

Rotary endodontics and latest advances

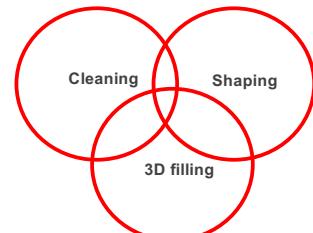


Dr. Saaid Al Shehadat

Year4
17/9/2019

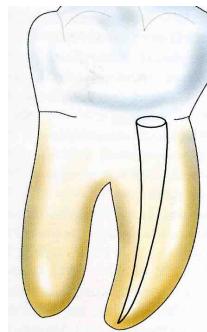
Main concept in root canal treatment

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

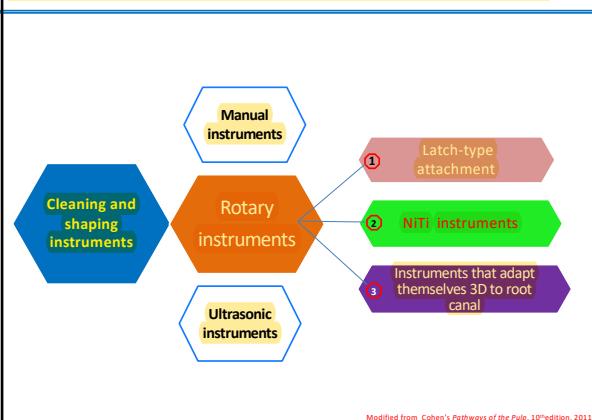


Techniques of cleaning and shaping

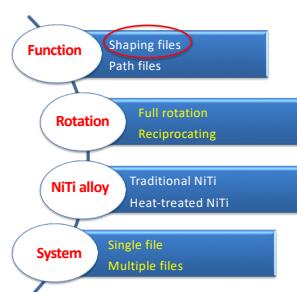
- I
 - Apical coronal techniques
 - standardized technique
 - step – back technique
- II
 - Coronal – apical technique
 - step down technique
 - crown down pressureless technique
- III
 - Double flare / hybrid technique
- IV
 - Balanced force technique
- V
 - Endosonics
- VI
 - Lasers
- VII
 - Non instrumentation technique (NIT)

PRIYANK PAREEK

Classification of Instruments Used for Cleaning and Shaping the Root Canal



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

All NiTi Instruments are:

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

Difference (Design)

Similarity

NiTi alloys

Traditional alloy
(Nitinol 55%, Nitinol 60%)

Recently

Heat-treated alloys

Increase flexibility

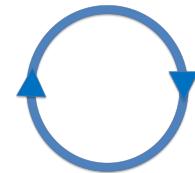
Increase resistance to cyclic fatigue

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.

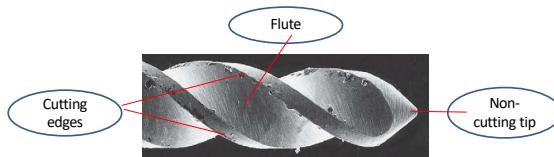


Similarity

Primary design

4- Usually non-cutting safe tips

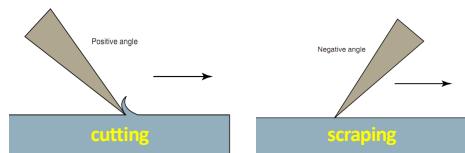
5- The working part consists of cutting edges (sharp edges or radial lands) and flutes



Similarity

Action

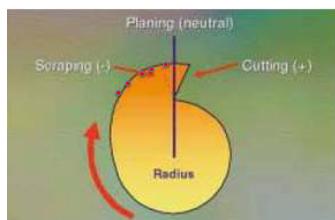
The angle formed by the cutting edge and the surface to be cut is either positive (cutting) or negative (scraping)



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 \longleftrightarrow Tip diameter = 0.30 \longleftrightarrow D₀ = 0.30 mm

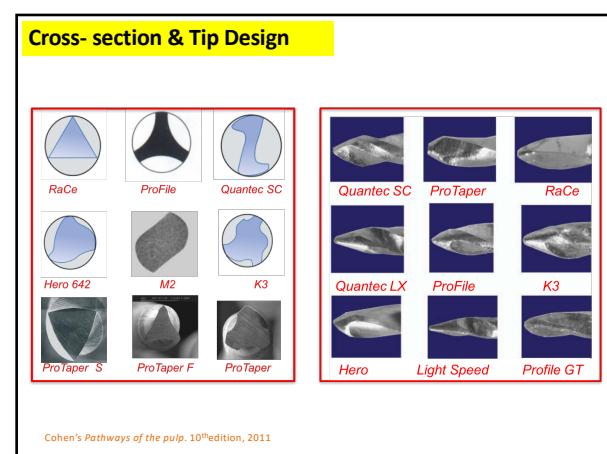
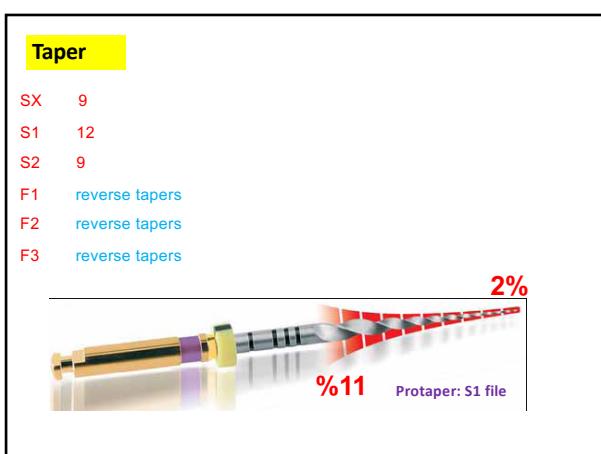
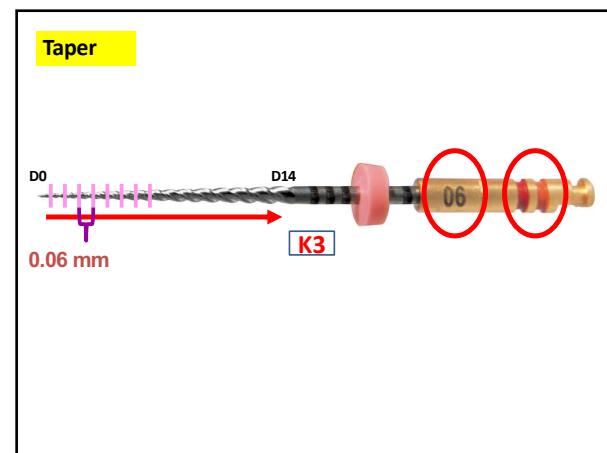
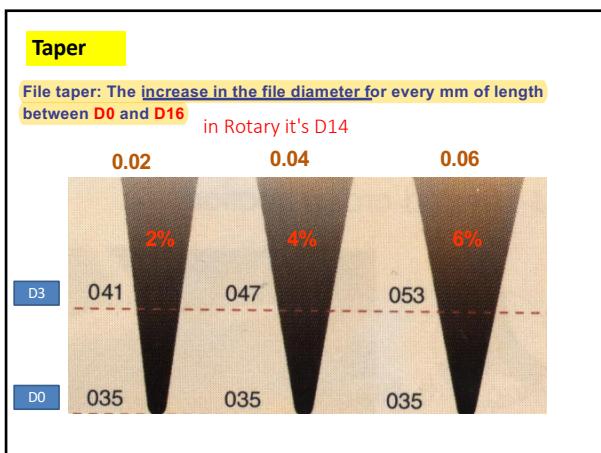
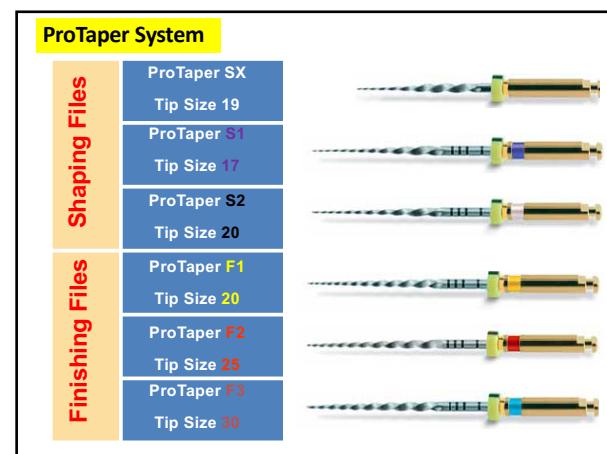


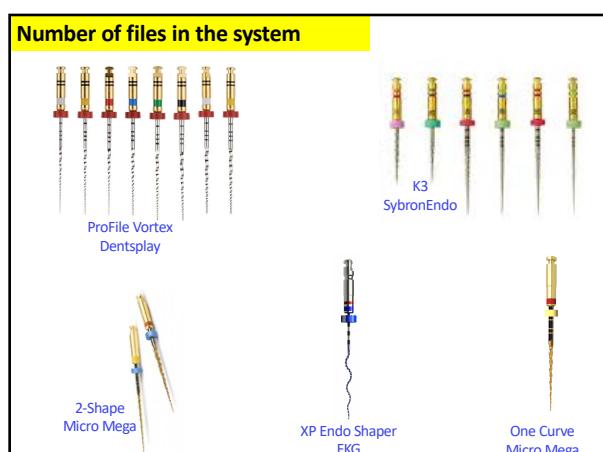
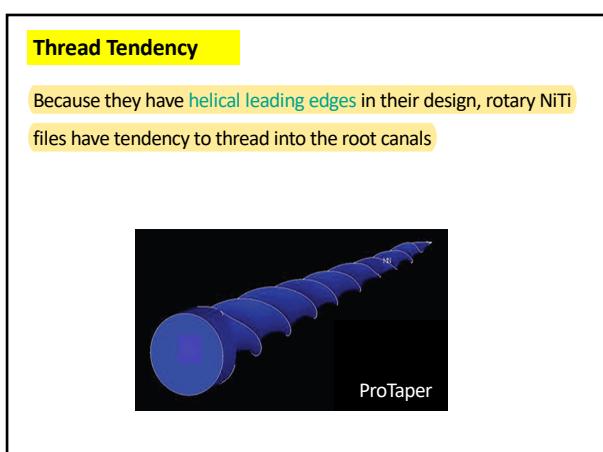
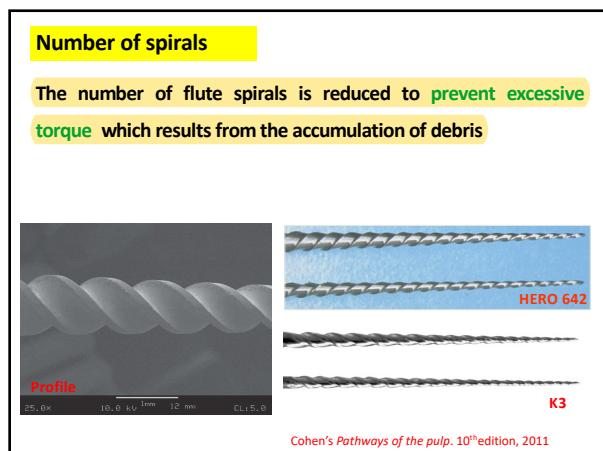
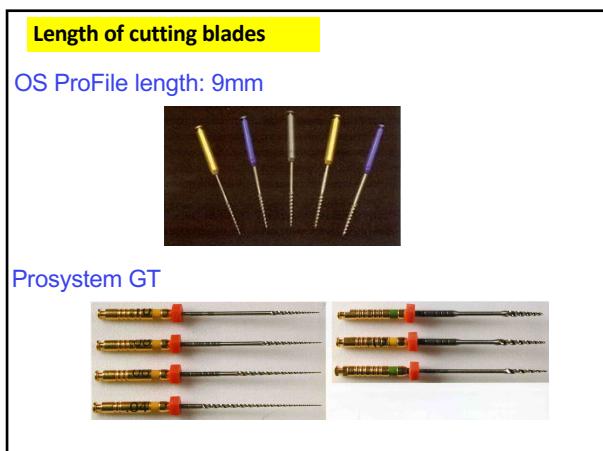
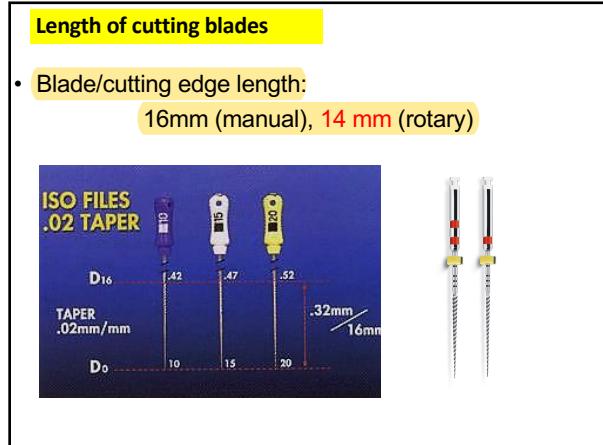
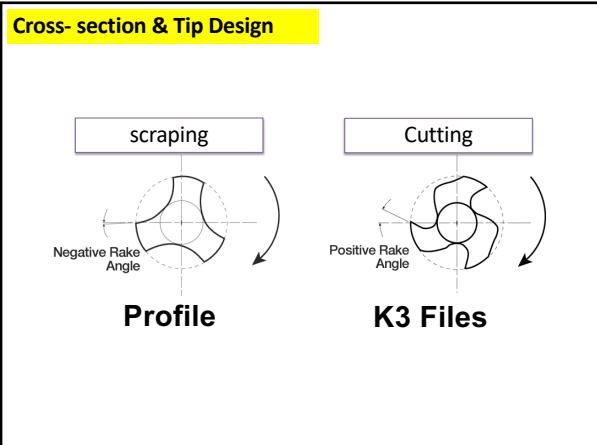
10-15-20-25-30-35-40-45-50-55-60...70-80...

Protaper System:

[Shaping Files] S(X) = 19, S(1) = 17, S(2) = 20

[Finishing Files] F(1) = 20, F(2) = 25, F(3) = 30

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



NiTi Rotary Systems

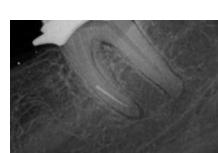
Advantages

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

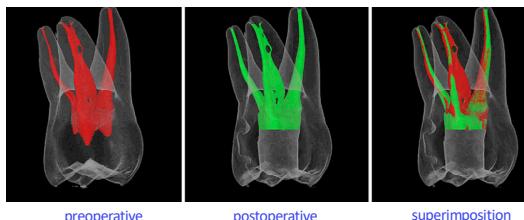
- 1- Have an increased **risk of fracture** compared with K-files
- 2- May create **micro-cracks** in the radicular dentin
- 3- Negotiation with narrow **curved canals** is difficult and dangerous especially when the canal is double curved



NiTi Rotary Systems

Disadvantages

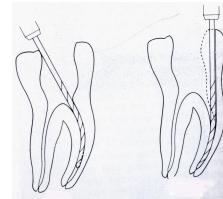
- 4- Does not result in complete cleanliness of **oval/ wide** root canal
- 5- **Expensive**



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 |
| ProTaper F1 | Tip Size 20 |
| ProTaper F2 | Tip Size 25 |
| ProTaper F3 | Tip Size 30 |

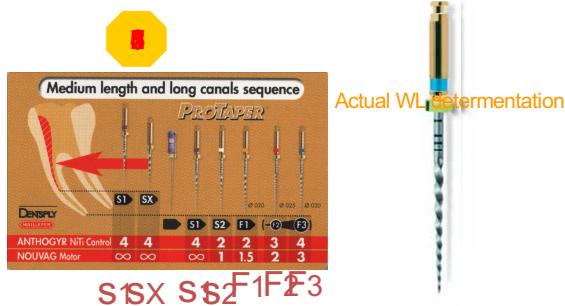


ProTaper System



ProTaper System

Basic Sequence in ProTaper system



ProTaper System

Adjustments in ProTaper System

F4 and F5 were later introduced



Taper (first mm) 6%
Taper (first mm) 5%

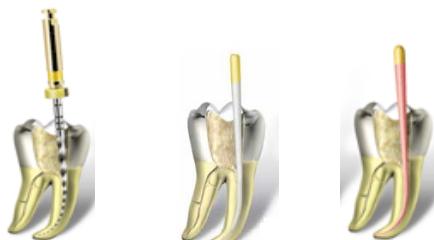
NiTi Rotary Systems

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 \leq 8%
- 3) The **Large** file for large canals
tip size is ISO 40 / taper \leq 8%



The WaveOne single-file reciprocating system

- improves the overall instrument **flexibility**

- Tips can follow canal **curvature** accurately

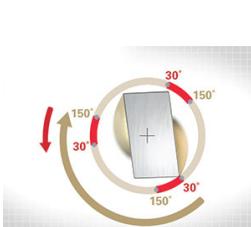


Modified convex triangular cross-section
(the tip end)



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

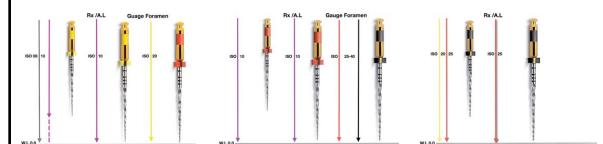
- The pre-programmed motor is set for **reciprocation** and speed for **WaveOne**



WaveOne file selection and clinical procedure

Shaping Technique

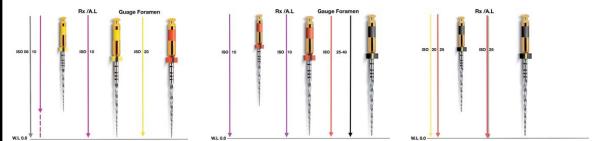
1. take **hand file** into canal and **watch-wind** to length or resistance
2. use **WaveOne file** to approximately **two-thirds** of canal length
3. irrigate copiously
4. take **hand file** to full W.L and confirm (apex locator/radiograph)
5. take **WaveOne file** to length



WaveOne file selection and clinical procedure

Shaping Technique

6. confirm **foramen diameter** with hand file the **same size** as WaveOne file (20, 25, or 40); 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**, **gutta-percha points** and **Thermafil WaveOne obturators**



Cases from WaveOne company data sheet

WVC using Calamus Dual



References

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