Cleaning and Shaping of the Root Canal System

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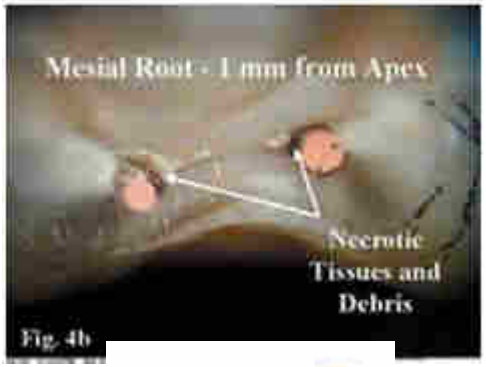
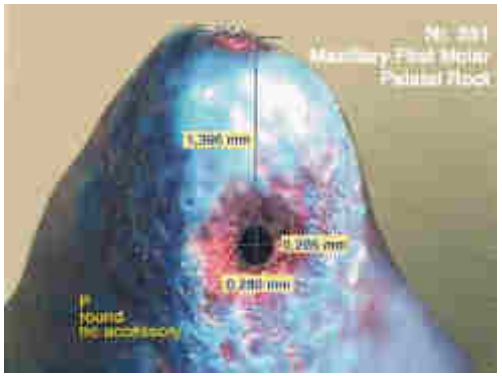
Based on **Mahmoud Torabinejad, Richard E. Walton,** ENDODONTICS: PRINCIPLES AND PRACTICE 4th edition

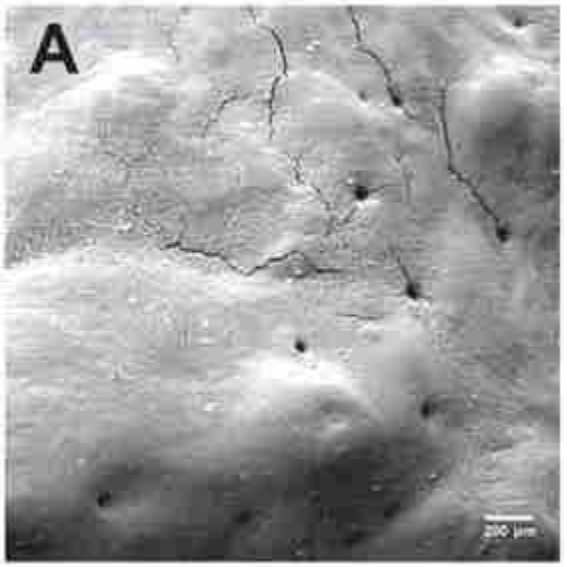
PRINCIPLES OF CLEANING AND SHAPING TECHNIQUES

- The criteria of canal preparation include
  - developing a continuously tapered tunnel
  - maintaining the original shape of the canal
  - maintaining the apical foramen in its original position
  - keeping the apical opening as small as possible (prevention of reinfection, apical stop for obturation)
  - developing glassy smooth walls

Untouchables





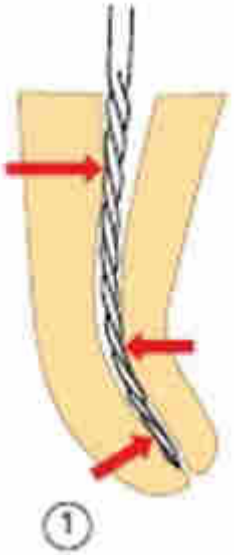


Procedural Errors

- loss of working length:
  - Inadequate reference point
  - Apical block
  - Ledge formation
- apical transportation (zipping) → apical perforation
- stripping perforations
- Instrument fracture

Reasons of procedural errors:

Restoring force (stiffnes) in curved canal (Standard technique – stainless steel file)

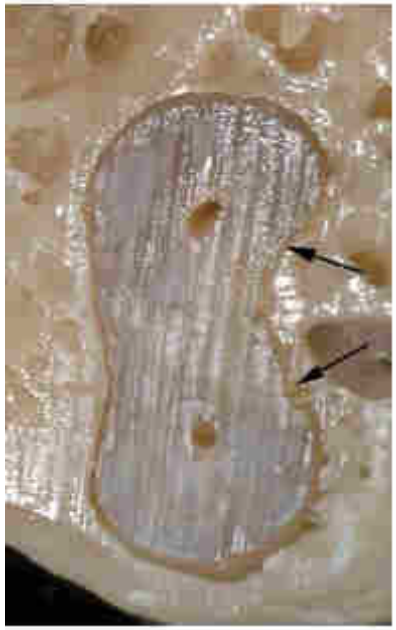


Ledge formation – loss of working length

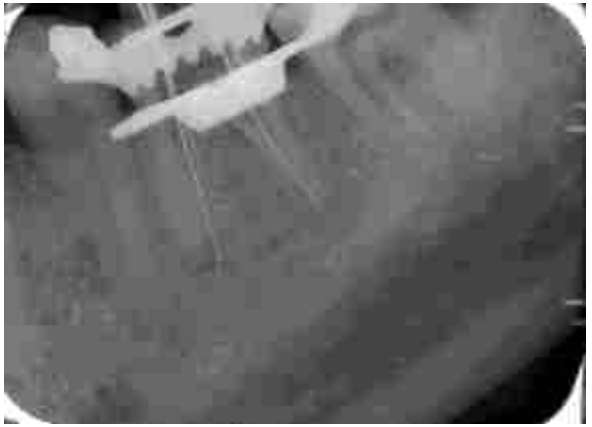
apical transportation (zipping) → apical perforation

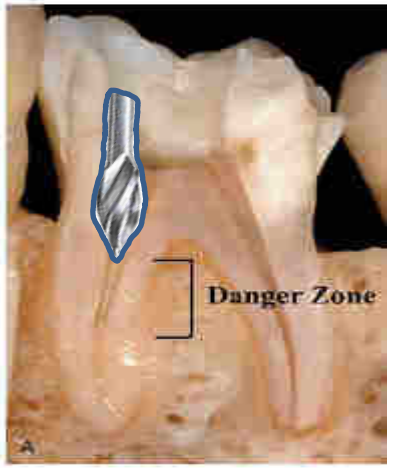
Reasons of procedural errors:

Stripping perforation due to **asymmetrical over prepartion**



Perforation

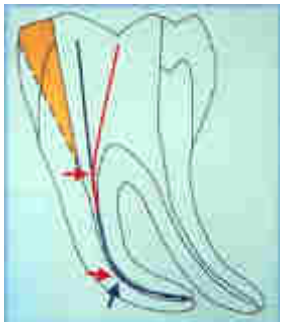




Right position

Reasons of procedural Errors

- Torsional or cyclic **fatigue** of the file → **Instrument fracture**
- **Prevention:**
  - Minimal force on file
  - Straight-line access
  - Inspection of the file



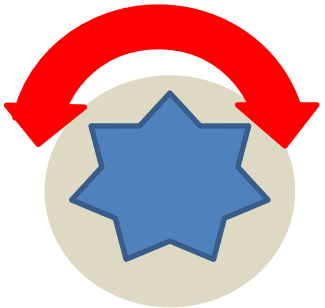
  - Rotary:
    - cyclicl axial motion
    - file manufacturer recommends:
      - speed (in revolutions per minute [rpm])
      - torque control
    - Preflaring the canal (crown-down)
    - Clean the file regularly
    - Single use?

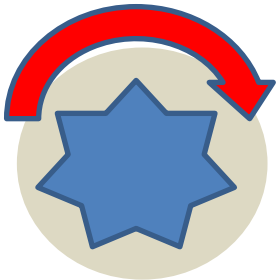
Preparation technique

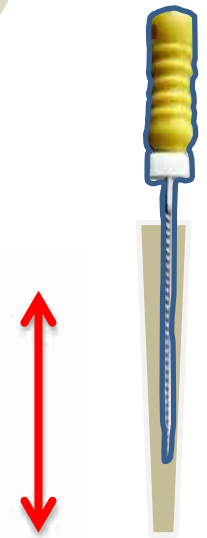
- Step-Back Technique
- Step-Down Technique
  - Crown-down Technique
- Anticurvature Filing
- Balanced Force Technique
- Nickel-Titanium Rotary Preparation
- Final Apical Enlargement and Apical Clearing
- Recapitulation
- Combination Technique

Movements for preparations

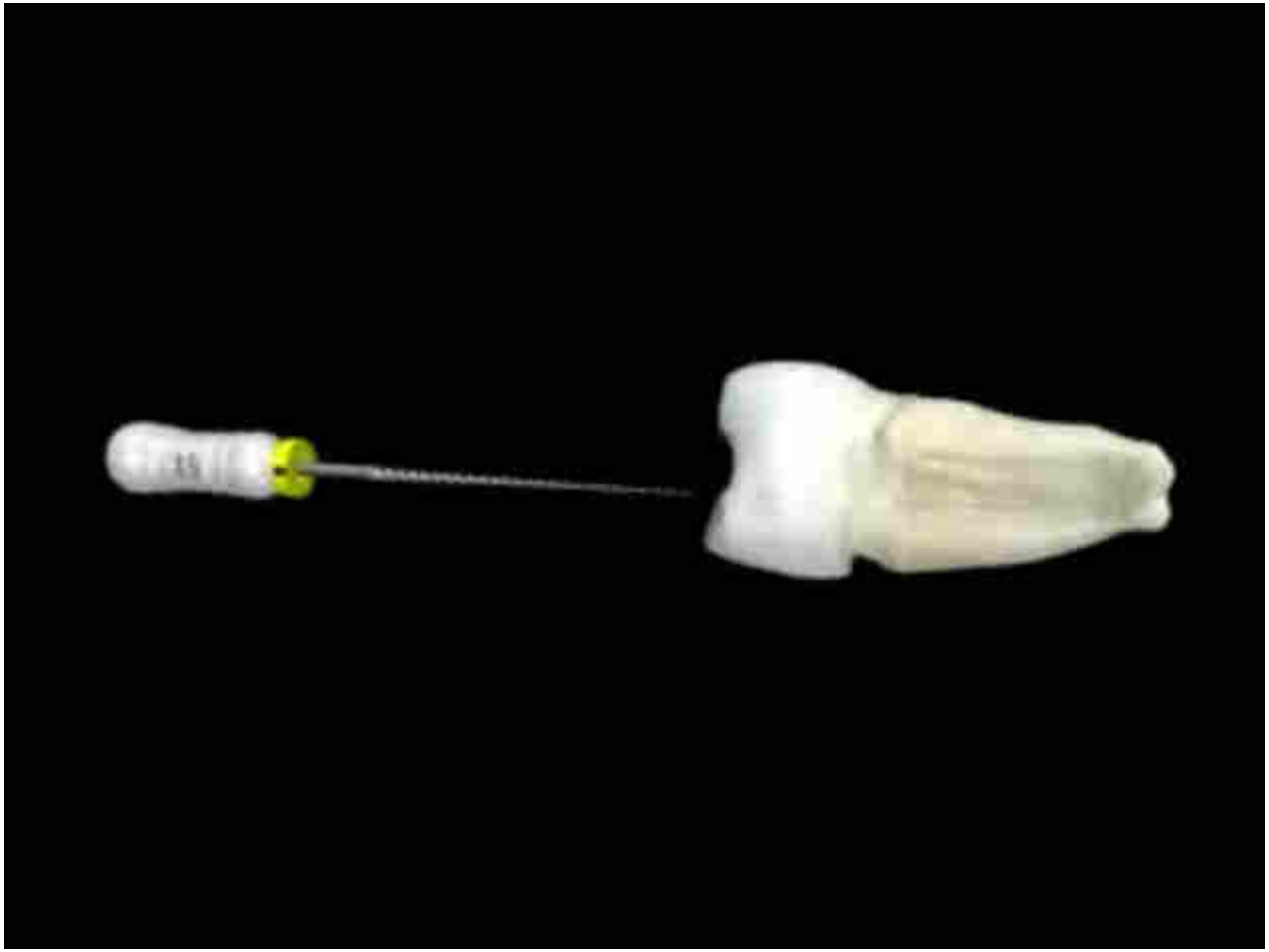
- Watch winding (clockwise/counterclockwise rotation, reciprocating)
- Reaming (clockwise cutting rotation)
- Filing (scraping), Circumferential filing





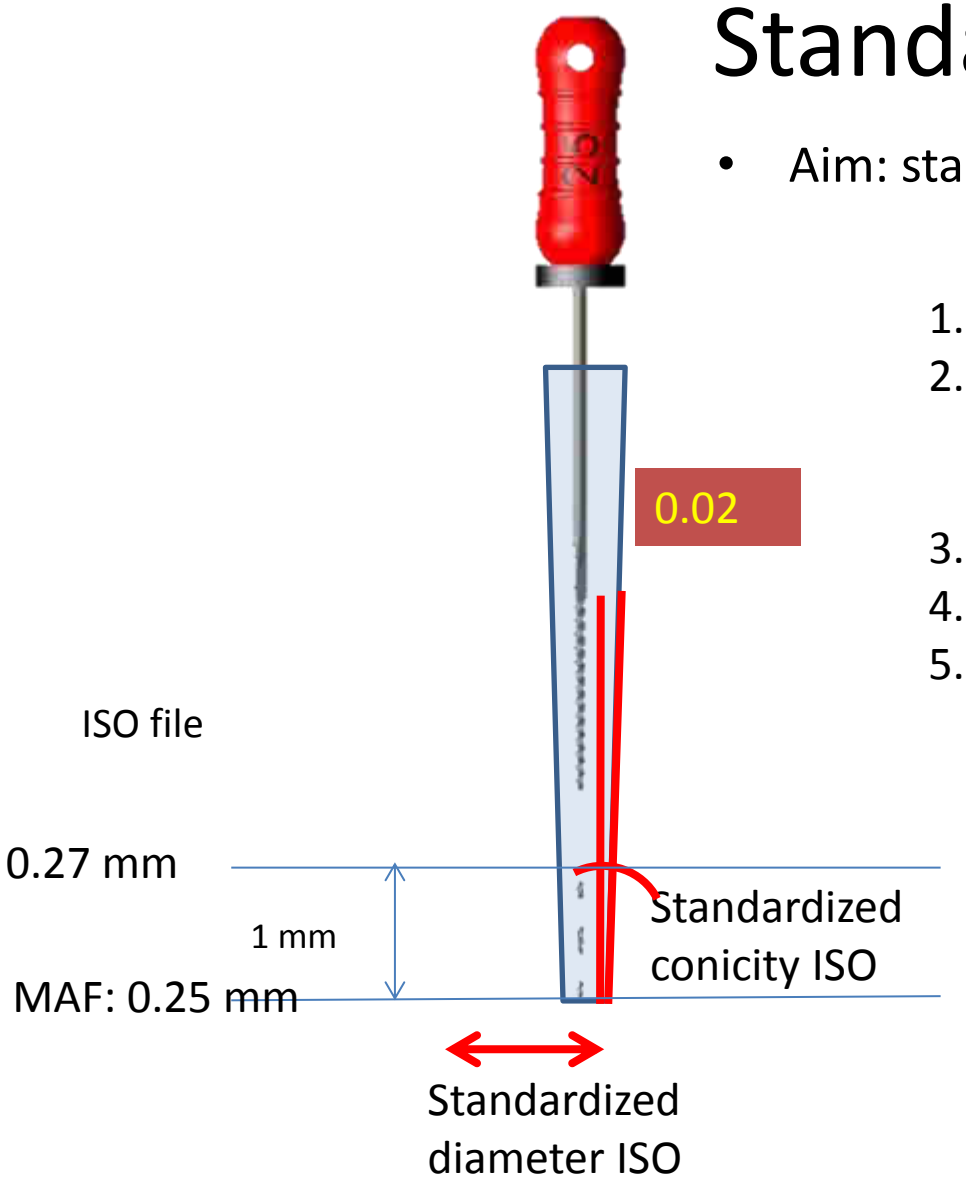


Watch-winding



Standardized technique

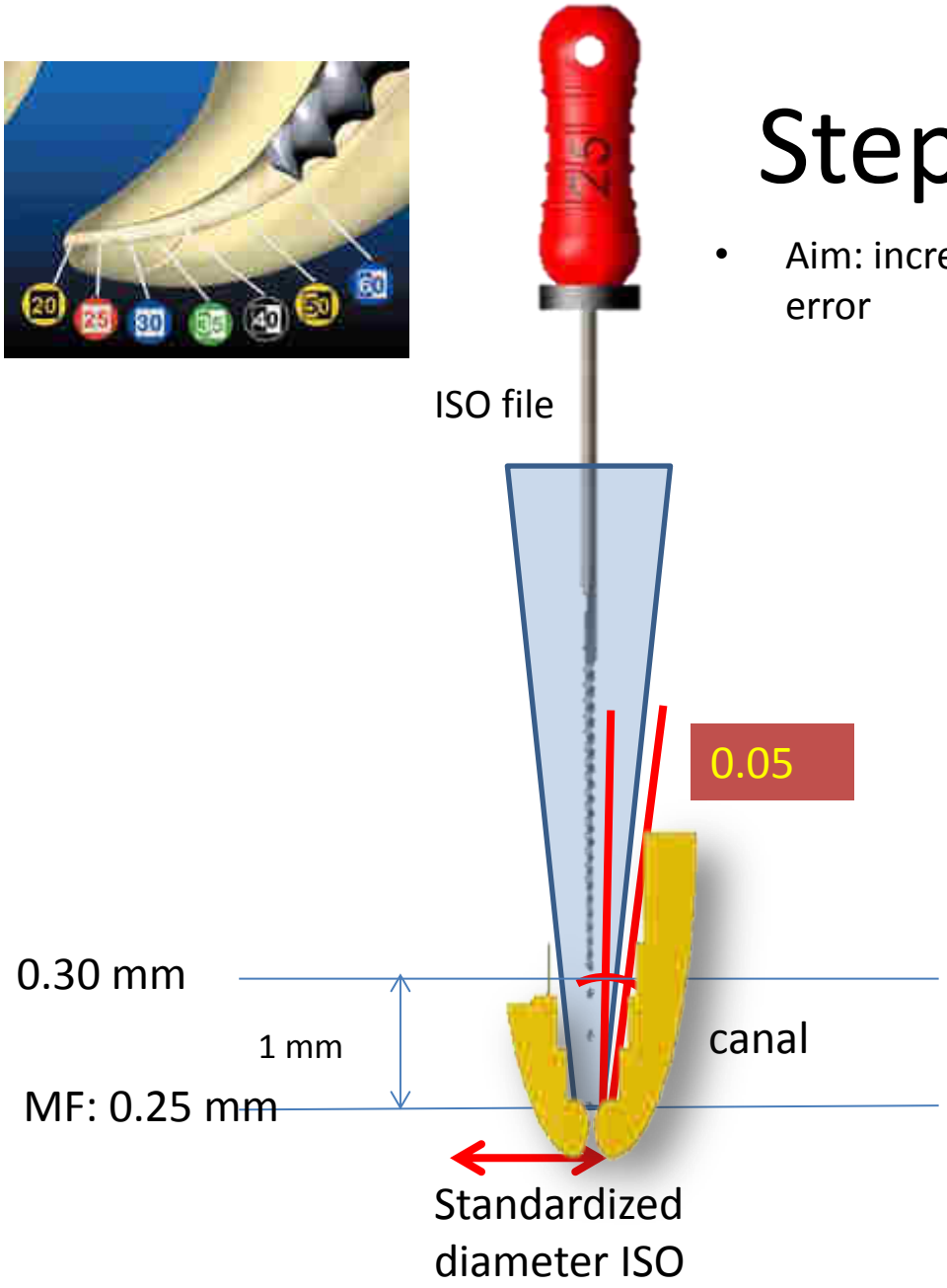
- Aim: standardized uniform tapered canal



1. Watch-winding (reamer, K-files)
2. all instruments introduced into a root canal to the entire working length, gradually larger and larger
3. MAF = the size of the last file used
4. Filling: single-cone technique
5. Cons: curved canals **will be wider** than the last used instrument, exacerbated by the pulling portion of the hand movement. Adequate **compaction** of guttapercha in such small a taper (0.02) is difficult or impossible.

Step-back technique

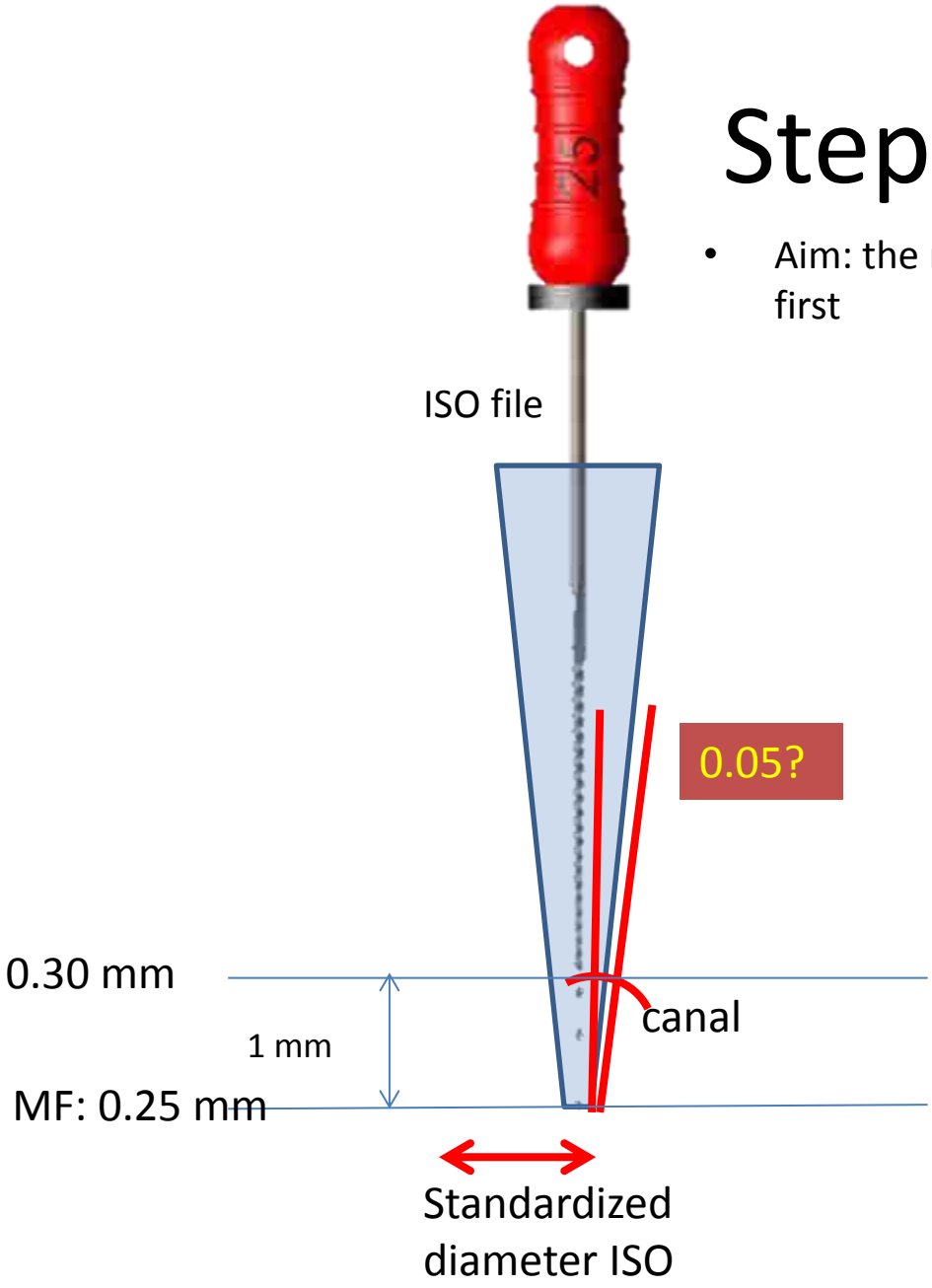
- Aim: increase the diameter without procedural error



1. Filing (+apical last mm: rotation)
2. Incrementally reducing the working length when using larger and stiffer instruments
3. More tapering: Avoid procedural error, easier rinsing, compactable filling, better copying the non-rounded cross-section
4. Cons: procedural error still occur, apical dentin plug

Step-down technique

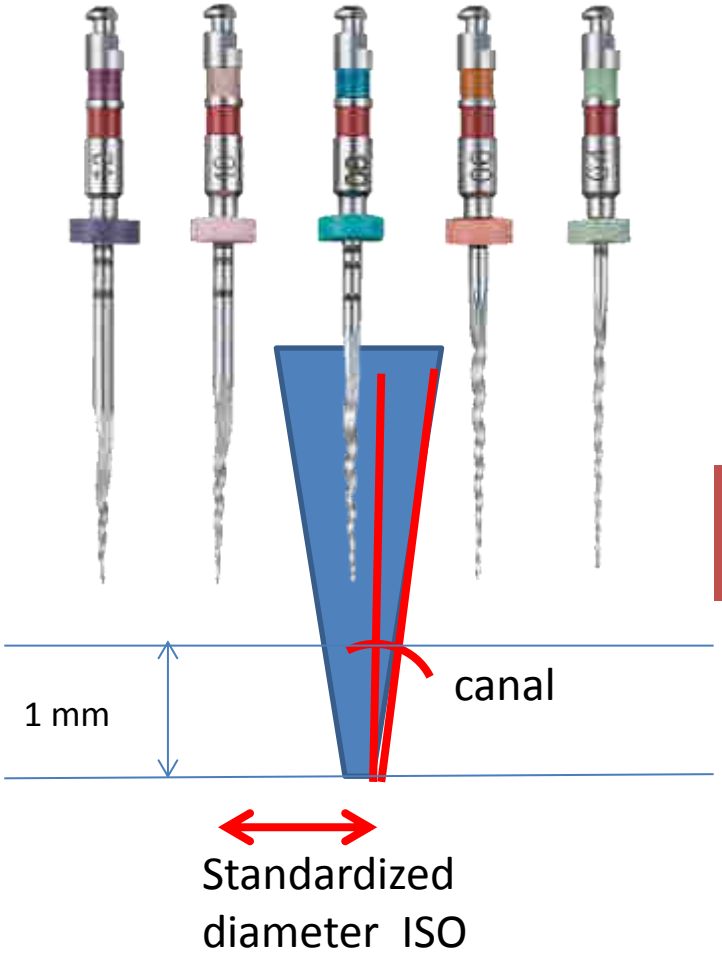
- Aim: the most infected coronal debris is removed first



1. Rotation motion (watchwinding or reaming)
2. Gradually move deeper with smaller file
3. More tappered canal: less error, easier rinse, compactable filling , less dentin plug
4. Cons: in narrow canal ledge formation may occur

Crown-down technique (modification of the step-down technique)

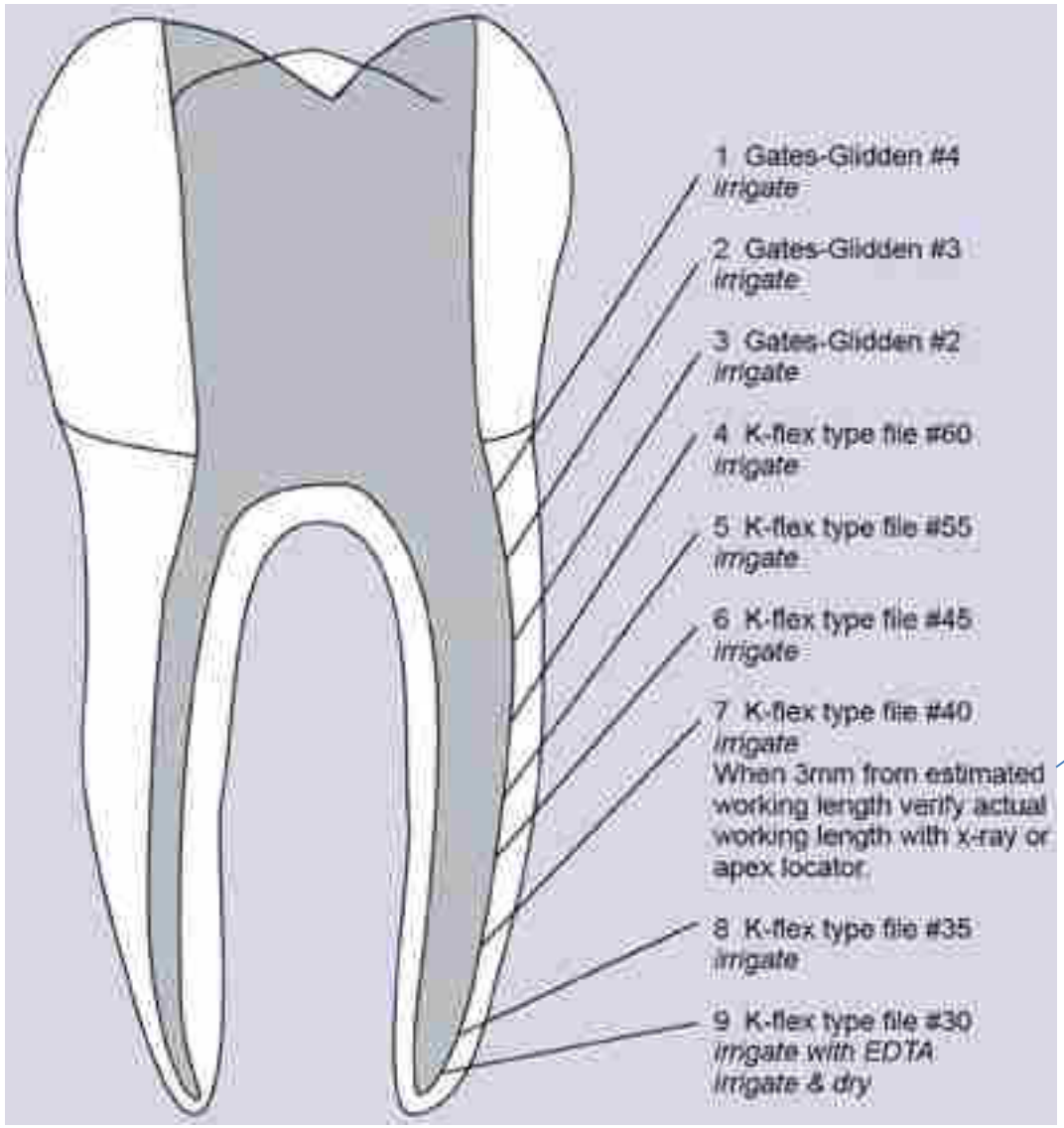
- Aim: even more aggressive coronal flaring to avoid intrusion of the debris and better determination of the apical size



1. Nowadays: preferable with engine driven instrument with rotary movement
2. The determination of the WL done after the coronal preparation

0.04, 0.05, 0.06, 0.07, 0.08, …..

An example of crown-down technique



Coronal flare (orifice shaper)

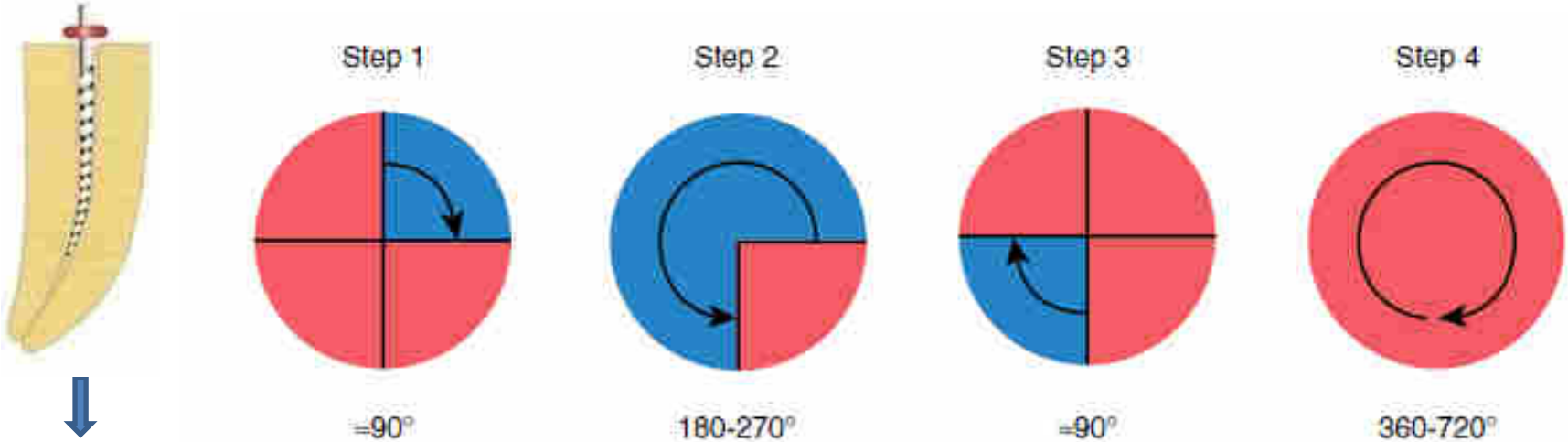
WL determination

Apical shaping

Balanced-force technique

Aim: To reduce procedural error significantly in case of K-file

This technique keeps the file centrally in the canal



Passive introduction

Light apical pressure

sufficient apical pressure to keep the file in constant length

Advance of the instrument apically

File removing for cleaning


FLEXMASTER


2in1
160

- Length control
- Speed control
- Torque control

Endodontic Intracanal Lubricants

simple to use

Simply put some FileCare® EDTA from a dappen dish or similar...

...onto an endodontic instrument (e.g. FlexMaster® or hand-file)...

...and introduce it into the canal.

Nickel Titanium versus stainless steel files

NiTi

- Shape memory
- High flexibility
- Cyclic and torsional fatigue
- Expensive

Stainless Steel

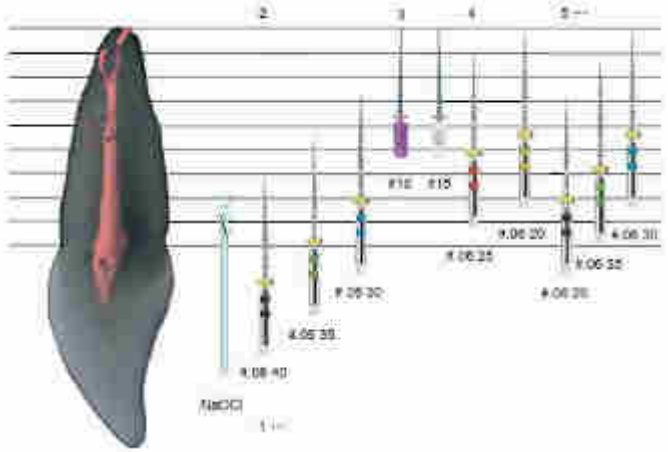
- Recording curves
- Rigidity
- More resistant to fatigue
- Cheap

Hand versus engine driven rotary instruments

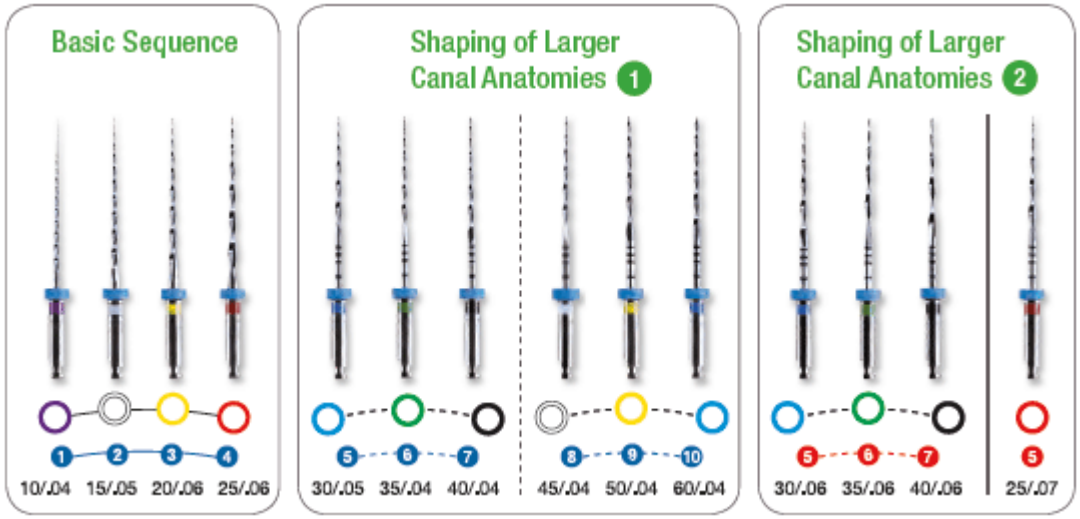
- NiTi rotary instruments:
  - **Less debris and irritants** enter the periapical tissue (Madhusudhana et al. Contemp Clin Dent. 2010 Oct-Dec; 1(4): 234–236.), causing less inflammation and complaints (Siqueira Int Endod J. 2003 Jul;36(7):453), except the reciproc (Bürklein and Schäfer, J Endod. 2012 Jun;38(6):850-2.)
  - **Less preparation error** (Esposito and Cunningham CJ. J Endod 1995;21:173-176., Sonntag et al. Int Endod J 2003;36:715-723.)
  - Convenient
  - Faster:
    - Very narrow canal
    - Standardized, smooth, equally tapered canal is easier to fill in
- Hand instruments:
  - Better adapt to the individual canal morphology
  - Elliptic, figure-8 cross-section
  - Big curvature: precurved stainless steel hand file
  - Less file separation?

Nickel-Titanium Rotary Preparation

- Crown down techniques,
  - preflaring,
    deeper and deeper, smaller and smaller
    - Profile, Protaper
- Standardized technique – reaming movement,
  - whole working length larger and larger file
    - MTWO, Ligth Speed
- Balanced force-technique
  - One file endo
    - Wave-One, Reciproc



MTWO system



Mtwo® TORQUE VALUES

Mtwo®	gcm	Ncm	Mtwo®	gcm	Ncm
10/.04	120	1.2	25/.07	200	2.0
15/.05	130	1.3	30/.06	120	1.2
20/.06	210	2.1	35/.06	100	1.0
25/.06	230	2.3	40/.06	170	1.7
30/.05	120	1.2			
35/.04	120	1.2	**Retreatment instruments**		
40/.04	160	1.6			
45/.04	160	1.6	R15/.05	30	0.3
50/.04	200	2.0	R25/.05	120	1.2
60/.04	300	3.0			
All sizes:		**280 rpm**			

Files can be operated between 250-350 rpm. The VDW torque values are recommended for safety and efficiency.
100 gcm are equivalent to 0.981 Ncm.

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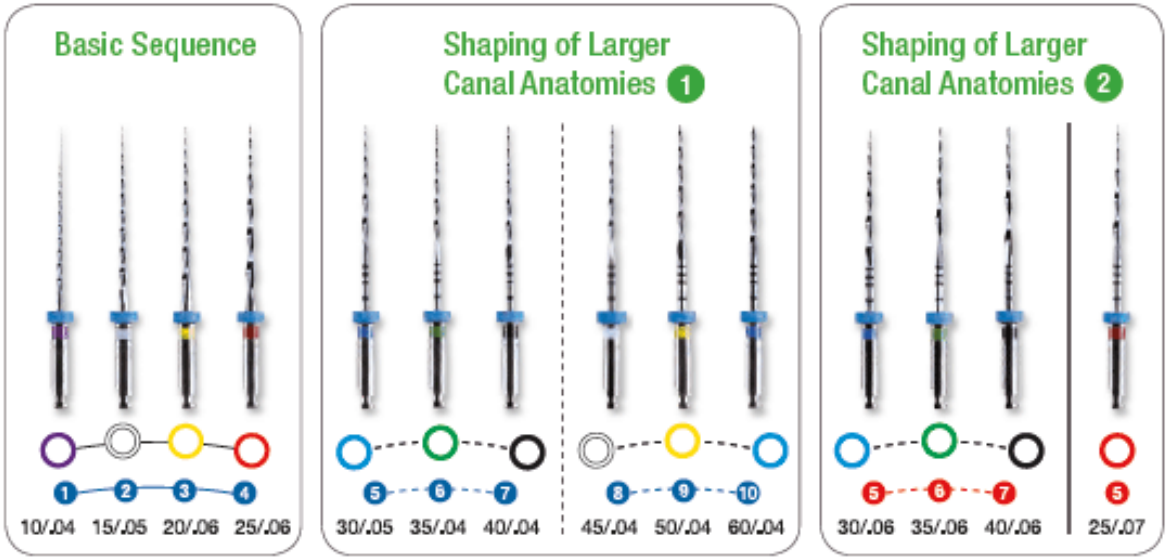
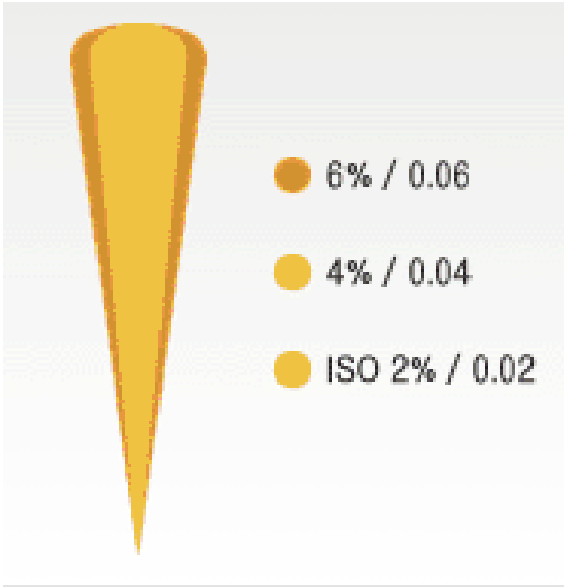
VDW

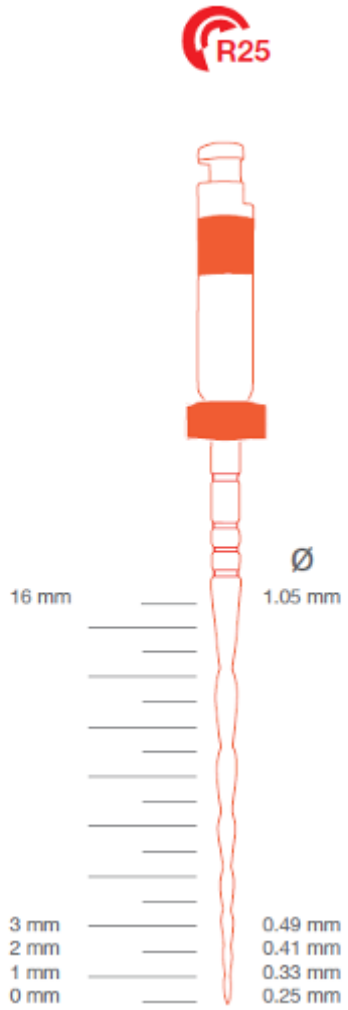
VW000213
Rev.3/30.8.10

Tapering of the guttapercha points should match the canal morphology after preparation





Reciproc system



0.33-0.25 = 0.08

RECIPROC® Instruments

Single sizes

STERILE

Blister of 6 Instruments		21 mm	25 mm	31 mm
R25	●	0212 021 025	0212 025 025	0212 031 025
R40	●	0212 021 040	0212 025 040	0212 031 040
R50	●	0212 021 050	0212 025 050	0212 031 050
Blister of 4 Instruments		**21 mm**	**25 mm**	**31 mm**
R25	●	0212 021 025	0212 025 025	0212 031 025

RECIPROC® Gutta-Percha

Box of 60 pieces

Size		28 mm
R25	●	0214 028 025
R40	●	0214 028 040
R50	●	0214 028 050
40 x R25, 10 x R40, 10 x R50		0214 028 237

RECIPROC® Paper Points

STERILE

Box of 144 pieces

Size		29 mm
R25	●	0216 029 025
R40	●	0216 029 040
R50	●	0216 029 050
96 x R25, 24 x R40, 24 x R50		0216 029 237

Reciproc system