes

ISO system

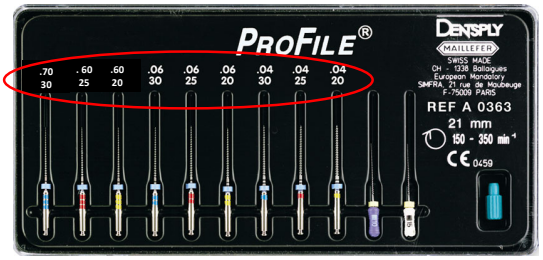
The number indicates the diameter of the file tip

File #30 ⟷ Tip diameter = 0.30 ⟷ D0 =0.30 mm

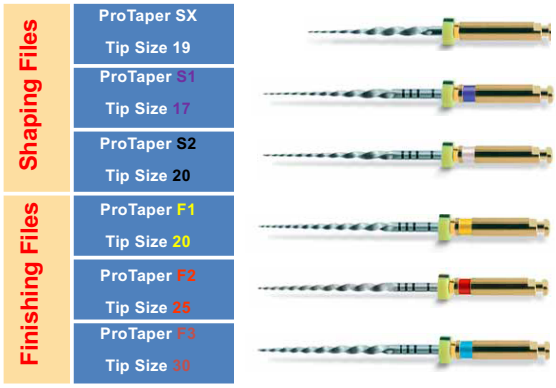
10-15-20-25-30-35-40-45-50-55-60…70-80…

Protaper System:
[Shaping Files] S(X) = 19, S(1) = 17, S(2) = 20
[Finishing Files] F(1) = 20, F(2)= 25, F(3)= 30

Sizes



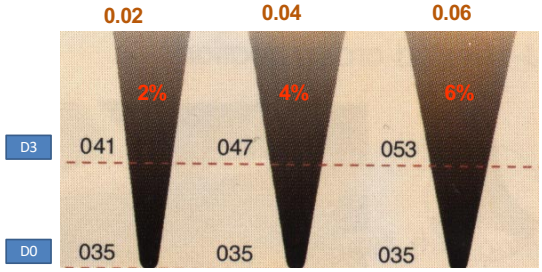
ProTaper System



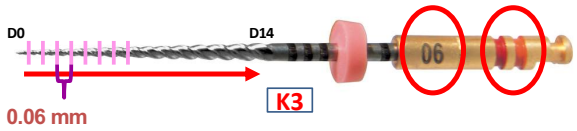
Taper

File taper: The increase in the file diameter for every mm of length between D0 and D16

in Rotary it's D14



Taper

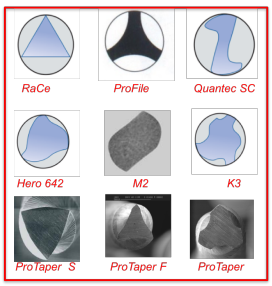


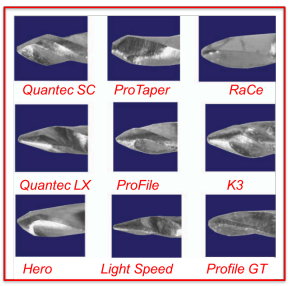
0.06 mm

Taper

SX 9
S1 12
S2 9
F1 reverse tapers
F2 reverse tapers
F3 reverse tapers

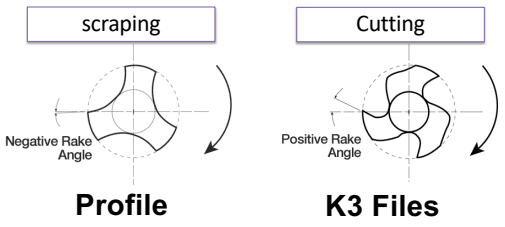
Cross- section & Tip Design





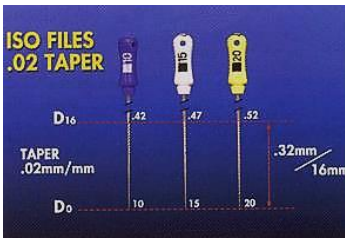
Cohen's *Pathways of the pulp*. 10th edition, 2011

Cross- section & Tip Design



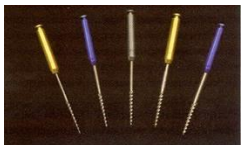
Length of cutting blades

- Blade/cutting edge length:
  16mm (manual), 14 mm (rotary)

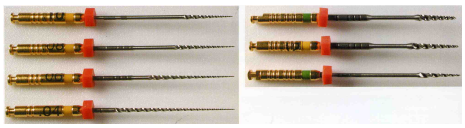


Length of cutting blades

OS ProFile length: 9mm

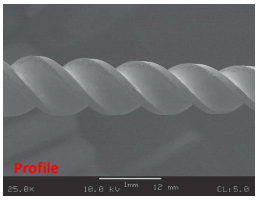


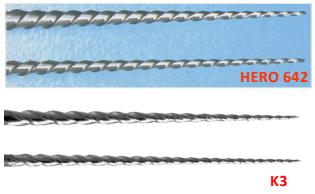
Prosystem GT



Number of spirals

The number of flute spirals is reduced to prevent excessive torque which results from the accumulation of debris

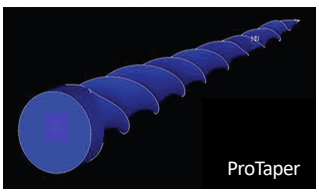




Cohen's *Pathways of the pulp*. 10th edition, 2011

Thread Tendency

Because they have helical leading edges in their design, rotary NiTi files have tendency to thread into the root canals



Number of files in the system

ProFile Vortex
Dentsplay

K3
SybronEndo

2-Shape
Micro Mega

XP Endo Shaper
FKG

One Curve
Micro Mega

NiTi Rotary Systems

Advantages

1. Fast save time and efforts
2. Fewer instruments required to achieve the desired shape
3. A continuously tapering conical shape is automatically achieved
4. No perforation apex transportation and zipping
5. Results in less straightening and better centered preparations curved root canals

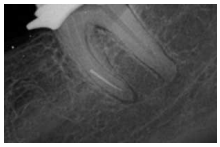
NiTi Rotary Systems

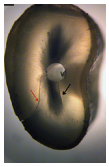
Disadvantages

1- Have an increased risk of fracture compared with K-files

2- May create micro-cracks in the radicular dentin

3- Negotiation with narrow curved canals is difficult and dangerous especially when the canal is double curved



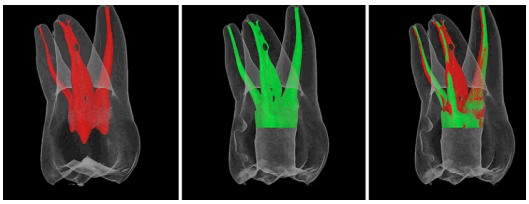


NiTi Rotary Systems

Disadvantages

4- Does not result in complete cleanliness of oval/ wide root canal

5- Expensive

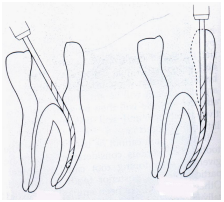


preoperative postoperative superimposition

NiTi Rotary Systems

Clinical Procedures

Open pulp chamber and obtain the straight line access if possible



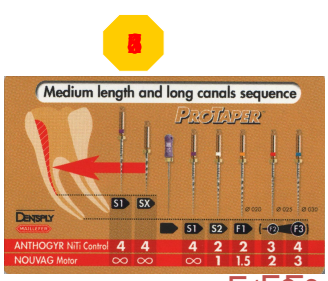
ProTaper System

Shaping Files	ProTaper SX Tip Size 19	
	ProTaper S1 Tip Size 17	
	ProTaper S2 Tip Size 20	
Finishing Files	ProTaper F1 Tip Size 20	
	ProTaper F2 Tip Size 25	
	ProTaper F3 Tip Size 30	

ProTaper System

ProTaper System

Basic Sequence in ProTaper system



S1 SX S2 F1 F2 F3

Actual WL determentation

ProTaper System

Adjustments in ProTaper System

F4 and F5 were later introduced

F4

Tip size:40

Taper (first mm) 6%

F5

Tip size:50

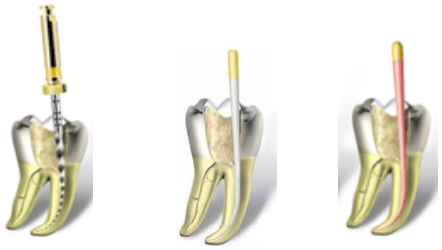
Taper (first mm) 5%

NiTi Rotary Systems

Clinical Procedures

- Use EDTA, RC. Prep or any lubricant with each instrument
- Copious irrigation with sodium hypochlorite between instruments
- Each file will be used for only 5-10 seconds

ProTaper System

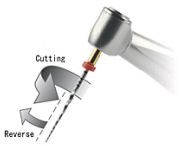


- Match the shape of finishing files, (sizes F1,F2,F3)

The WaveOne single-file reciprocating system

- SINGLE-use, SINGLE-file system

WaveOne, Dentsply



The WaveOne single-file reciprocating system

Why single use system?

To avoid the need of sterilization

- Single use has the advantage of reducing instrument fatigue
- Prions might be present in human dental pulp tissue

Letters 2005; Schneider et al., 2007

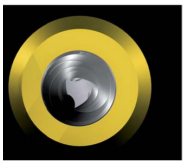
The WaveOne single-file reciprocating system

Three files in the WaveOne system?

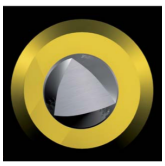
1) The Small file is used in fine canals
   tip size is ISO 21 taper of 6%
2) The Primary file for the majority of canals
   tip size is ISO 25/ taper ≤ 8%
3) The Large file for large canals
   tip size is ISO 40 /taper ≤ 8%

The WaveOne single-file reciprocating system

- improves the overall instrument flexibility
- Tips can follow canal curvature accurately

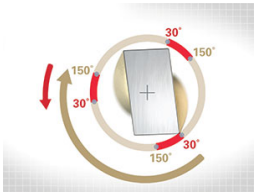


Modified convex triangular cross-section
(the tip end)



convex triangular cross-section
(the crown end)

The WaveOne single-file reciprocating system



WaveOne, Dentsply

WaveOne file selection and clinical procedure

The WaveOne technique stages

1. Preoperative X-ray, access cavity, scout the canals
2. Irrigation with 5% NaOCl and EDTA before, during and after single-file shaping
3. Select the suitable WaveOne file:
   - If a 10 K-file is very resistant to movement, use Small file
   - If a 10 K-file moves to length easily, is loose or very loose, use Primary file
   - If a 20 hand file or larger goes to length, use Large file

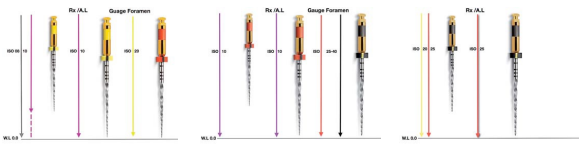
The WaveOne single-file reciprocating system

- The pre-programmed motor is set for reciprocation and speed for WaveOne

WaveOne file selection and clinical procedure

Shaping Technique

1. take hand file into canal and watch-wind to length or resistance
2. use WaveOne file to approximately two-thirds of canal length
3. irrigate copiously
4. take hand file to full W.L and confirm (apex locator/ radiograph
5. take WaveOne file to length

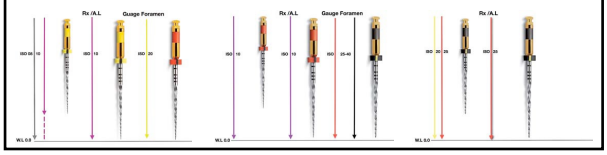


WaveOne file selection and clinical procedure

Shaping Technique

6. confirm foramen diameter with hand file the same size as WaveOne file (20, 25, or40); if snug, preparation is complete

7. if foramen diameter is larger than WaveOne file, consider the next larger WaveOne file



WaveOne file selection and clinical procedure

Tips for use

1- use WaveOne files with a progressive up and down movement no more than 3-4 times,

2. remove file regularly, wipe clean, irrigate and continue

3. in severely curved canals, complete apical preparation by hand if reproducible glide path is not possible

WaveOne file selection and clinical procedure

Obturation

- The WaveOne system includes matching paper points, guttapercha points and Thermafil WaveOne obturators

Cases from WaveOne company data sheet

WVC using Calamus Dual

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