

New Concepts in Endodontics

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Specialist In Endodontics



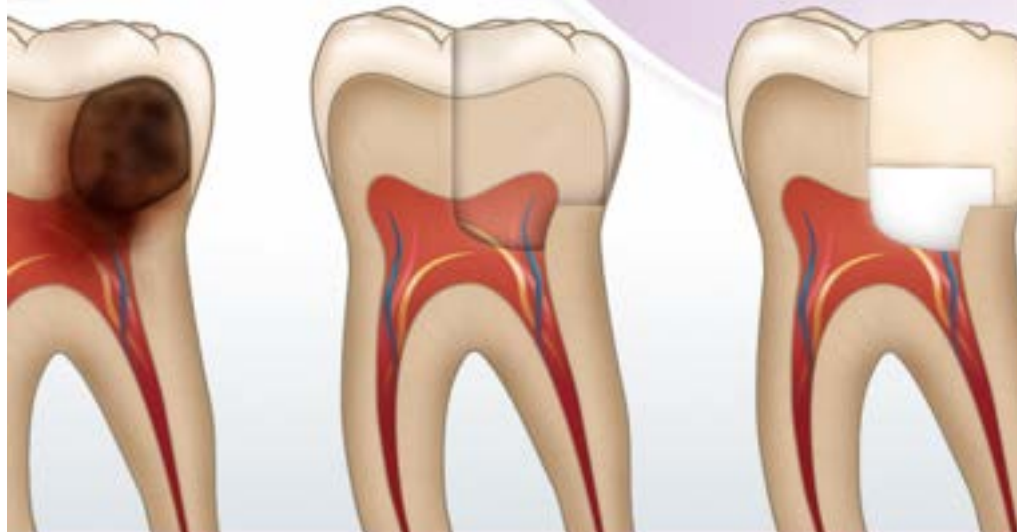
- Sulphur not Sulfur
- Albums not playlists
- O Levels not GCSEs
- 5th form upper 6th not years 12 and 14
- First Division not Premiership
- George Best not Messi



Overview Slide

- Aims of RCT
- Stainless Steel Files
- Nickel Titanium Files
- New Sealants

A guide to
**Good
Endodontic
Practice**



■ First edition September 2022

Edited by Phillip L Tomson

Contents

Foreword

Preface

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Aim of Root Canal Treatment

- To eliminate the infection
- (removal of biofilm)
- Stop re-infection of the root canal system

Objectives of Root Canal Treatment

- Clean
- Shape
- Obturate

Root Canal Systems



Cleaning and Shaping

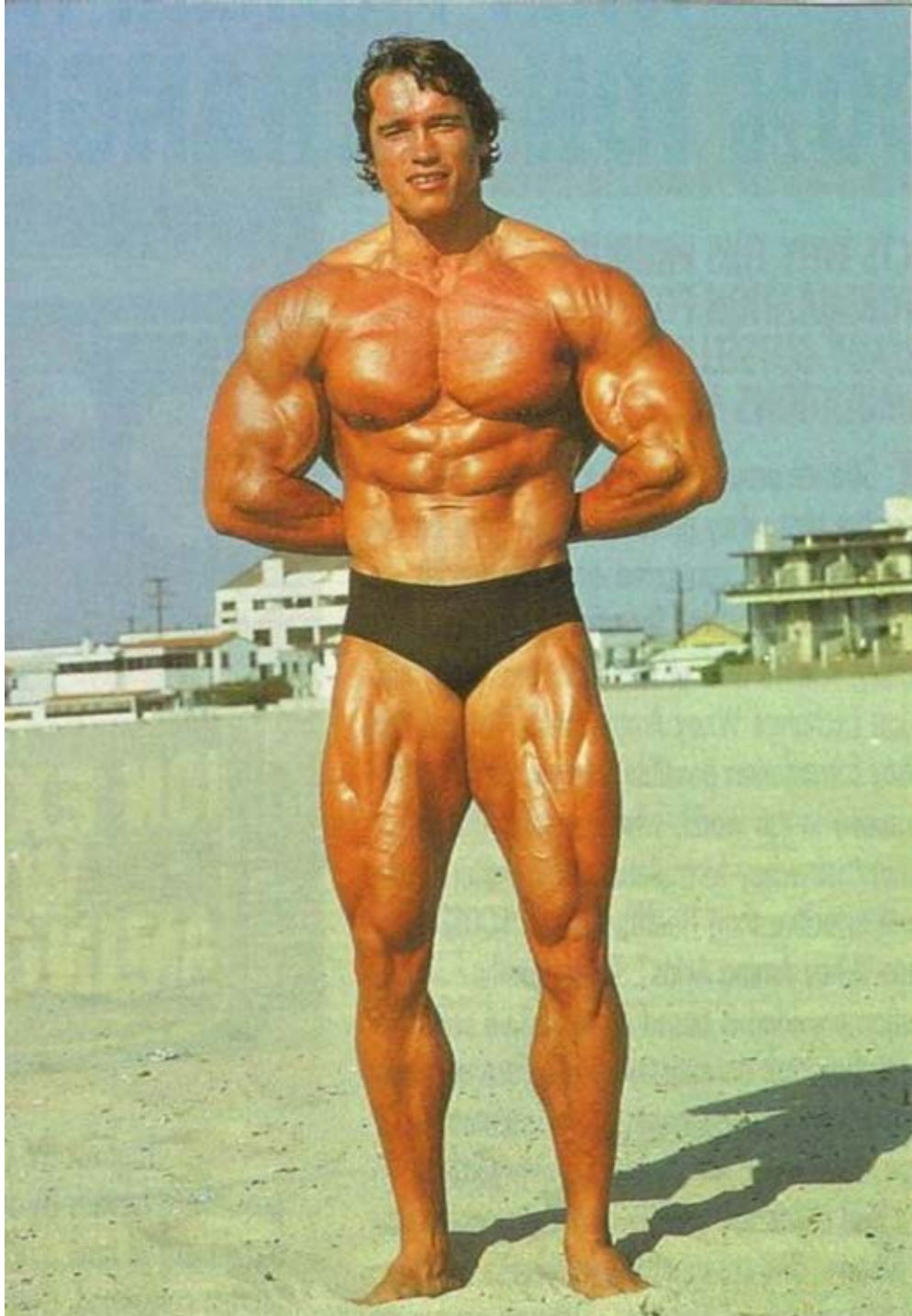
- *It is important to appreciate that files produce shape, but it is essential to understand that irrigants clean a root canal system.*
- *H.Schilder*

Cleaning and Shaping

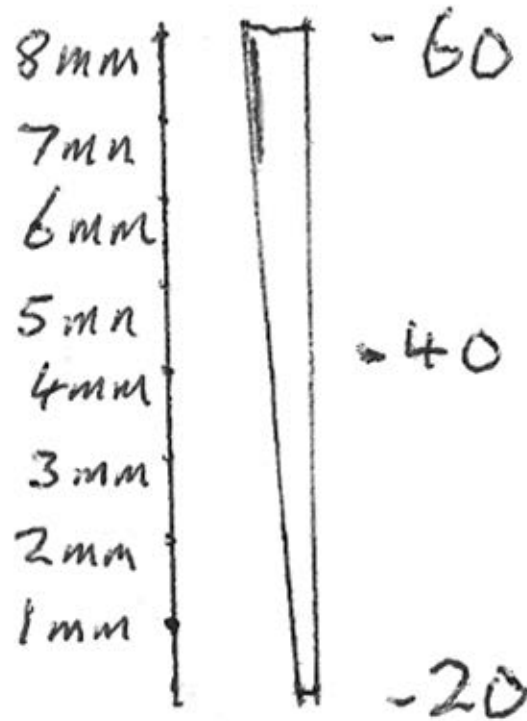
- Well shaped canals allow
- Effective cleaning
- Three dimensional obturation

- Shape
- Clean
- Obturate





Measurement of Fine Medium point

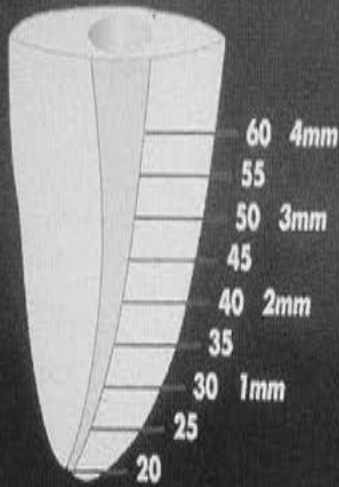




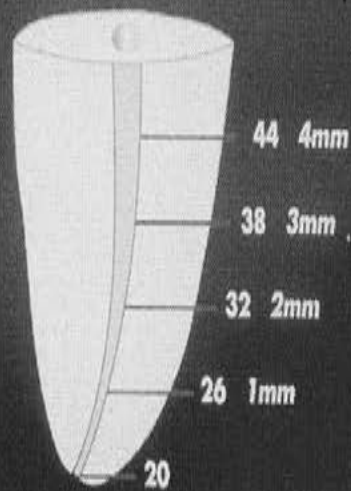


APICAL SHAPE vs FILE TAPER

.02 TAPER

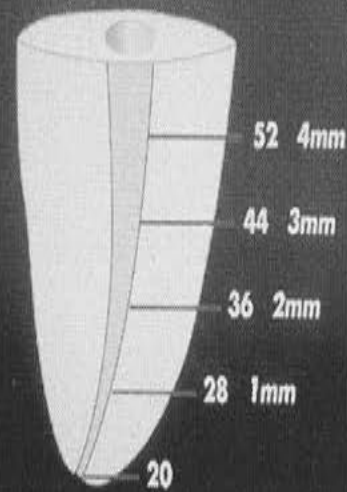


.06 TAPER



APICAL SHAPE vs FILE TAPER

.08 TAPER



.10 TAPER

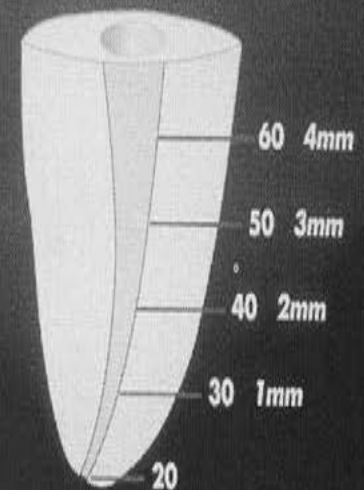


Fig. 8-47 Comparison of apical shape and file taper. **A**, Note that 0.02 tapered instruments used in a step-back manner can create a 10% taper. **B**, Note the differences in diameters at similar levels between preparations.

Cleaning and Shaping

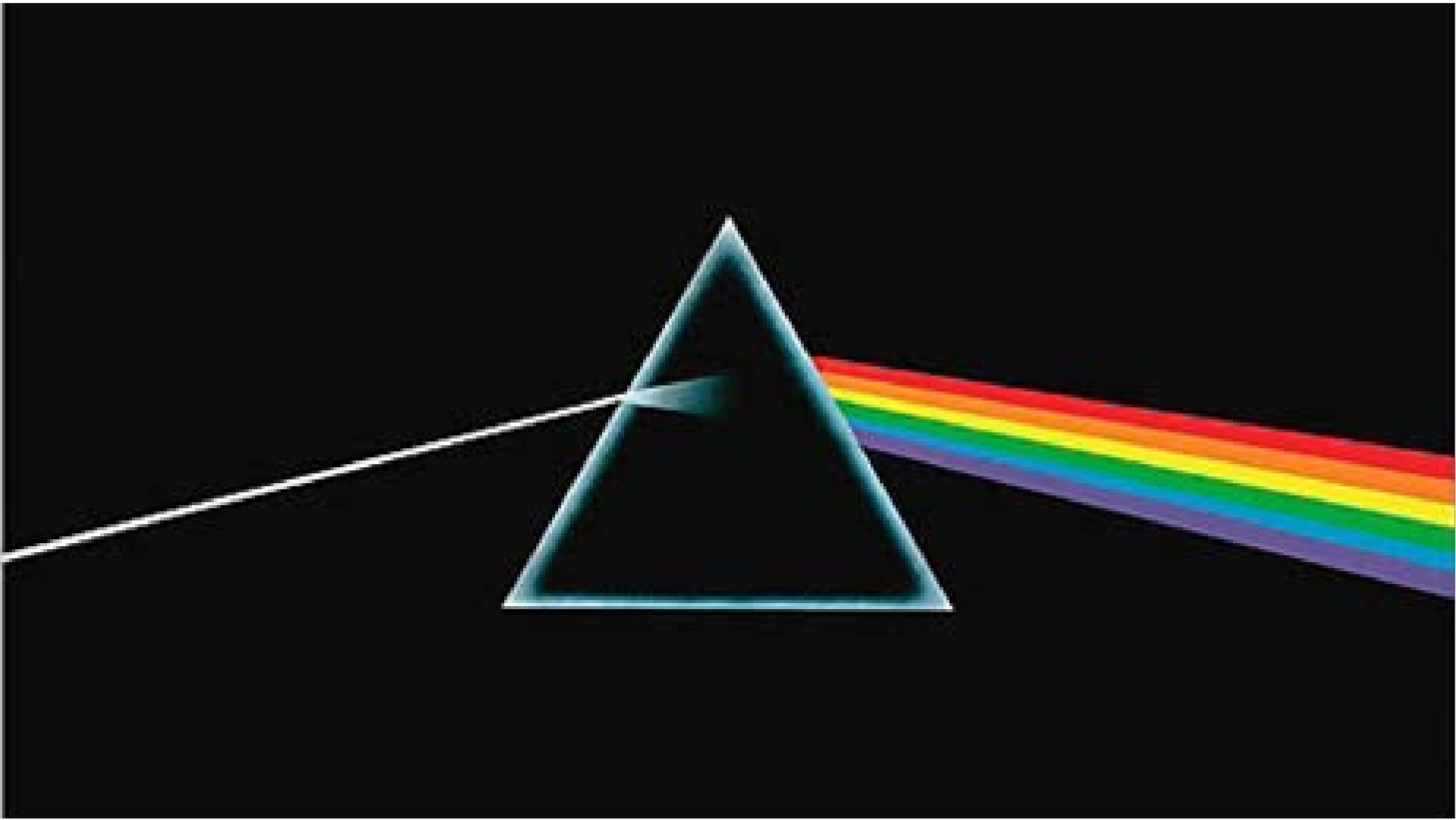
- Dr Christine Sedgely
- Apical size 60
- Straight curved canals



Clean

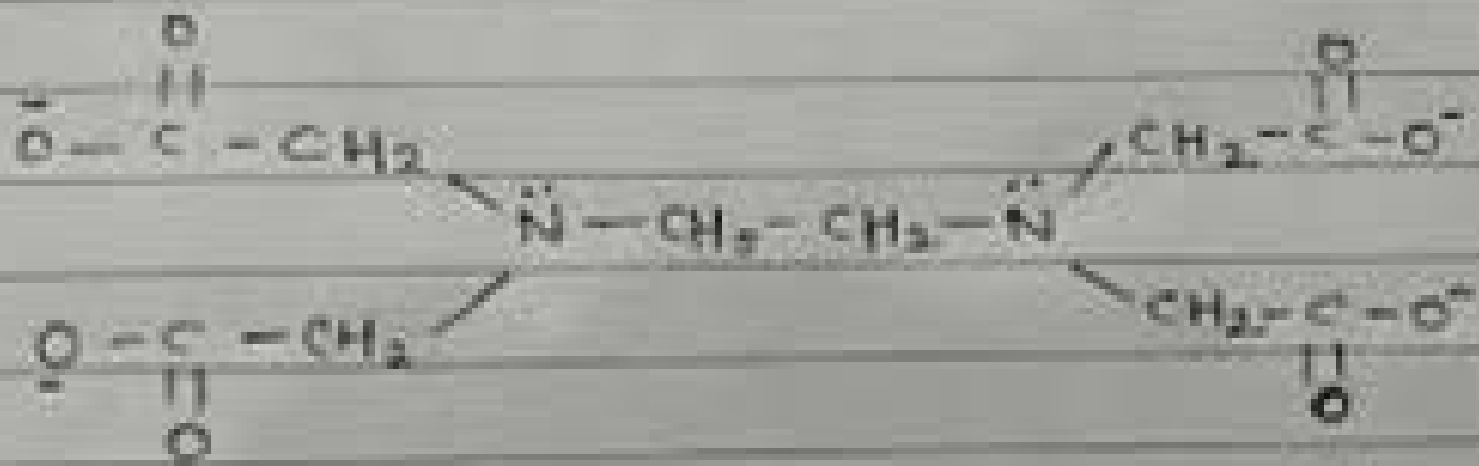
- Strength of irrigant
- Type of irrigant
 - » Sodium Hypochlorite
 - » Chlorhexidine
 - » Iodine
 - » Hydrogen peroxide
 - » Ionised water
 - » Ozone
 - » PAD

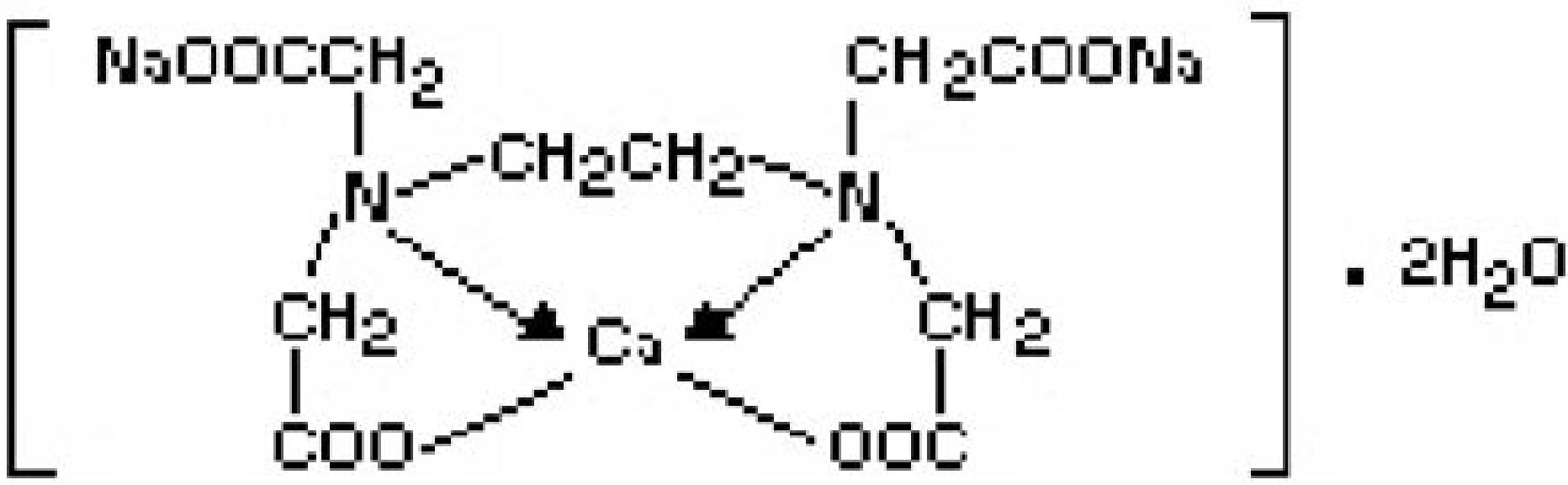




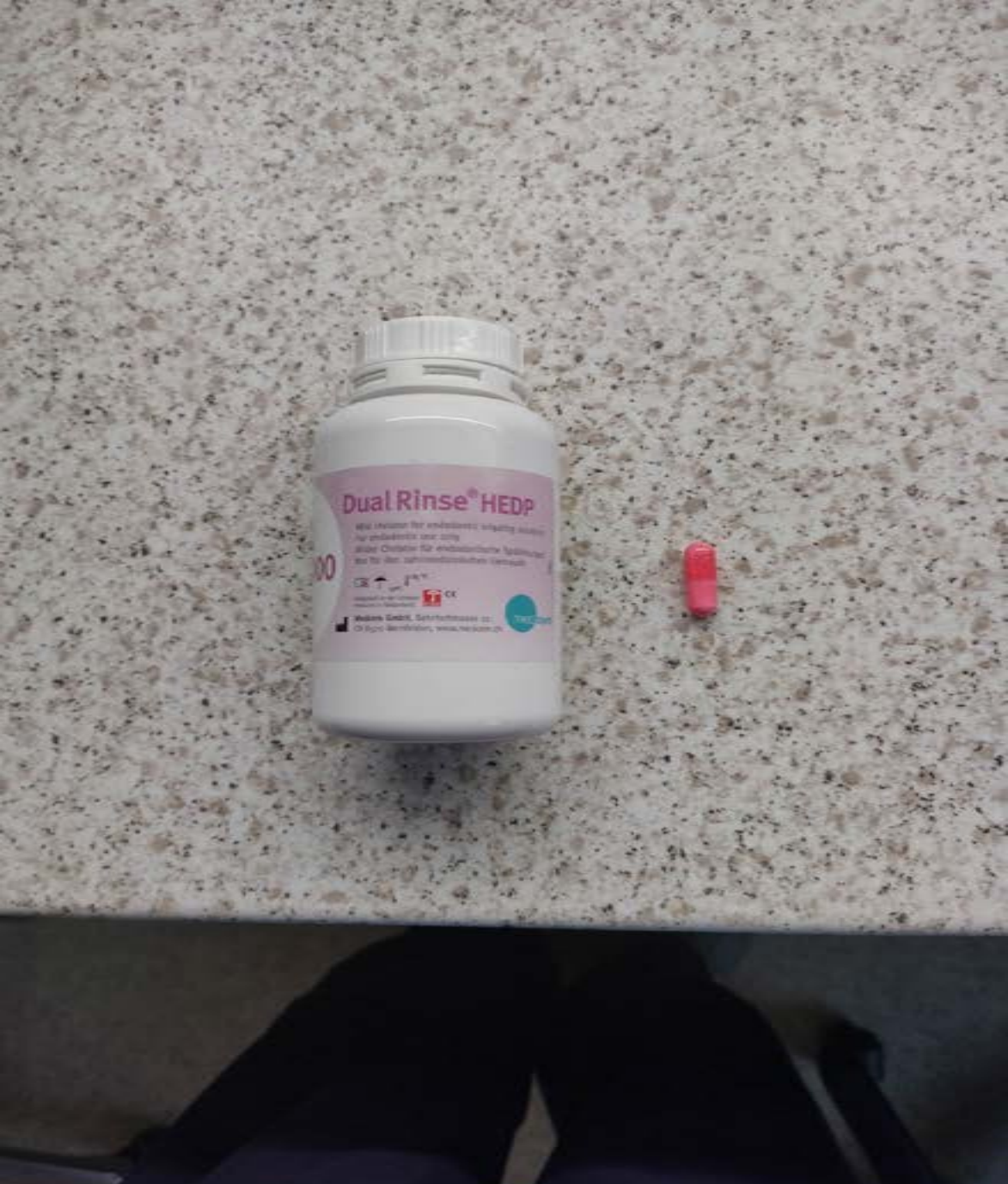














EDTA 17%



Liquid for root canals widening

ENDO-SOLUTION

CE
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EDTA 17%

Liquid for root canals widening
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EDTA 17%

Liquid for root canals widening
Liquido para ampliar los conductos radiculares

ENDO-SOLUTION

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FOR DENTAL USE ONLY
Solo para uso dental / DO STROKOVNÁ
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MD











PulpSucker®

A MULTI-CANNULAR NEGATIVE PRESSURE IRRIGATION DEVICE

Get results like these, including through a
ninja access...all without an electric cord.





Chlorhexidine Gluconate

Mouthwash

300ml

Peppermint Flavour

Videne

Antiseptic Solution

500ml

Instructions for use:

- 1. Use undiluted.
- 2. Rinse gently under the patient and in the mouth.
- 3. Rinse with diluted solution (which contains chlorhexidine gluconate).

Contains 0.12% chlorhexidine gluconate.

Keep all medicines out of the reach of children.

Store below 25°C.

Preparations containing chlorhexidine gluconate may be used for the treatment of oral cavity infections.

DePuy HealthCare

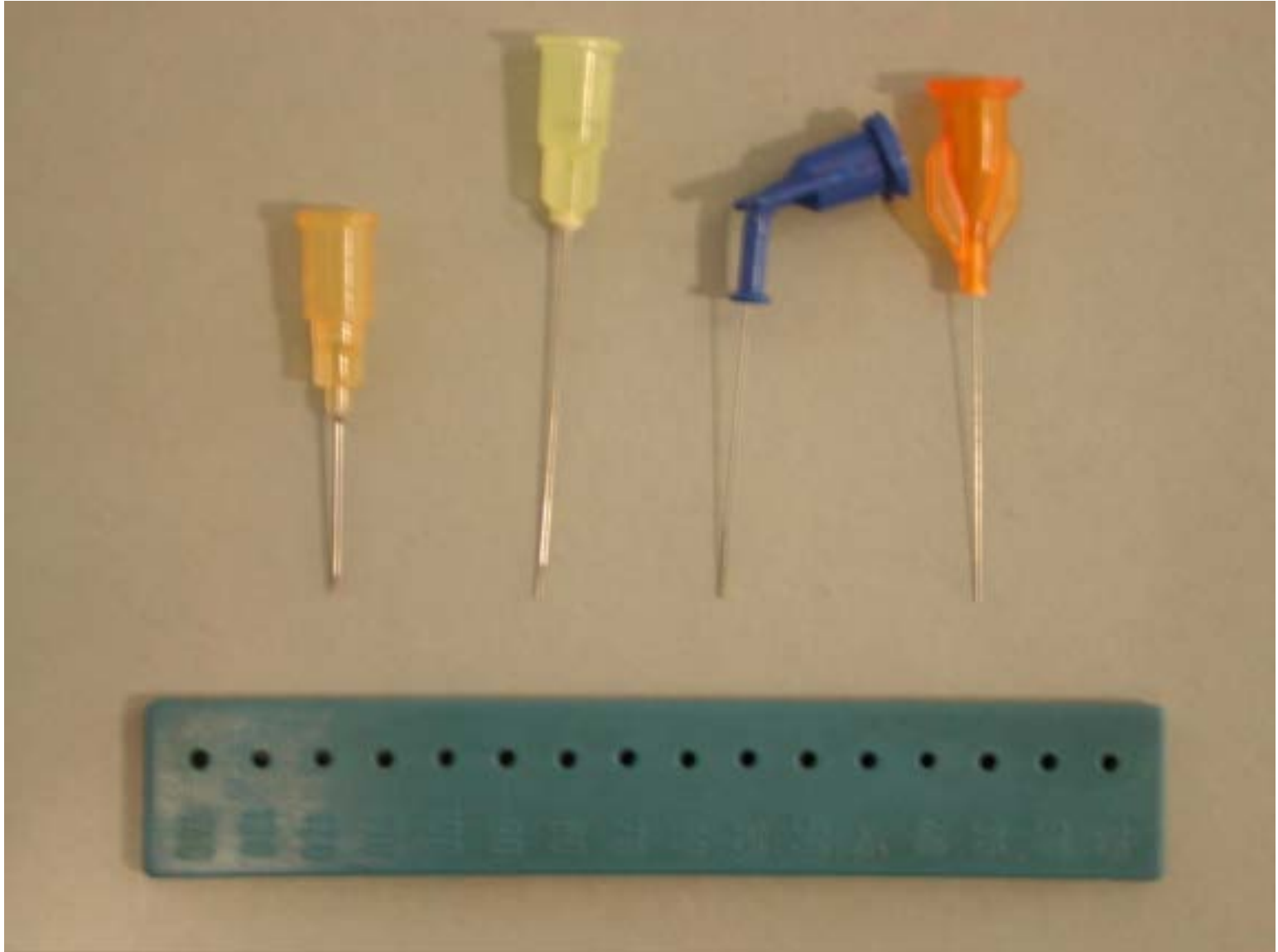
3 Forces of Adhesion

- Dipole dipole
- Van de Waals
- Hydrogen bonding

Churchill's Solution

- Iodine 16.5g
- Potassium iodide 3.5g
- Distilled water 20g
- 90% ethanol 60g







Max-i-Probe®

Perkembangan terbaru dengan
sistem "buka-tutup"
prosedur inspeksi dengan
sistem "buka-tutup"
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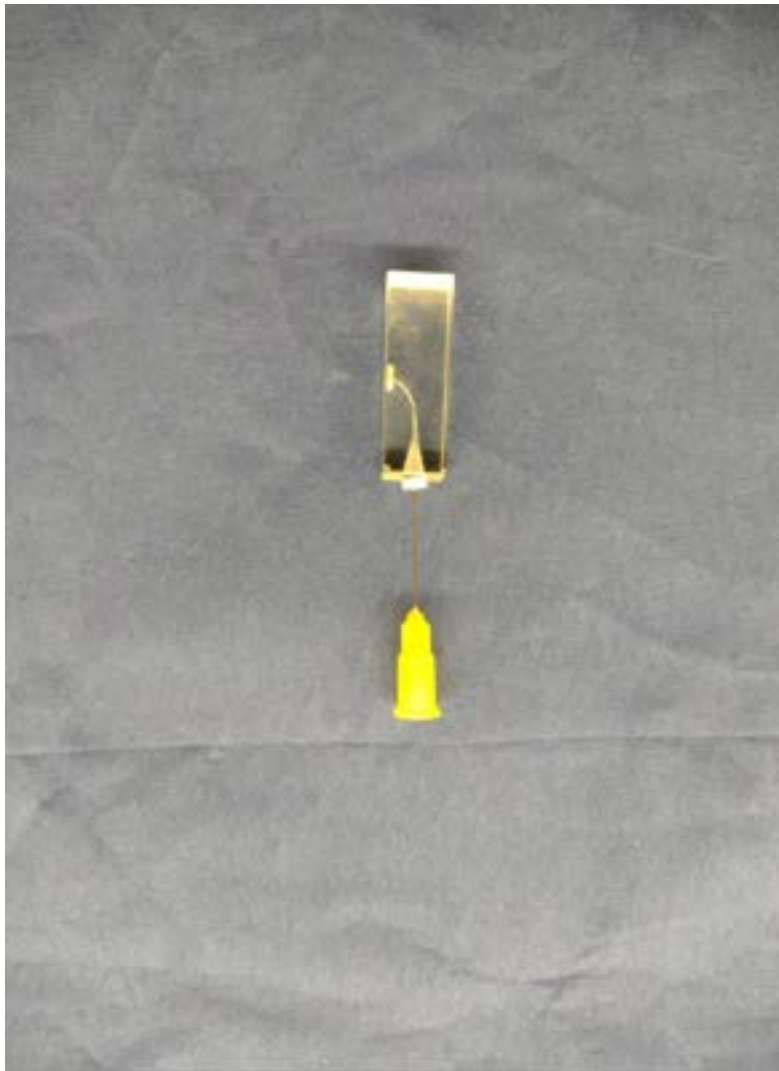
Made in USA

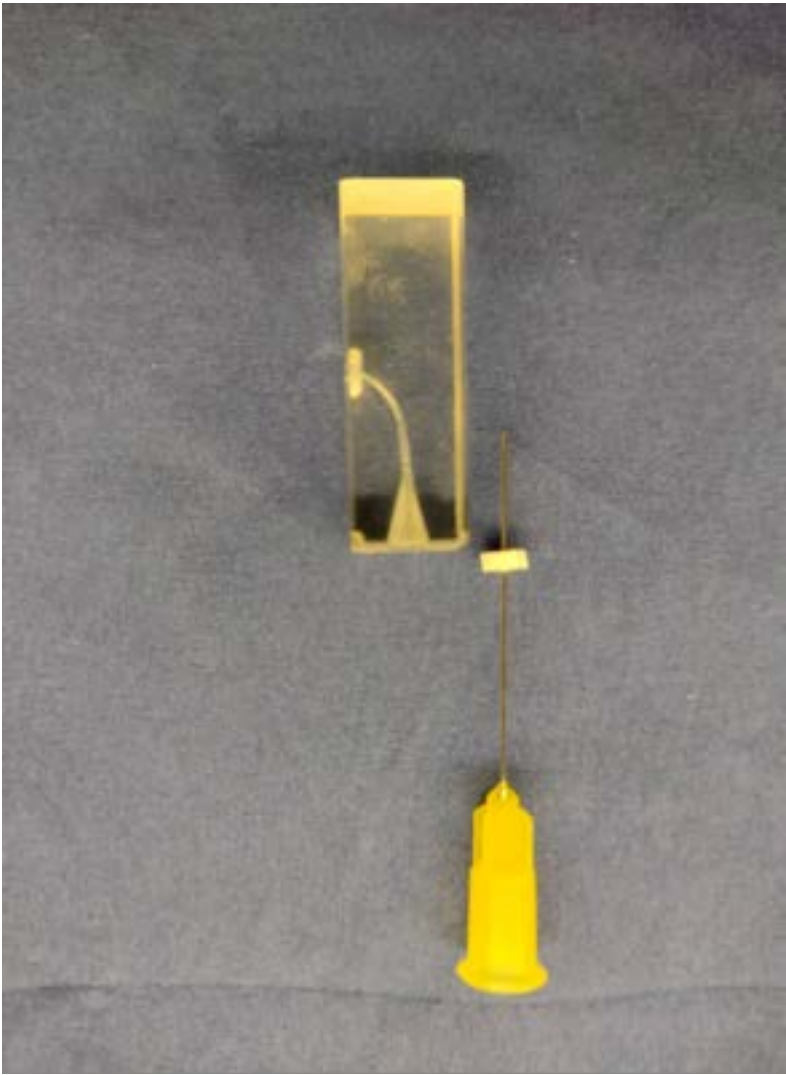
Bitte along perforation for convenient dispenser.
Für praktische Entnahme wählen sie die perforierte Linie.
Déchirez en suivant la perforation pour utiliser commodément le contenu.
Shangqing kanyan li perforation per usare comodamente il contenuto.
Rótunda a lo largo de la perforación para facilitar el acceso al contenido.





















Shape

- Continuously tapering preparation-ideal taper
- Create resistance form to pack GP
- Retain enough residual dentine-original anatomy maintained
- Position of apex maintained
- Foramen as small as possible -doubling the file size increases area four fold ?patency

Cleaning Techniques

- Crown down
- Modified crown down



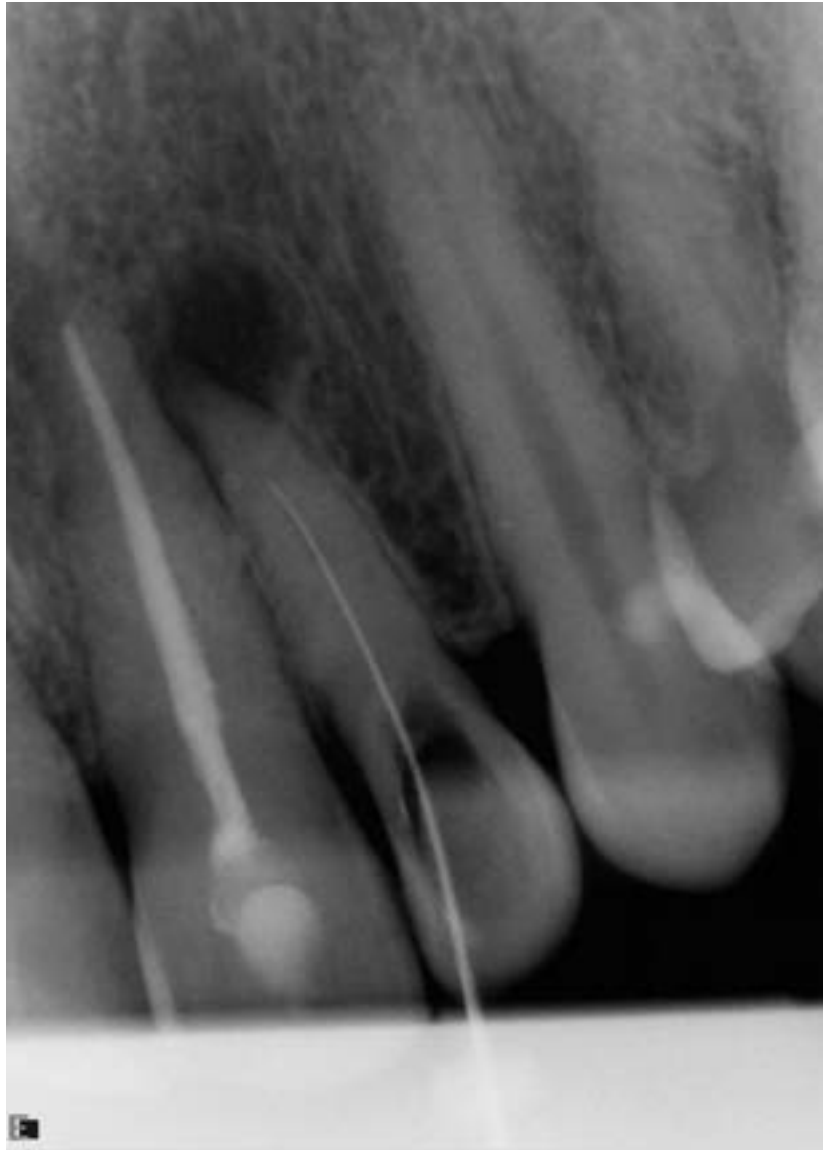
Maxilla

Central incisor	1 canal 100%
Lateral incisor	1 canal 100%
Canine	1 canal 100%
1st premolar	2 roots 57% Single root, 2 canals 16% Single root, 2 canals, 1 foramen 12% 3 roots, 3 canals 6%
2nd premolar	1 canal 53% 2 canals, 1 foramen 22% 2 canals, 1 foramen 13% 2 roots, 2 canals 11% 3 roots, 3 canals 1%
1st molar	3 roots, 3 canals 38% 4 canals 60% Mesiobuccal canal: 2 canals 60% 2 foramina 20% 1 foramen 80%
2nd molar	3 roots 60% 1 mesiobuccal canal 70% 2 mesiobuccal canals: 1 foramen 15% 2 foramina 10% 2 roots 25% 1 root 10%

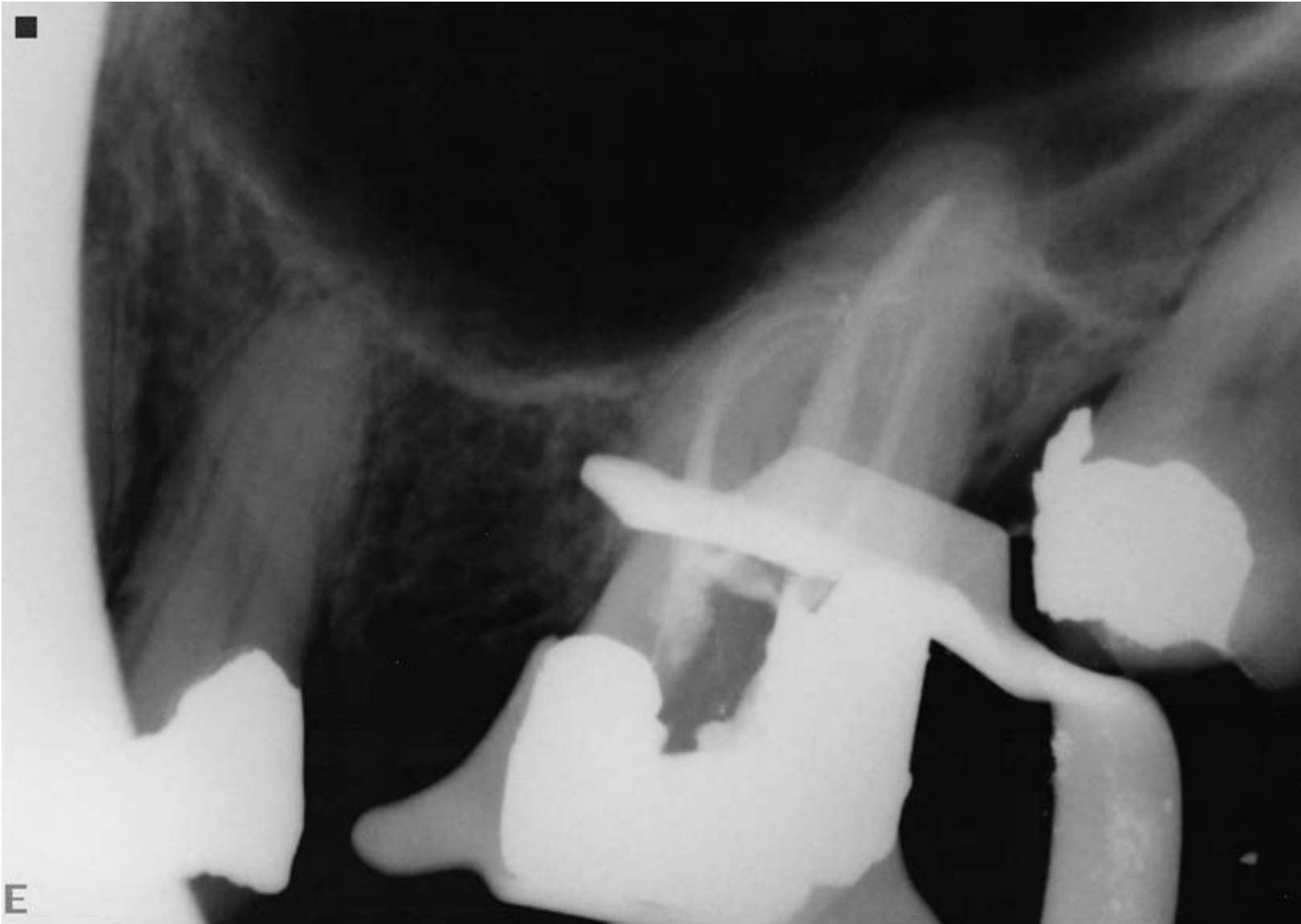
Mandible

Central incisor	1 canal 70%
Lateral incisor	1 canal 55%
	2 canals, 2 foramina: central 5%
	lateral 15%
	2 canals, 1 foramen: central 25%
	lateral 30%
Canine	1 canal 70%
	2 canals, 1 foramen 20%
	2 canals, 2 foramina 10%
1st premolar	1 canal, 1 foramen 74%
	Branching canal: 1 foramen 4%
	2 foramina 25%
2nd premolar	1 canal, 1 foramen 97%
	Branching canal: 1 foramen 12%
	2 foramina 3%
1st molar	2 mesial canals 60%, 1 foramen 40%
	1 distal canal 70%
	Distal canal: 2 canals, 1 foramen 35%
	2 canals, 2 foramina 10%
2nd molar	2 mesial canals 40%, 1 foramen 35%
	1 canal 25%
	1 distal canal 92%
	2 canals, 1 foramen 5%
	2 canals, 2 foramina 3%
	Can have a C-shaped distal canal

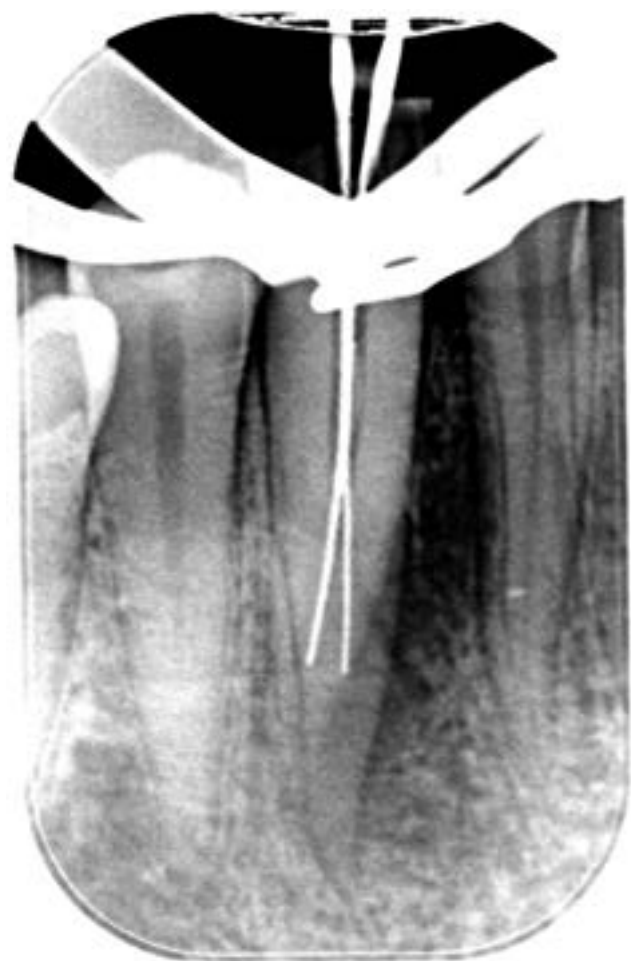














BES Case Assessment Tool

The BES EndoApp is a web-based case difficulty assessment tool designed to help assess the risks and difficulties of a particular case that requires non-surgical endodontic treatment.

It was developed from the original version of EndoApp*.

The algorithm takes into account various tooth and patient factors relevant to the complexity of a case. A score is generated which suggests the most appropriate management route. The user can then decide as to whether to manage the case or refer onwards.

The BES EndoApp is compatible on both desktop and mobile devices. Please follow the link below 'BES EndoApp' or QR code and choose to 'Bookmark' or 'Add to Home screen' for easier access.

[BES ENDOAPP](#)



*References



British
Endodontic
Society

EndoApp

The case difficulty assessment tool for endodontics

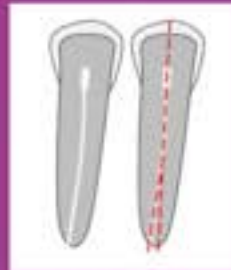
Developed by
PK Shah, Q Zhang & BS Chong.

Start

press Enter ↵

6 → Estimated curvature of the root (most curved): *

Based on radiographic assessment.



A Mild ($< 15^\circ$ curvature)



B Moderate (15-30° curvature)



C Severe (30-60° curvature)



D Exceptional ($> 60^\circ$ curvature, or S-shaped)

OK ✓

9 → What is the likely root-filling material present? *



A None/
Medicament



B Gutta percha



C Carrier device/
Silver point



D Other/ Mixed
(multi-root tooth)

OK ✓

British Endodontic Society

The treatment complexity score is 48. The expected level of difficulty is estimated to be **Very High** (≥ 25 units).

This case may be best managed by a **Specialist Endodontist**.

Where appropriate, a referral to a hospital-based **Restorative/Endodontic Consultant** may also be considered.

Thank you for using the BES EndoApp.
Please provide your feedback by clicking [here](#).

again



Stainless Steel Instruments





Hand Files

- 16 mm cutting blade
- .02 mm increase per mm
- % change of tip diameter of 10 to 15 is 50%
- 20 file 33% larger than a 15
- 55 file 10% larger than 50

Hand Files

- Size 10
- 16mm back
- $.02 \times 16 = .32$
- $.32 + .10 = .42$

.02 Taper

D0	.25
D1	.27
D2	.29
D3	.31
D4	.33
D5	.35
D6	.37
D7	.39
D8	.41
D9	.43
D10	.45
D11	.47
D12	.49
D13	.51
D14	.53
D15	.55
D16	.57

D0	.30
D1	.32
D2	.34
D3	.36
D4	.38
D5	.40
D6	.42
D7	.44
D8	.46
D9	.48
D10	.50
D11	.52
D12	.54
D13	.56
D14	.58
D15	.60
D16	.62

D0	.35
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D15	.65
D16	.67

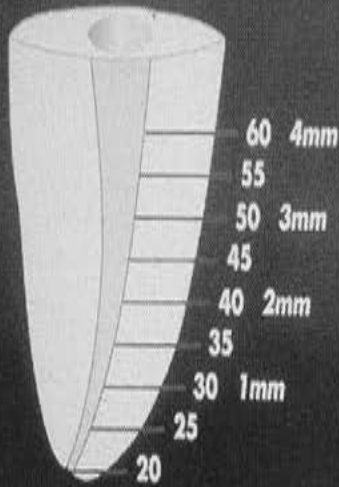
D0	.40
D1	.42
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D3	.46
D4	.48
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D8	.56
D9	.58
D10	.62
D11	.64
D12	.66
D13	.68
D14	.70
D15	.72
D16	.74

D0	.55
D1	.57
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D3	.61
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D6	.67
D7	.69
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D10	.75
D11	.77
D12	.79
D13	.81
D14	.83
D15	.85
D16	.87

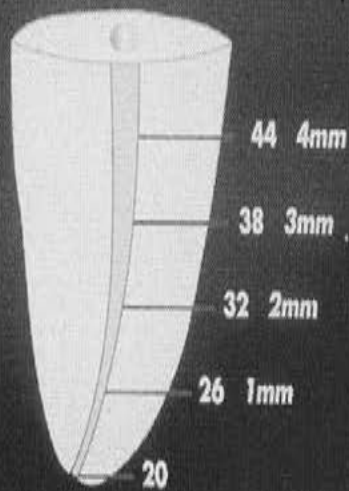
D0	.60
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D2	.64
D3	.66
D4	.68
D5	.70
D6	.72
D7	.74
D8	.76
D9	.78
D10	.80
D11	.82
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D13	.86
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D15	.90
D16	.92

APICAL SHAPE vs FILE TAPER

.02 TAPER

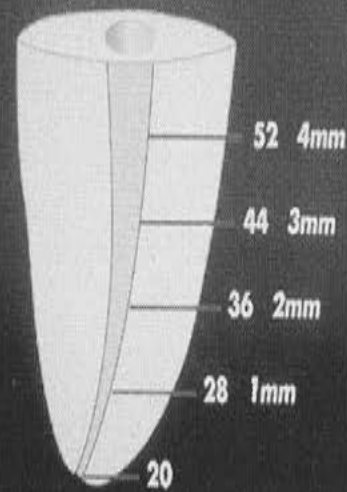


.06 TAPER



APICAL SHAPE vs FILE TAPER

.08 TAPER



.10 TAPER

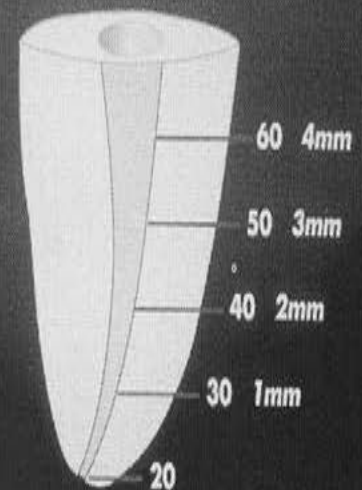


Fig. 8-47 Comparison of apical shape and file taper. **A**, Note that 0.02 tapered instruments used in a step-back manner can create a 10% taper. **B**, Note the differences in diameters at similar levels between preparations.

U.S. Custom Table

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Files and Reamers

- Reamers lack flexibility in large sizes
- K files less risk of torsional fracture
- Flexible K files
- Hedstrom files cuts on withdraw
- S files

Gates Glidden Burs Pesso Reamers



Problems with Stainless Steel Files

- Difficult to clean and shape narrow canals
- Files .02 taper (.02 for every 1mm)
- During preparation more of each instrument becomes engaged

Problems with Stainless Steel Files

- Canal transportation
- Ledges
- Zips
- Danger areas

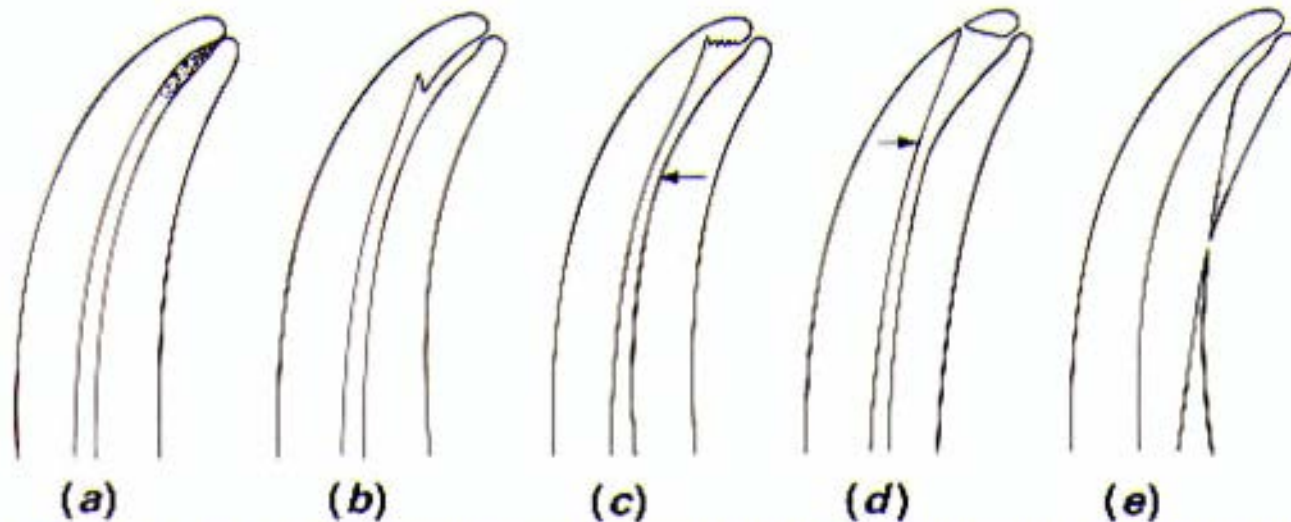
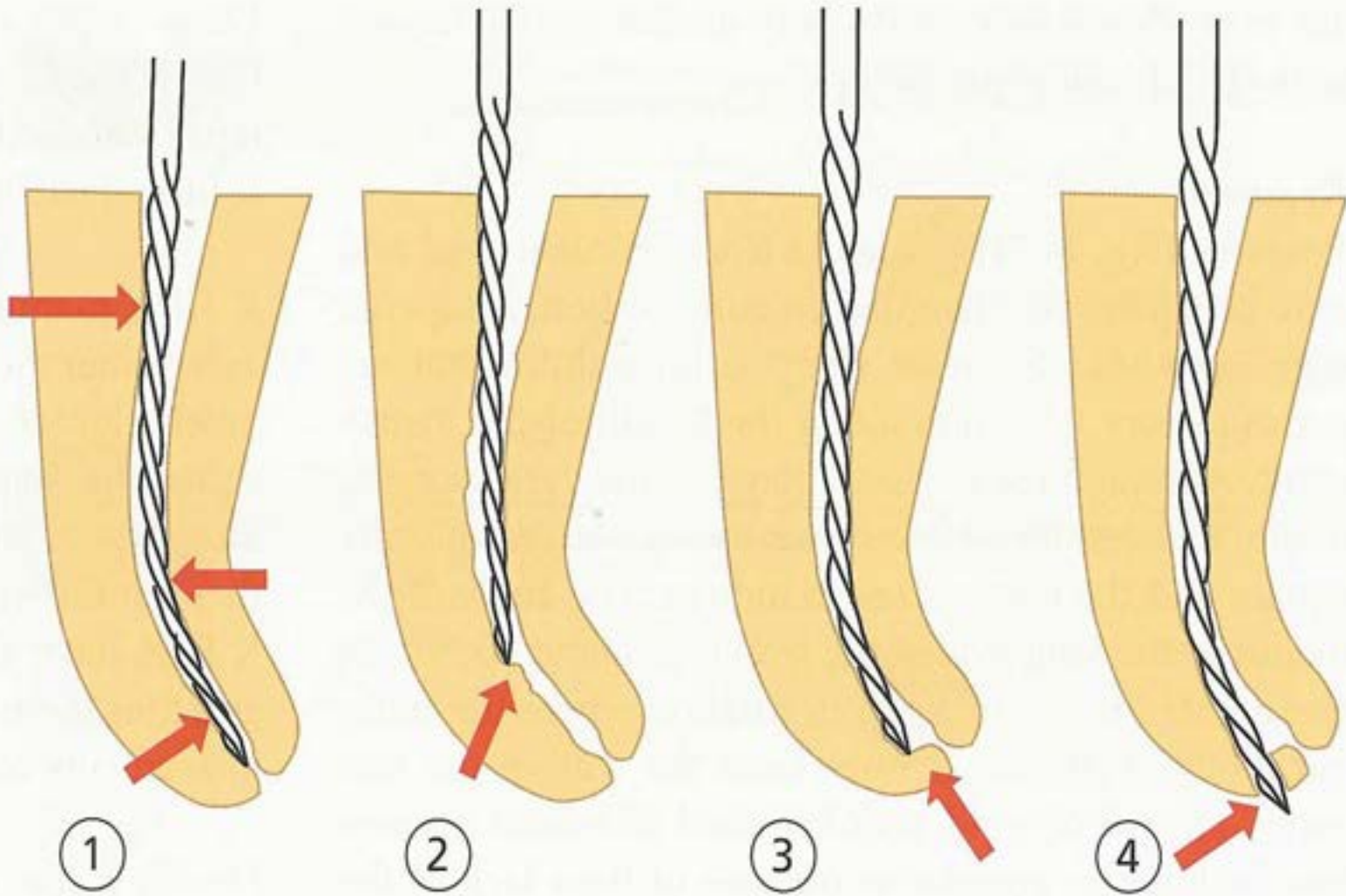


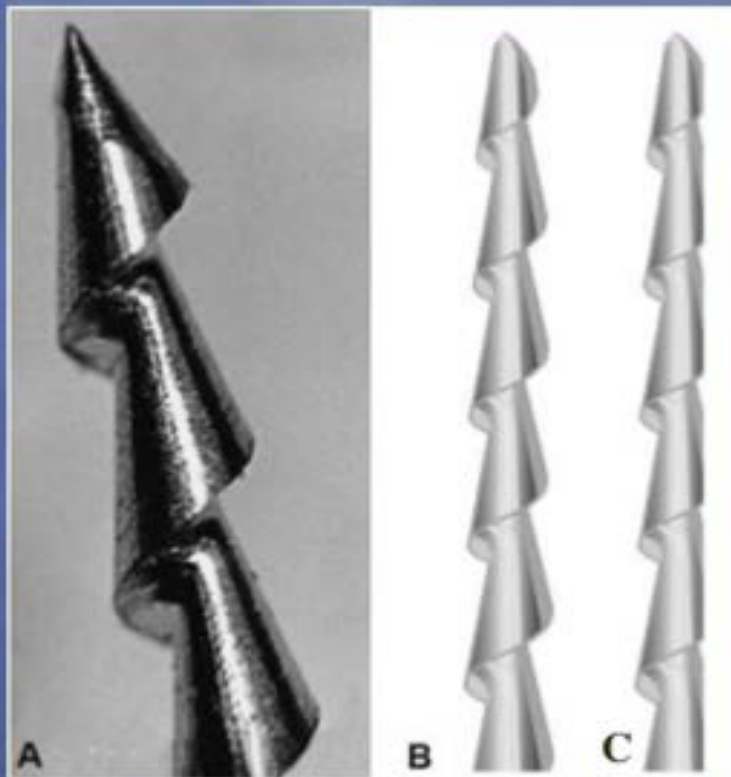
Fig. 2 Common errors in the preparation of curved canals. (a) Dentine debris packed into the apical part of the canal resulting in loss of working length. This may be prevented by recapitulation and copious irrigation. (b) Ledging due either to not precurving the instrument or forcing it into the canal. (c) Apical zip caused by not precurving the instrument or using a master apical file which is too large. Note the narrower part of the canal in (c) and (d) which is termed an elbow (*arrow*). This makes obturation of the root canal very difficult in the apical widened area. (d) Perforation due to persistent filing with too large an instrument. (e) Strip perforation caused by over preparing and straightening the curved canal.



Filing Techniques

- Watch Winding
- Circumferential
- Balance Force
- Pull Motion

- Buchanan has further modified the Hedstroem file, the **Safety Hedstrom file** (Sybron Endo/Kerr), which has a noncutting side to prevent ledging in curved canals.



A. H-style instruments resembling a wood screw.

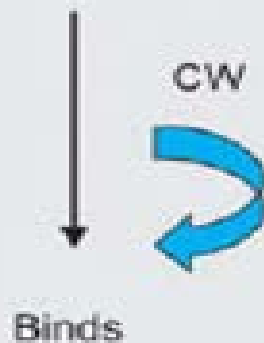
B. Modified Hedstroem file (left) with non-cutting tip

C. "Safety" Hedstroem (right) with flattened non-cutting side to prevent "stripping".



Balanced force technique

Insert file and engage
CW into the dentin
 $\frac{1}{4}$ turn



With continued pressure,
go CC $\frac{1}{2}$ turn to strip the
dentin away

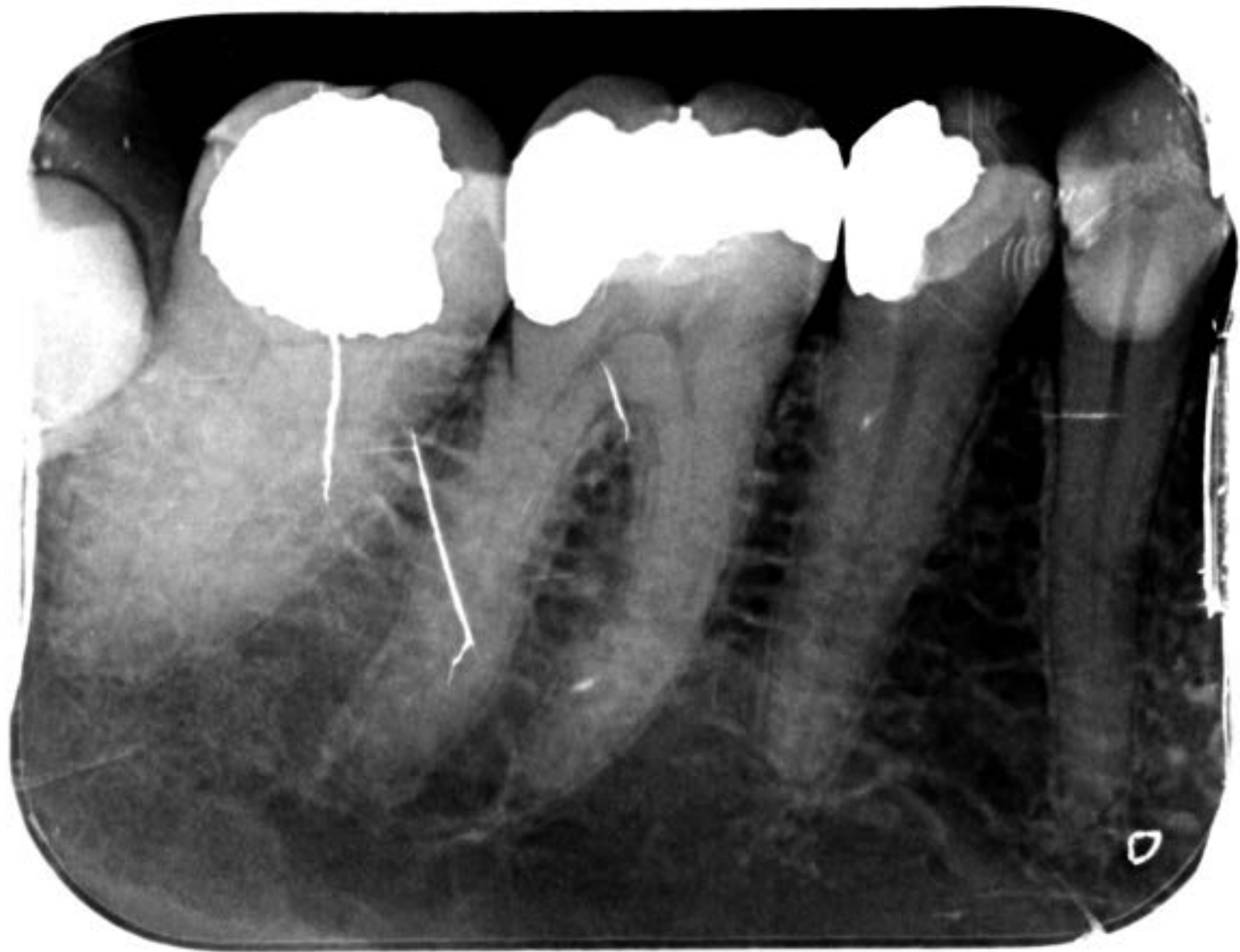


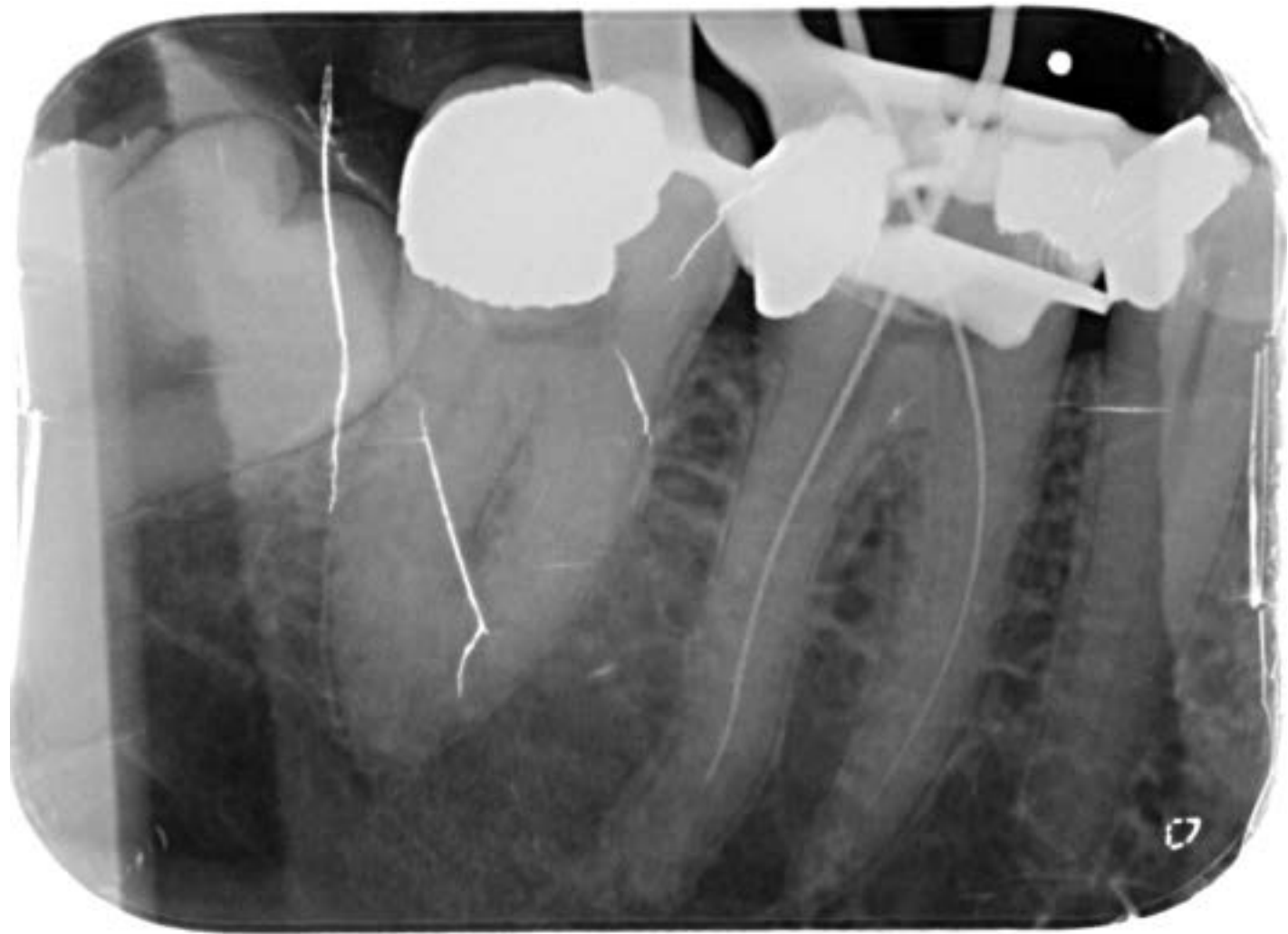
Do this 1 to 3 times
before removing the file
to remove debris and
check the file

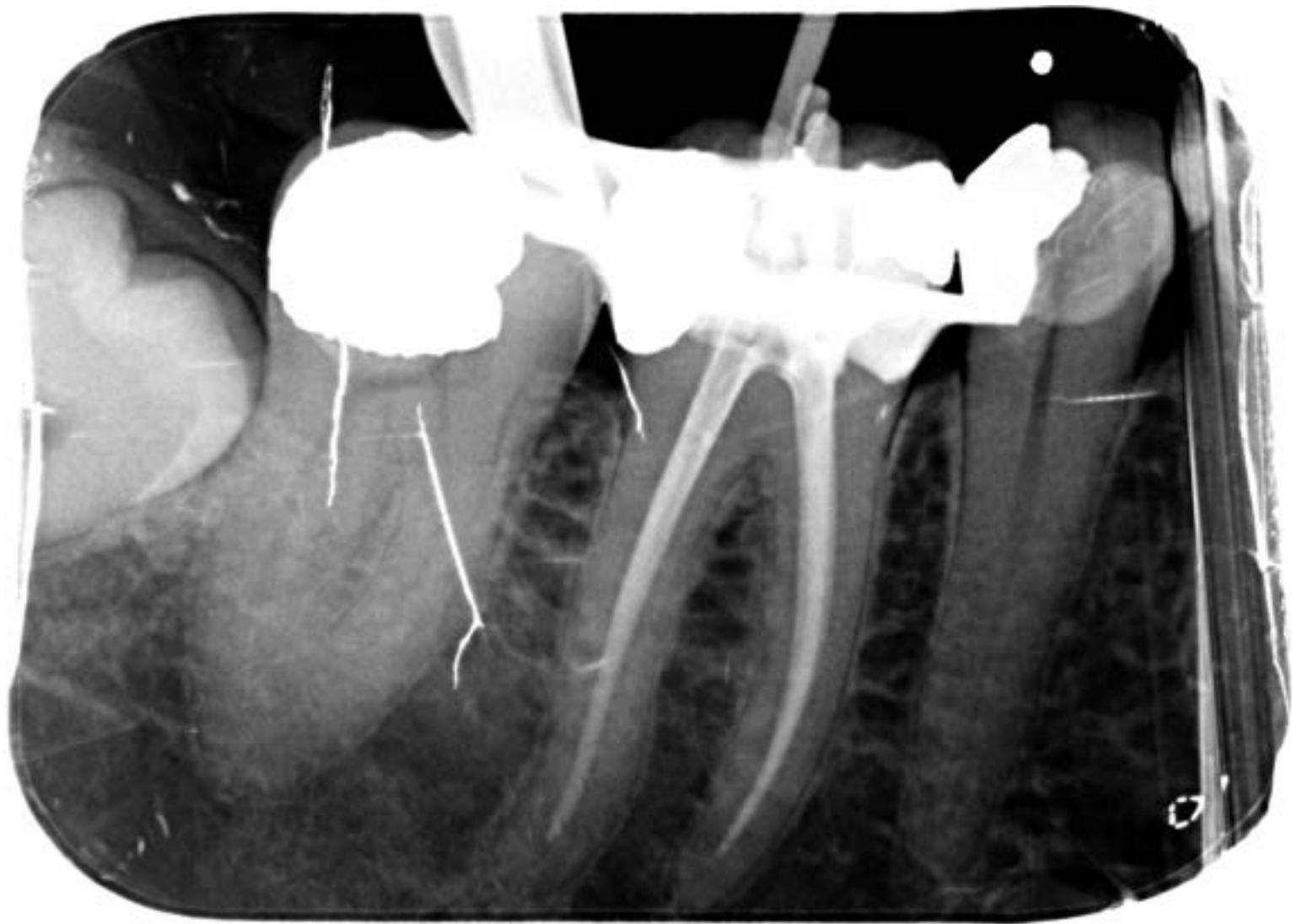
Remove
Clean
Reintroduce, working
your way to WL

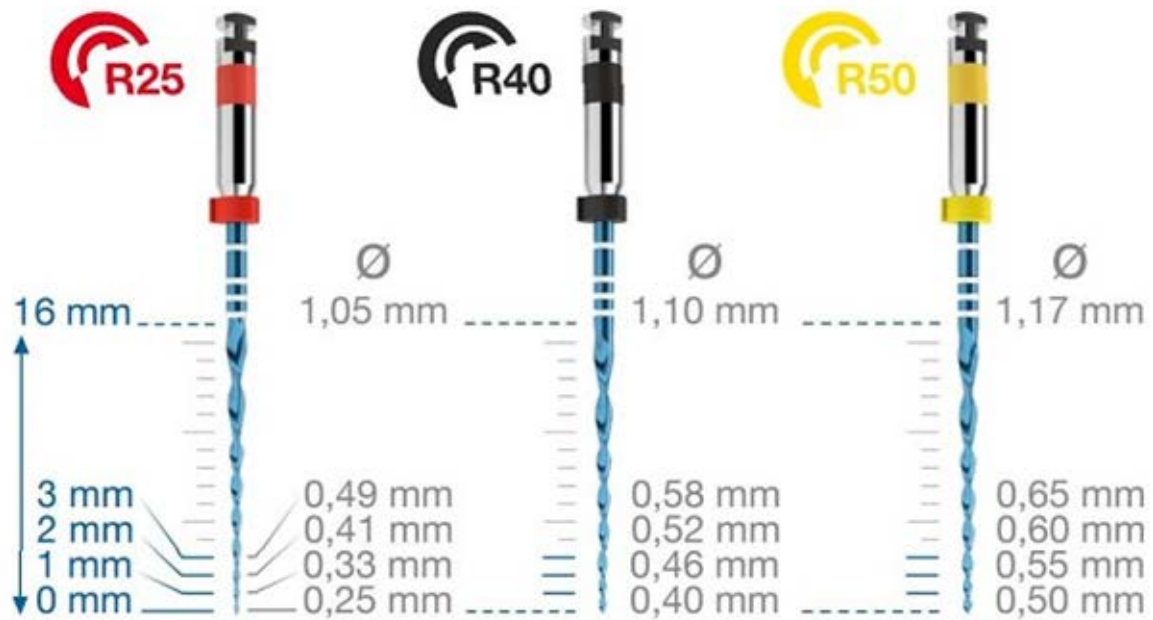












Narrow canals



Medium canals



Large canals



R60

RECIPROC® Gutta-Percha
Bills • cones • points • puritas • conis
-- 28 mm length

- Precise fit to canals shaped with RECIPROC® NiTi instruments
- All cold and warm obturation techniques: α phase with low melting point
- Injection moulded

VDW Endo Easy Efficient®

R40

RECIPROC® Gutta-Percha
Bills • cones • points • puritas • conis
-- 28 mm length

- Precise fit to canals shaped with RECIPROC® NiTi instruments
- All cold and warm obturation techniques: α phase with low melting point
- Injection moulded

VDW Endo Easy Efficient®









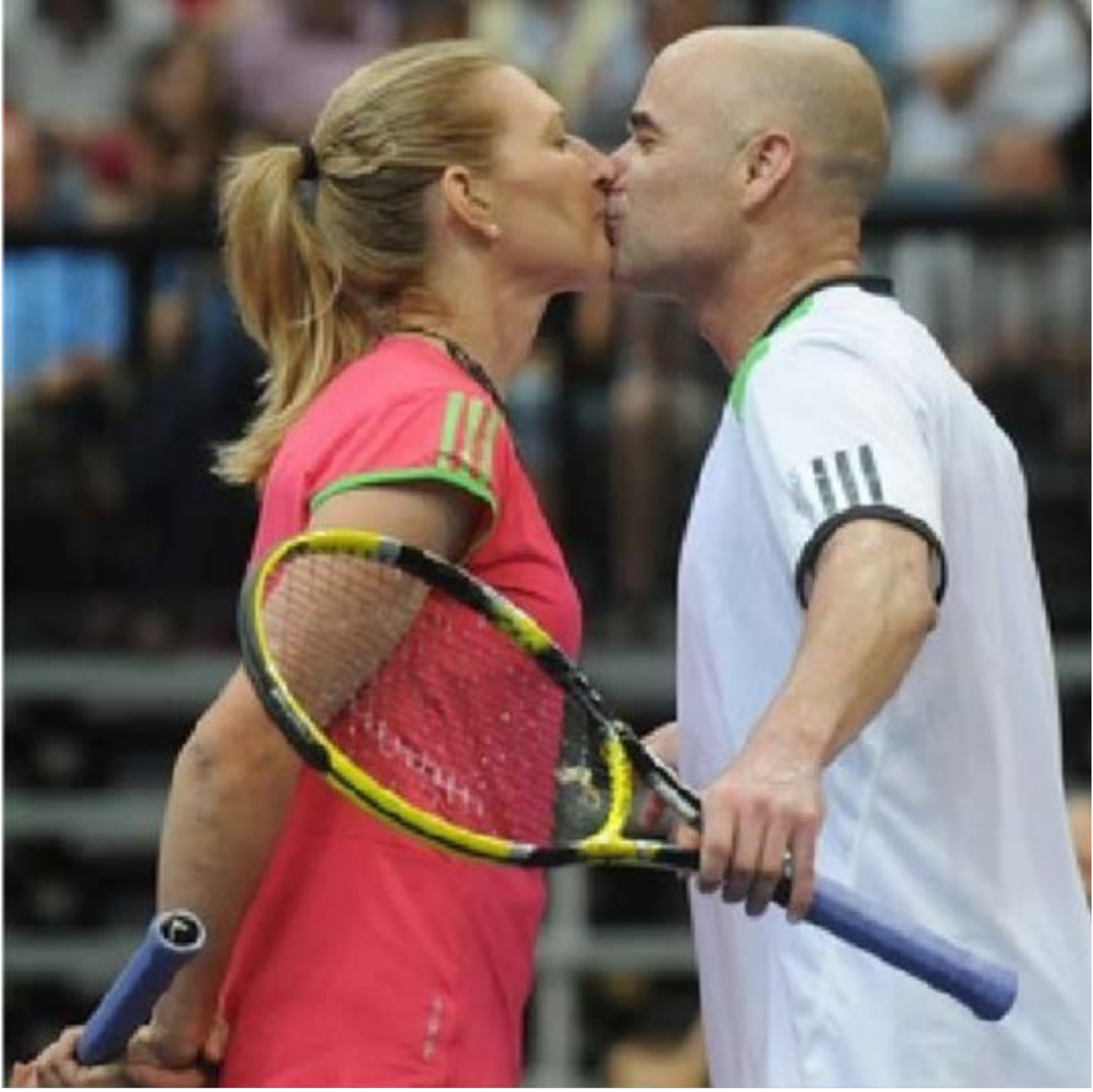


Click to **LOOK INSIDE!**

'A must-read for
anyone who
believes hardwork
will achieve success'
Duncan Bannatyne



Matthew Syed
Bounce
The myth of talent
and the power of practice













Experience

- Stress, psychological distress, burnout and perfectionism in UK dental students
- BDJ Nov 2020
- 35% maladaptive perfectionists





A microscopic view of a root canal. The canal is filled with a red material, likely a sealer, and is surrounded by a blue material, likely a core filling. The background is a solid purple color.

Modern Concepts in Endodontics

A guide to
**Good
Endodontic
Practice**



- Contents
- Foreword
- Preface
- Chapter 1
- Chapter 2
- Chapter 3
- Chapter 4
- Chapter 5
- Chapter 6
- Chapter 7
- Chapter 8
- Chapter 9

■ First edition September 2022

Edited by Phillip L Tomsen





Types of Sealant

- **BIOCERAMICS**
- Zinc oxide/eugenol
- Calcium hydroxide
- Silicone
- Glass ionomer
- Epoxy
- Methylacrylate

Bioceramic Sealers

- Calcium Silicate
- MTA

Calcium Silicate



Calcium Silicate

MD dentistry
MINOR DENTISTRY

designed for dentists

One-Fil[®]

Bioceramic Sealer

Contents:
#502 One-Fil 2g x 1 syringe
Disposable tips

White color
Insolubility
Setting time: within 3 hours
High radiopacity: X 2mm
Adequate flowability: 20mm/sy (1000Pa)

Antibacterial effect
Dimensional stability
Biocompatibility
Outstanding sealing property
Promoting hard tissue formation



Calcium Silicate



Calcium Silicate



Advantages of Bioceramic Sealers

- Biocompatible - Non toxic. Non shrinking. Chemically stable
- Great dentine adaptation-tubule penetration
- Chemical bond-form hydroxyapatite on setting causing bond to dentine
- Antibacterial- calcium hydroxide on setting high PH
- Osteo conductive- alkaline phosphatase, neutralizes lactic acid

11

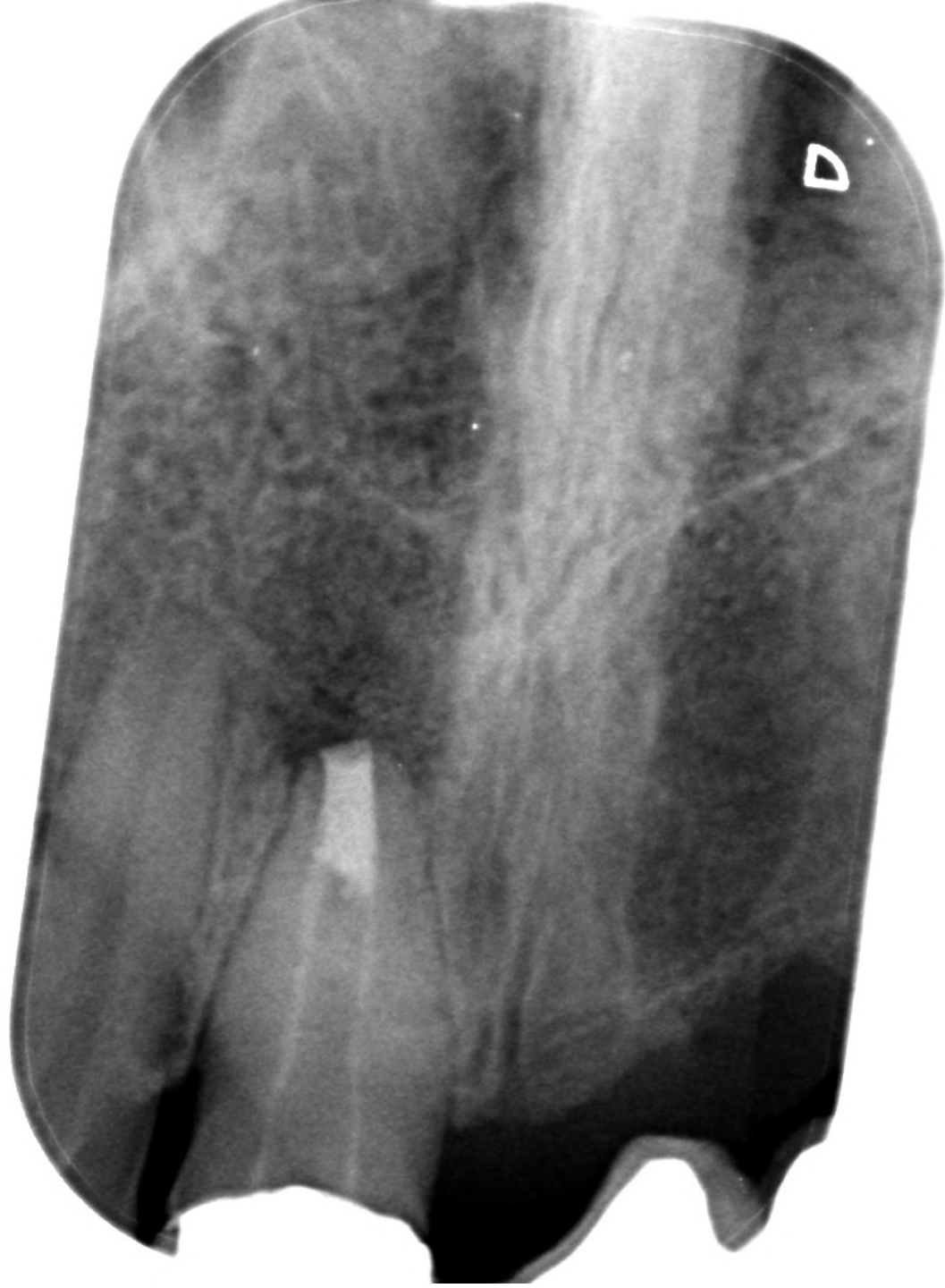
12



13

14







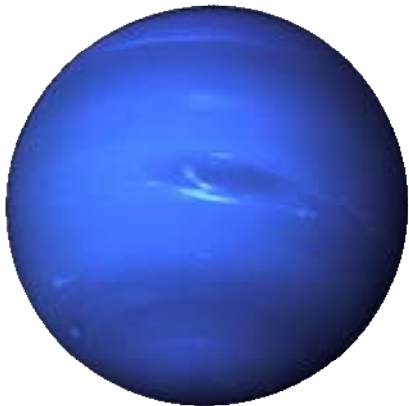
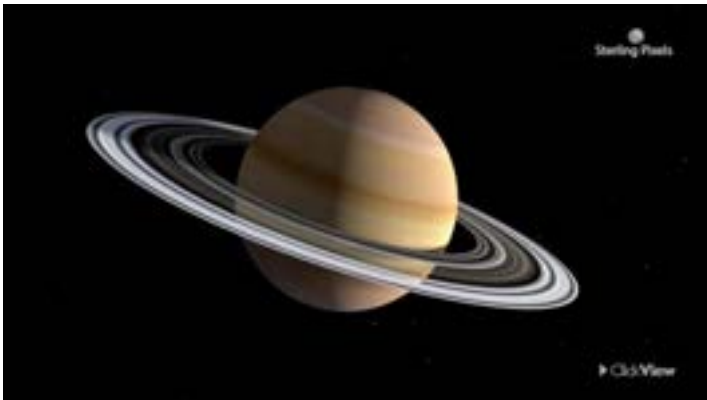


Functions of Sealants

- Seal - voids, accessory canals and multiple foramina
- Form a bond between filling material and wall canal
- Act as a lubricant when placing core root filling
- Entombing of any remaining bacteria

Rotary Nickel Titanium Instrumentation of Root Canals

- Nick Wright BDS FDSRCS
- Specialist in Endodontics



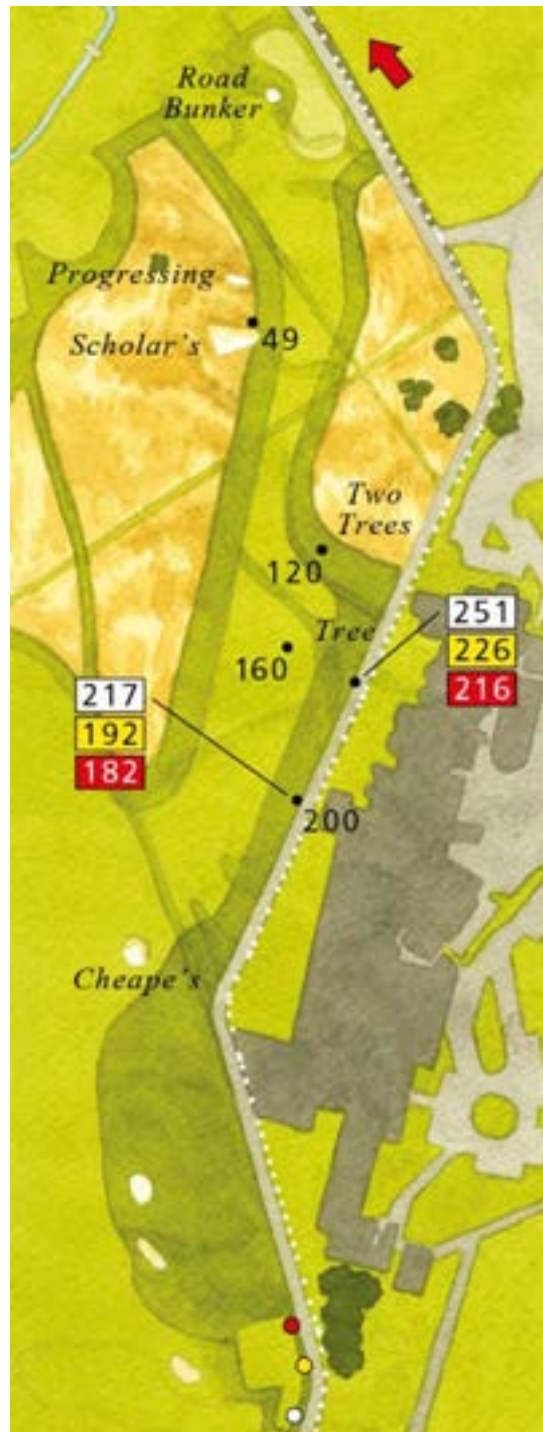
?

10,000 Hours of Practice

- 7 HOURS PER DAY CONSTANT ROOT CANAL TREATMENT
- 35 HOURS PER WEEK
- 140 HOURS PER MONTH
- 1820 HOURS PER YEAR

6 YEARS TO GET 10,000

hours of practice to become a world champion







septodont

Canal +

Gel pour l'alésage canalaire.

Gel para el ensachamiento canalar

Contenu : Seringue de 5 g + obturateur + 5 embouts.

Contenido : Jeringa de 5 g + tapon + 5 cánulas.

CE (0479)



SPÉCIALITÉS SEPTODONT

58, rue du Pont de Créteil.

94107 Saint-Maur-des-Fossés Cedex, France.

Tél. : 01 49 76 70 00



© Septodont S.A. - Tous droits réservés.
Distributeur : ...

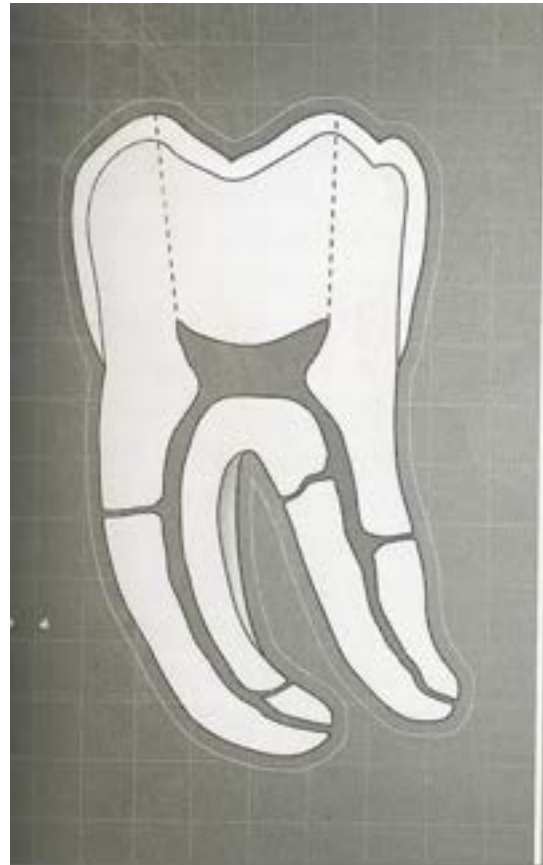


Max-I-Probe

- Dimensions
- 30 gauge needle
- Between size 30-35

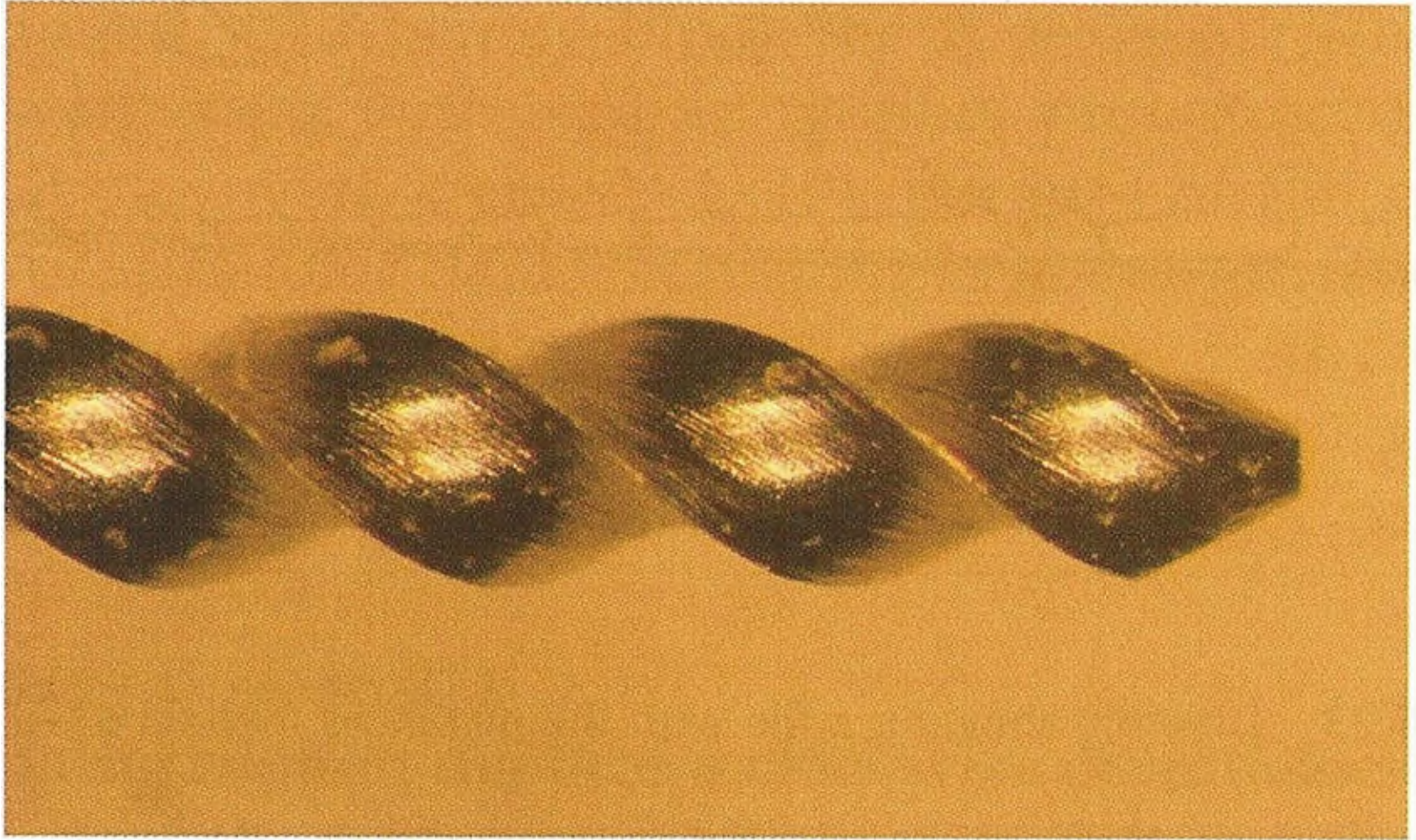


Root Canal Systems



Tooth morphology

- Crown 10 mm root length 9-15 mm
- Coronal 1/3 middle 1/3 apical 1/3



5.22 Non-cutting tip of hand instrument.



Cleaning Techniques

- Crown down
- Modified crown down

Coronal Enlargement

Straight line access

Better tactile control at apex

Hold greater volumes of irrigant

Stops inoculation of apical third

Apical third finishing

- Gain canal curvature
- Establish patency?
- Working length
- Gauge apical cross sectional diameter

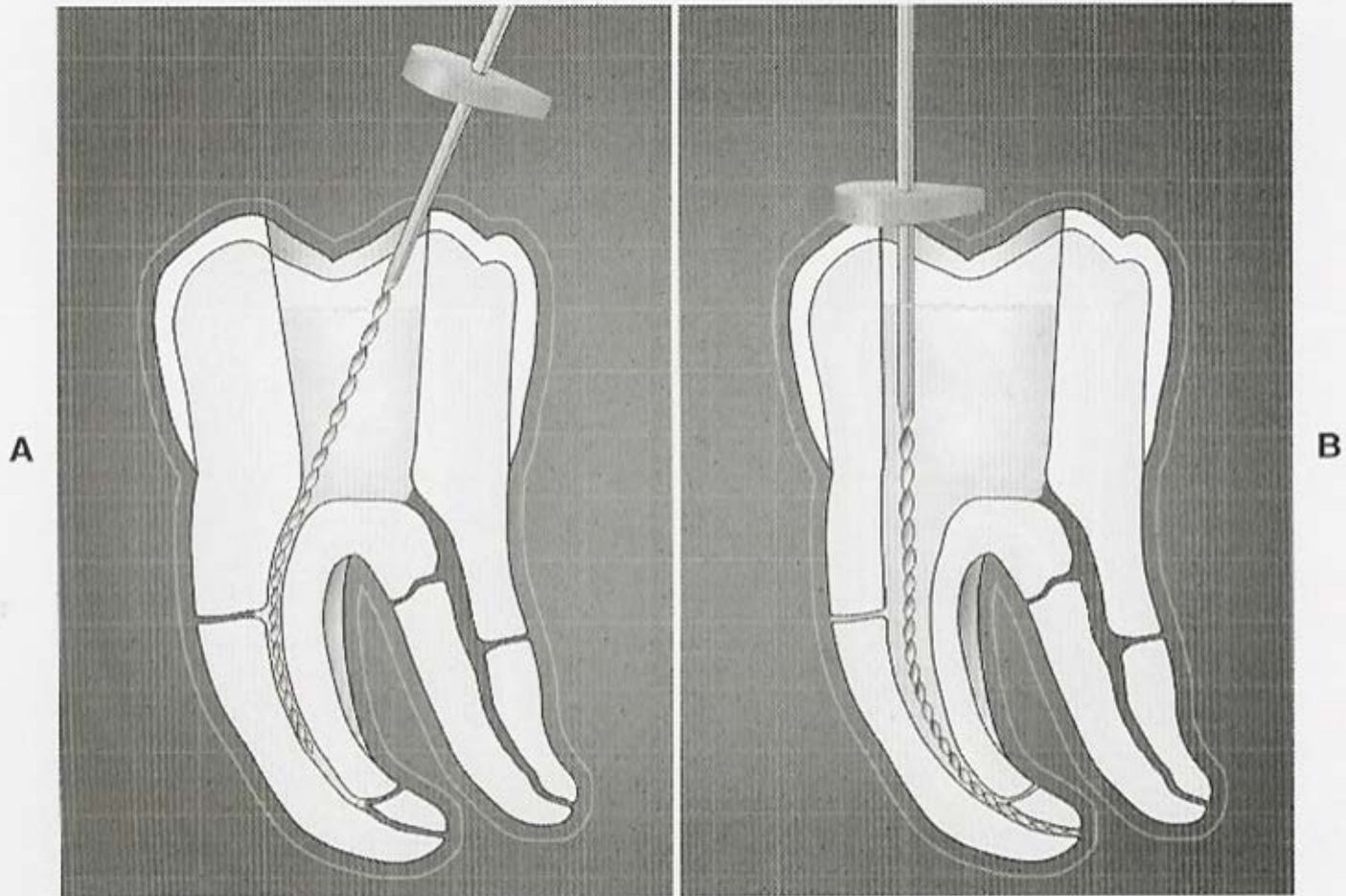


Fig. 8-58 **A**, Attempting to negotiate the canal when the handle of the file is off-axis because an inadequate access opening predisposes to iatrogenic mishaps. **B**, Expanding the access cavity in conjunction with preenlarging the coronal two thirds of the canal uprights the file and encourages it to slide to length.

Core concept 16.2

The step-down technique

- Provides less risk of extrusion of pulp debris, irrigant solution and dentine mud because there is less hydrostatic pressure generated in an apical direction.
- Reduces the risk of inoculation of endodontic pathogens into the periradicular tissues (15) because there is a marked tendency for the majority of microorganisms to be in the coronal part of the root canal system (44).
- Provides less likelihood for a change of the working length measurement during preparation.
- Facilitates adequate penetration of irrigant into the root canal system.
- Prevents binding of instruments except in the apical flutes, reduces the stress placed on the instrument and results in less risk of preparation errors such as zipping.









Techniques of shaping

Approach	Author(s)
Standardized technique	Ingle (1961)
Step-back technique	Clem (1969)
Circumferential filing	Lim & Stock (1987)
Incremental technique	Weine et al. (1970)
Anticurvature filing	Abou-Rass et al. (1980)
Step-down technique	Marshall & Papin (1980)
Step-down technique	Goerig et al. (1982)
Double flare technique	Fava (1983)
Crown-down-pressureless technique	Morgan & Montgomery (1984)
Balanced force technique	Roane et al. (1985)
Canal Master technique	Wildev & Senia (1989)
Apical box technique	Tronstad (1991)
Progressive enlargement technique	Backman et al. (1992)
Modified double flare technique	Saunders & Saunders (1992)
Passive stepback technique	Torabinejad (1994)
Alternated rotary motions-technique (ARM)	Siqueira et al. (2002)
Apical patency technique	Buchanan (1989)





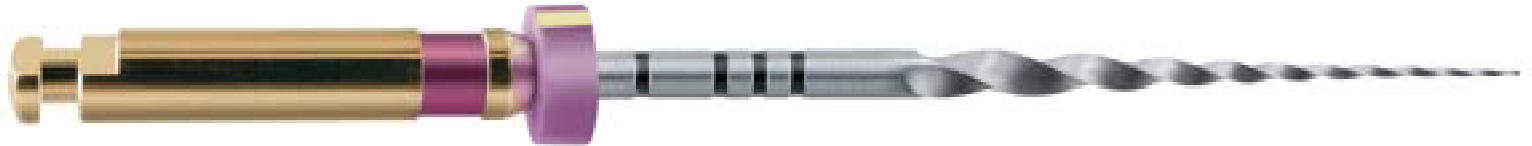
New Concepts in Endodontics

Nick Wright BDS FDSRCS

Specialist In Endodontics

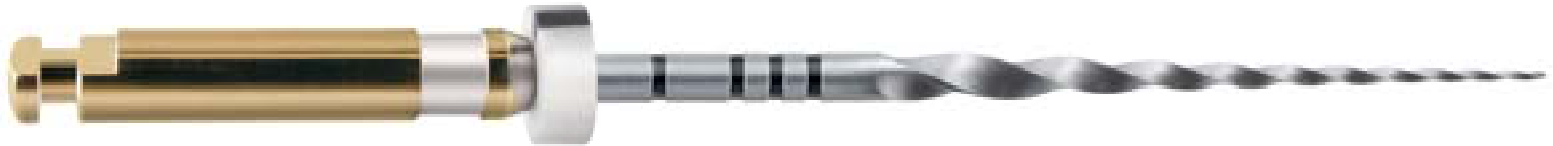


ProTaper S1



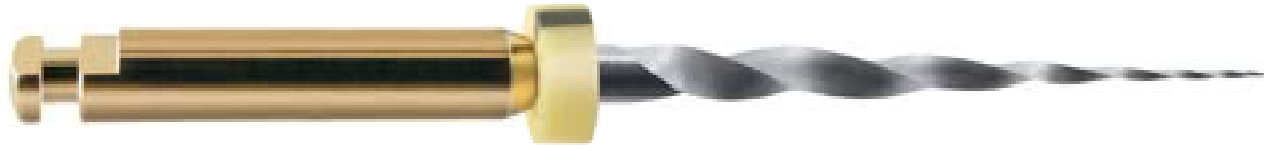
- Tip size 17

ProTaper S2



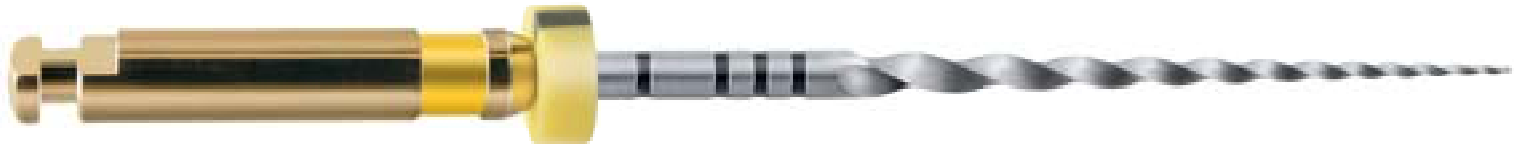
- Tip size 19

ProTaper SX



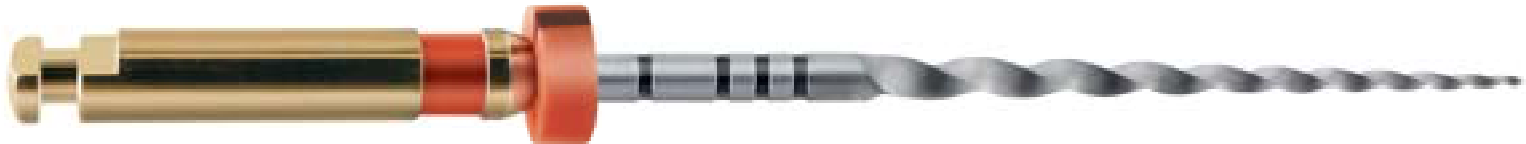
- Tip size 19

ProTaper F1



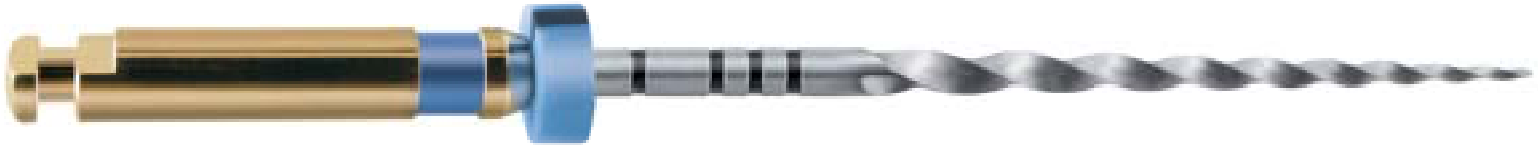
- Tip size 20
- Apical taper 7%

ProTaper F2



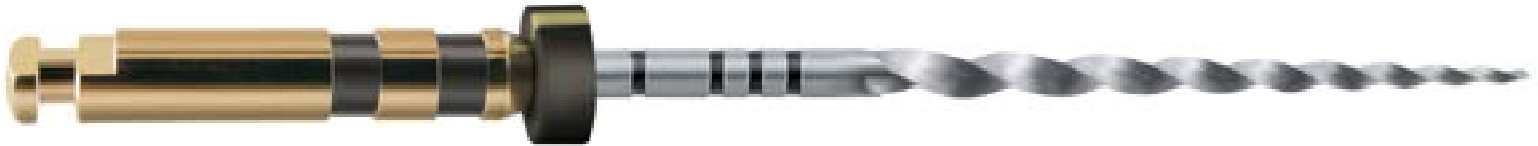
- Tip size 25
- Apical taper 8 %

ProTaper F3



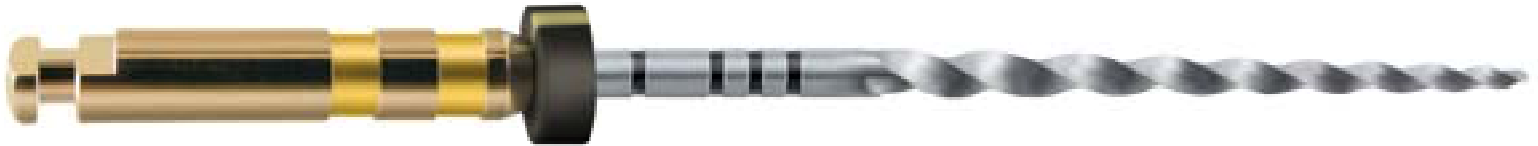
- Tip size 30
- Apical taper 9%

ProTaper F4



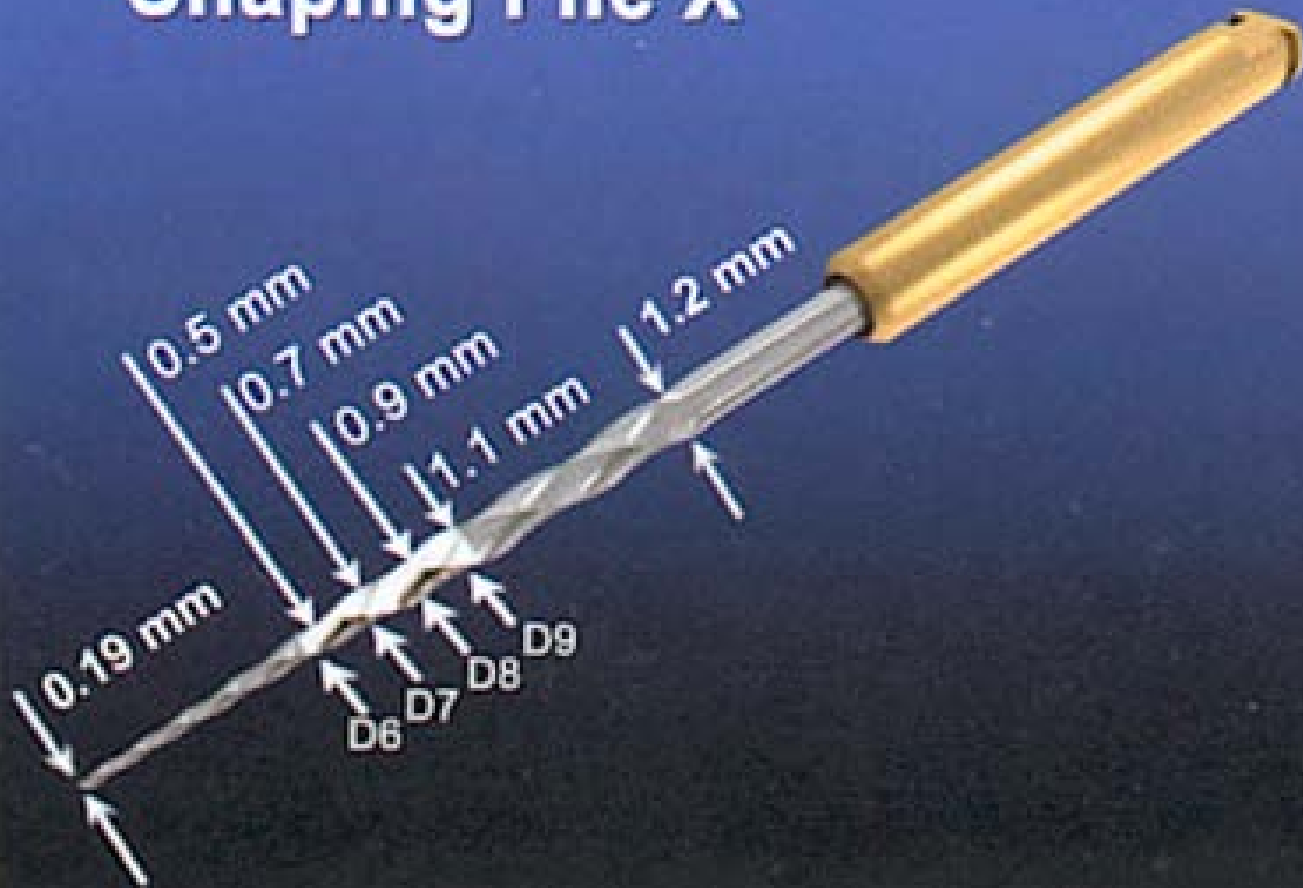
- Tip size 40
- Apical taper 6%

ProTaper F5



- Tip size 50
- Apical taper 5%

Shaping File X



Pro Taper Finishing F3



V Taper (H)		Ø Diameters	
0		0	30
1	.09	1	39
2	.09	2	48
3	.09	3	57
4	.07	4	64
5	.07	5	71
6	.05	6	76
7	.05	7	81
8	.05	8	86
9	.05	9	91
10	.05	10	96
11	.05	11	101
12	.05	12	106
13	.05	13	111
14	.05	14	116
15	.05	15	121
16	.05	16	126

PROTAPER NEXT Shape dimensions

PROTAPER
NEXT ROTARY FILES

	Taper mm	Active part lengths						Tip Ø
		16mm	13mm	9mm	6mm	3mm	1mm	
X1	6%	1.16	0.98	0.70	0.49	0.31	0.21	0.17
X2	4%	1.20	1.11	0.84	0.63	0.43	0.31	0.25
X3	5%	1.20	1.09	0.89	0.71	0.53	0.38	0.30
X4	4.5%	1.20	1.13	0.93	0.78	0.60	0.47	0.40
X5	4%	1.20	1.14	0.98	0.84	0.68	0.56	0.50

Apicectomy Case 1











Narrow canals



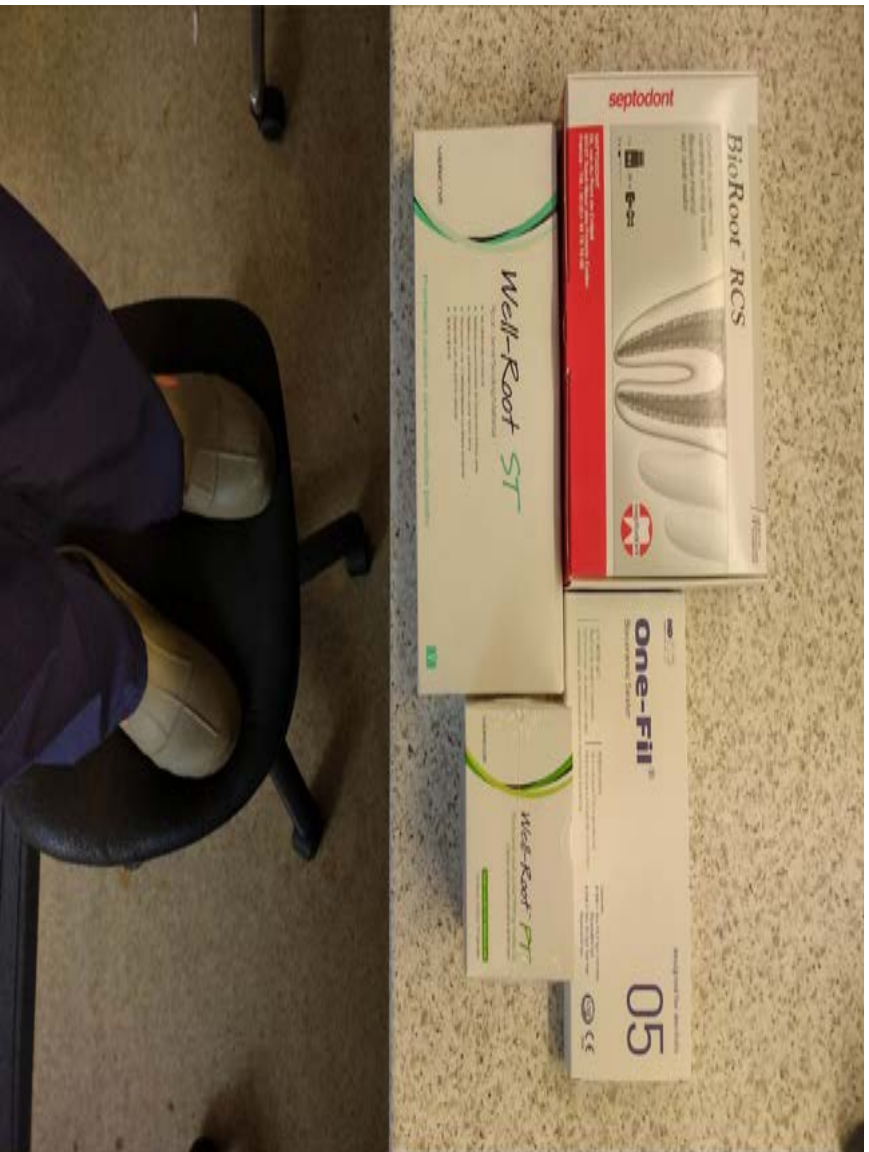
Medium canals



Large canals



- .02 .04 .06 Taper



wave•one®
GOLD



20/07
SMALL

25/07
PRIMARY

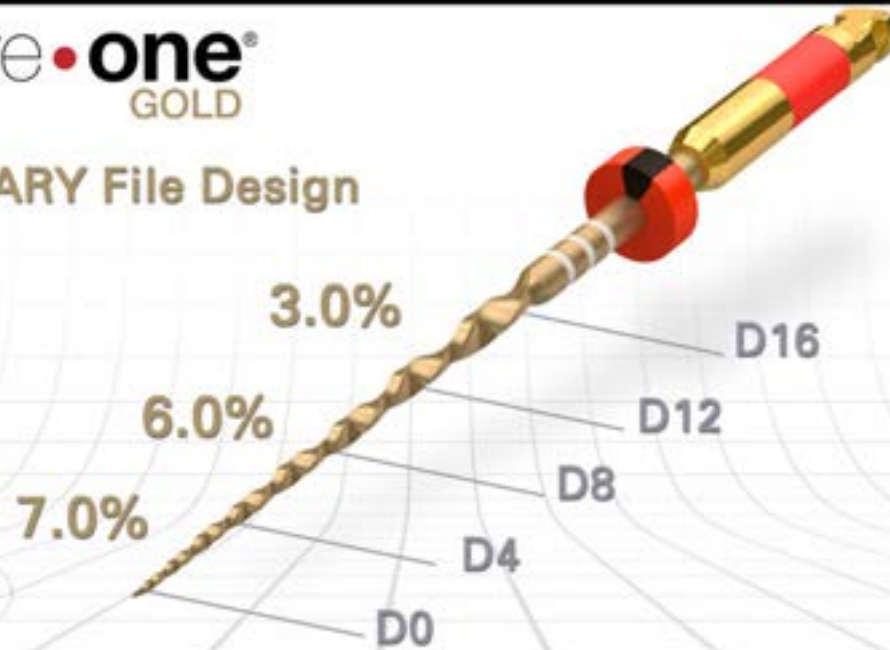
35/06
MEDIUM

45/05
LARGE




wave•one[®]
GOLD

PRIMARY File Design



Rev 08/18

 Dentsply
Sirona

WaveOne® Gold
Conform Fit™ Gutta-Percha

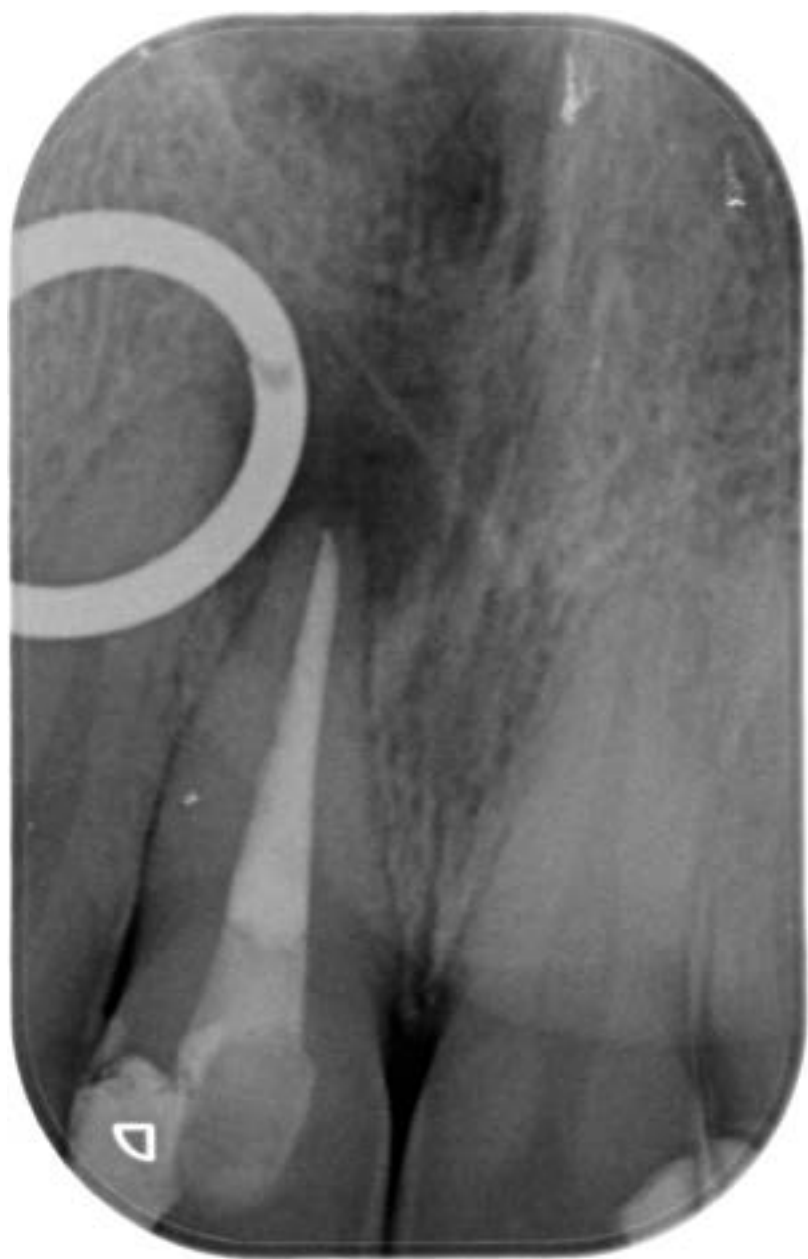
Obturation Points

60x Medium









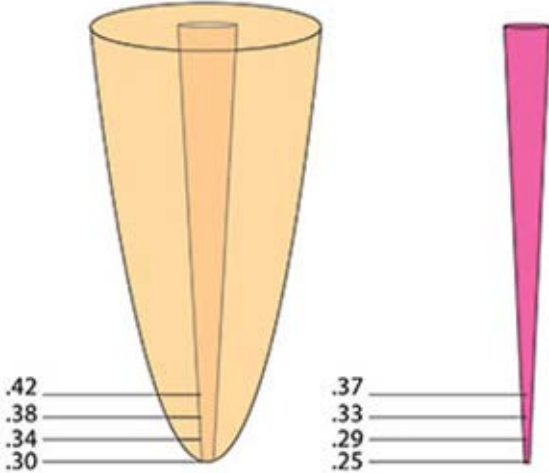






30/.04 Tapered Canal

25/.04 Tapered Point





25.04

VERICOM

Bioactive Ceramic embedded
Gutta Percha Points

Eazi-Endo™

Hand Rolled
60 Gutta Percha Points

CE 0120



Minimally Invasive Endodontics

- A New Diagnostic System for Assessing Pulpitis and Subsequent Treatment Needs
- Wolters, Duncan, Tomson, Karim, McKenna, Dorri, Stanvaltaite, and van de Sluis

Minimally Invasive Endodontics

- Irreversible pulpitis-- necrosis mainly in the coronal pulp not radicular

Minimally Invasive Endodontics

- Endolight—Pulpotomy
- Preserves immunological functions and tooth structure
- Simplifies treatment
- Causes little pain
- Reduces costs

Minimally Invasive Endodontics

- Initial Pulpitis
- Mild Pulpitis
- Moderate Pulpitis
- Severe Pulpitis

















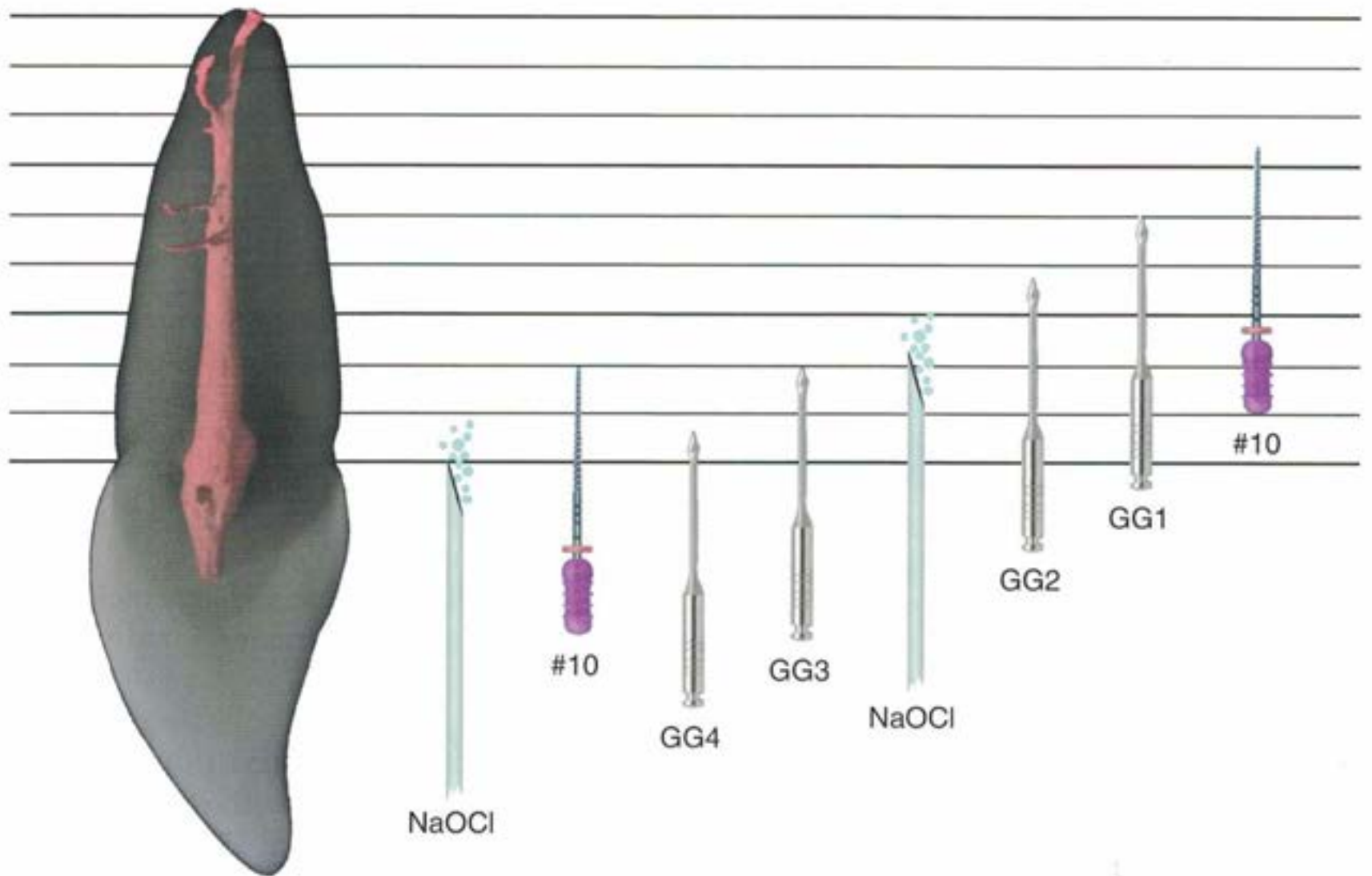


FIG. 6-34 Diagram of coronal enlargement in a maxillary anterior tooth. After preparation of the access cavity (see Fig. 6-32) and copious irrigation, Gates-Glidden burs are used in a step-down manner to enlarge the orifice and provide straight-line access into the middle third of the canal. Precurved size #10 K-files are used to explore the canal path and dimension.

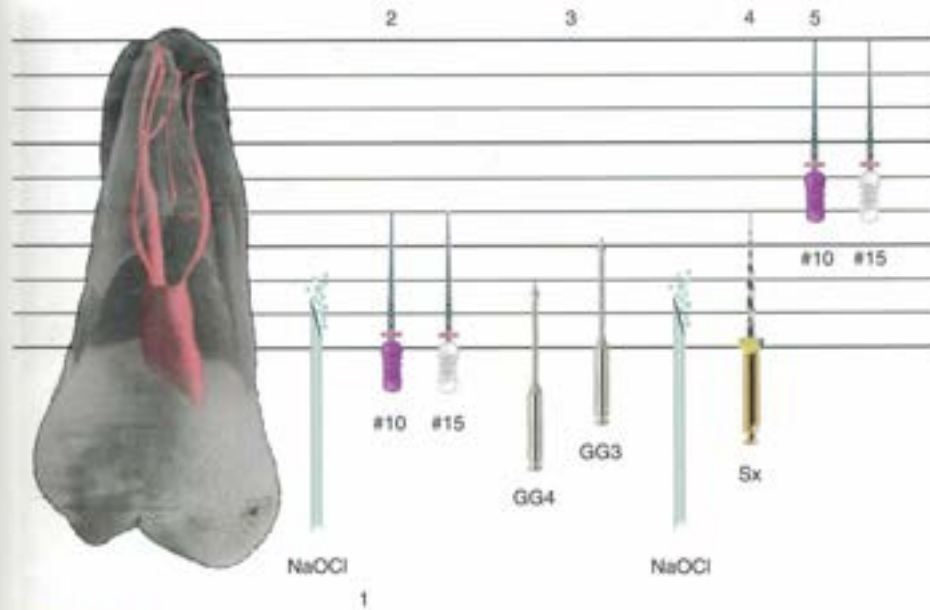


FIG. 6-48 Hybrid technique: Part I. After irrigation (1) and scouting (2), GG drills (3) or ProTaper SX files (4) are used for coronal preenlargement and to secure straight-line access to the middle third. Precurved K-files are then used to explore and determine the working length (5).

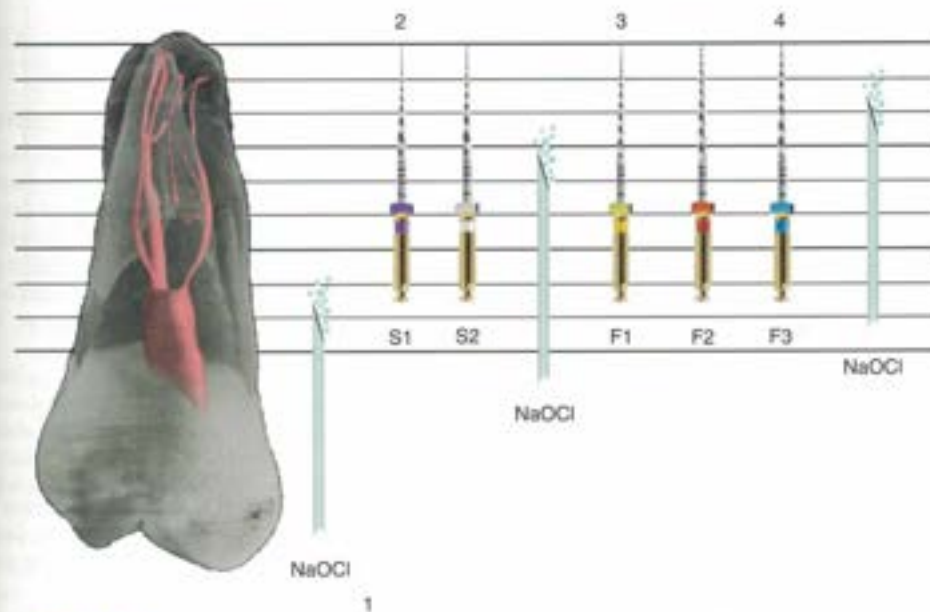
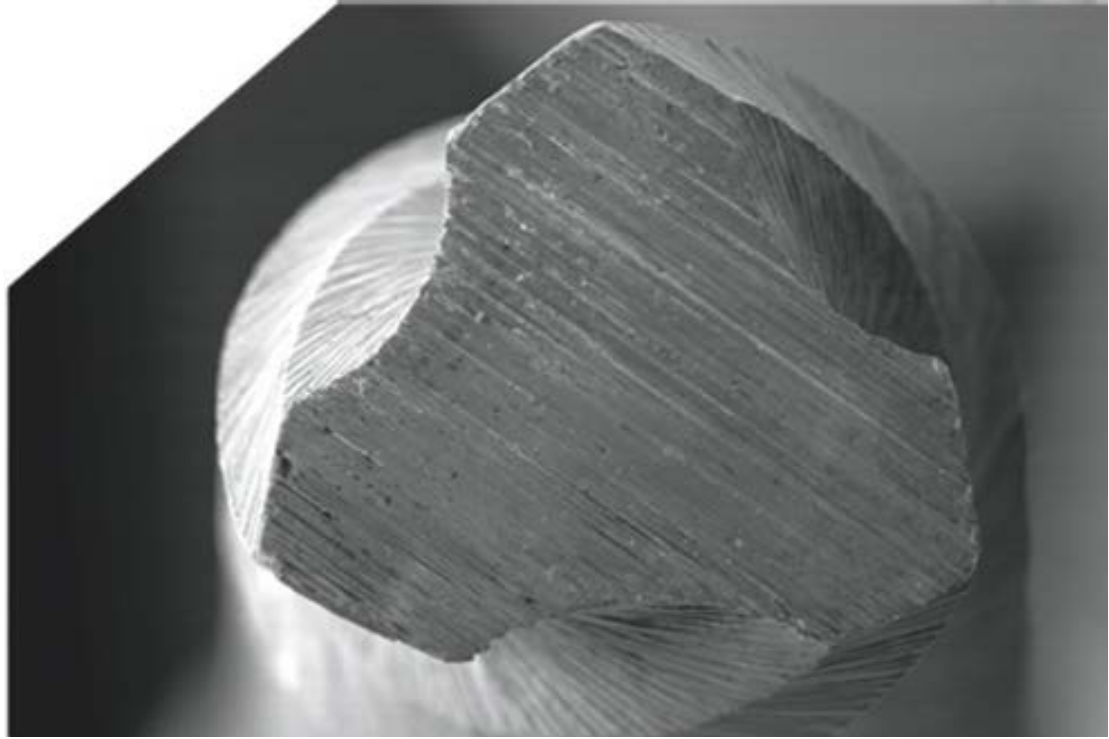


FIG. 6-49 Hybrid technique: Part II. In canal systems flooded with irrigant (1), ProTaper shaping instruments S1 and S2 (2) and then finishing instruments F1 and F2 (3) are used to preenlarge the apical third, allowing irrigants access to the canals. Finishing instrument F3 may be used if feasible (4).



Re RCT/ Healing

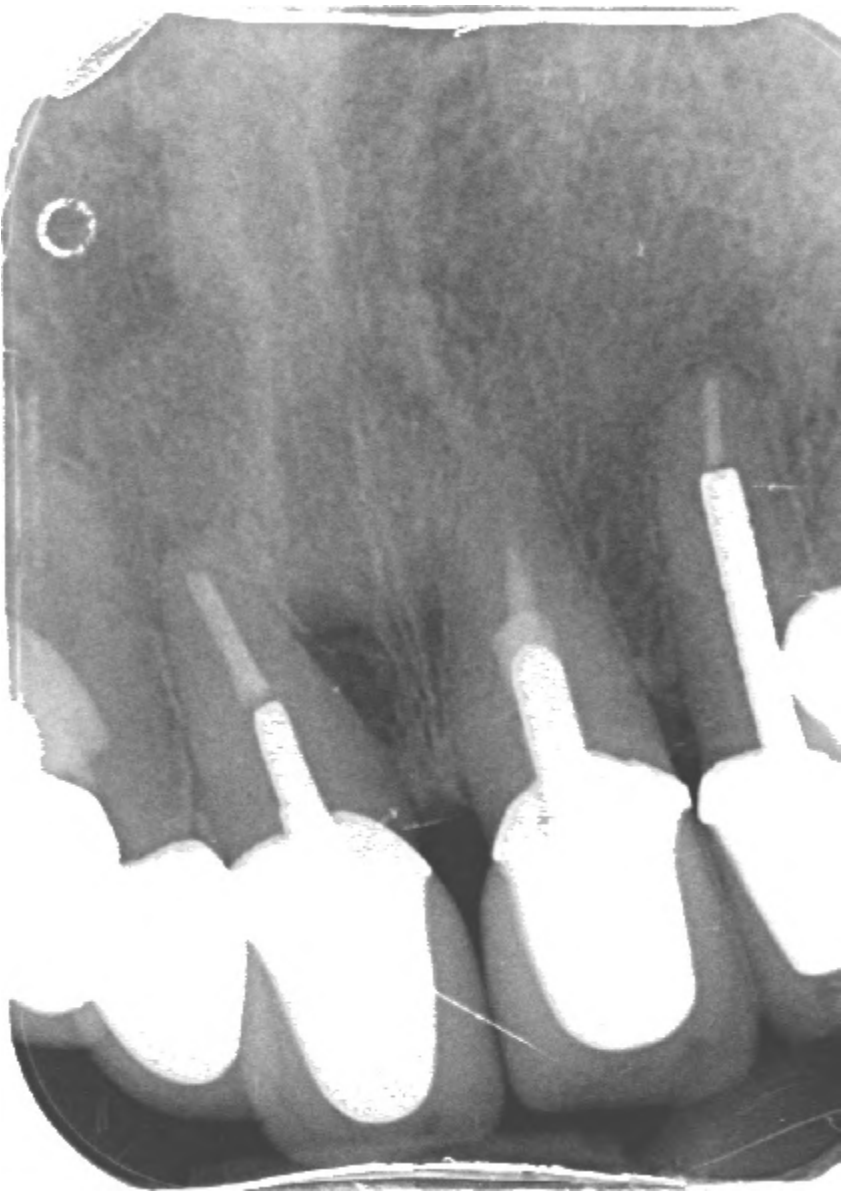


Nickel Titanium

- Files cut from blanks
- Retain flexibility in increased taper
- Taper 02-12 %

Properties of Nickel-Titanium

- Biocompatible
- Less resistance to Bending than stainless steel
- 2-3 times more flexible than stainless steel
- Hardly corrodes



Nickel-Titanium Alloy

- Nickel 55%
- Titanium 45%
- Shape memory alloy
- When subjected to 125 degrees C
- Super elastic - returns to original state when unloaded

Properties of Nickel-Titanium

Resistance to cyclic fatigue

- Allows files to be used in full rotation
- Cyclic fatigue study by Pruett size 30 and 40 Light speed instruments
- Torque load less than stainless steel
- Torsional overload instrument will fracture in 1/6 of a second

GT™ Files of Greater Taper™ **DENTSPLY**

6 Nickel Titanium Hand Files

Designed by Dr. L. Stephen Buchanan

Tip 20
Size .06-.12
25mm

 **CAUTION:** Do not use on curved or
bent teeth to avoid fracture of the root.

 Made in USA 2017 • DENTSPLY S.A.
DENTSPLY Inc. 36 Westway
Elkhart, IN 46517 USA

DENTSPLY
1-800-562-1500
DDE
1-800-597-2779
www.talchord.com

Stock No. GTA025

 **NON-RETURNALE IF SEAL IS BROKEN**



K-file NiTi

25 ————— 28

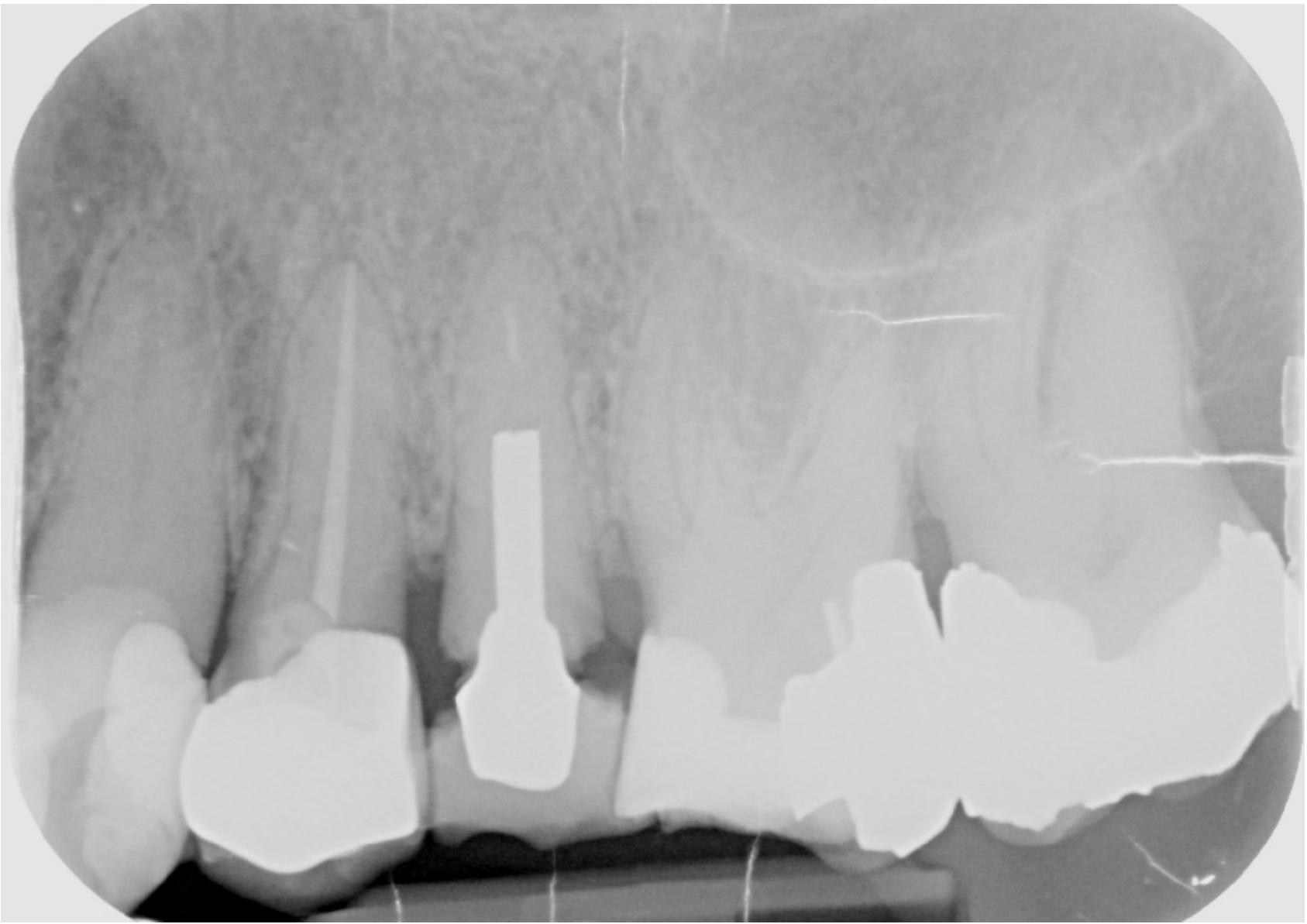
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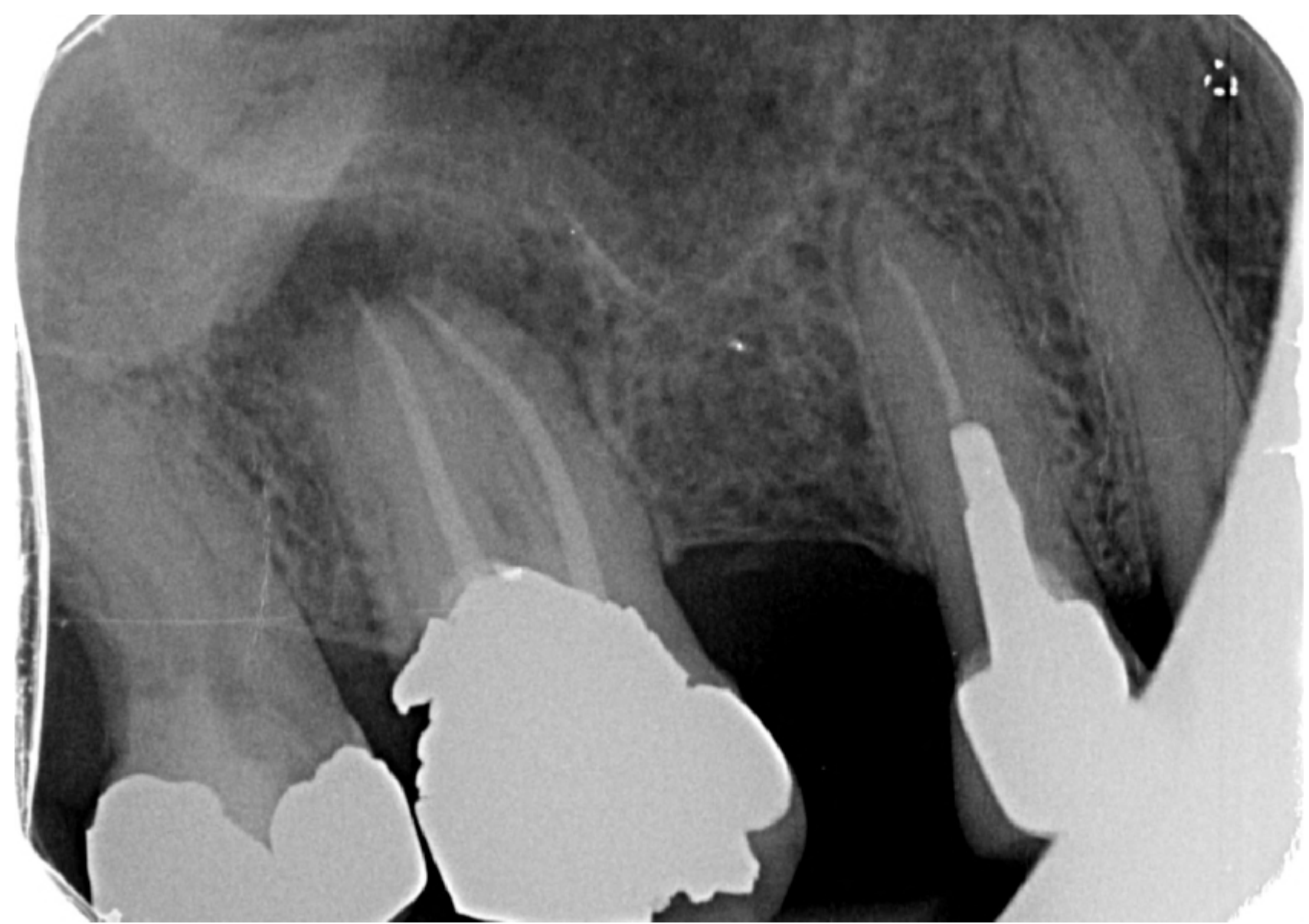
MEDIN
CZECH REPUBLIC

 0318

Changes of File Design with Ni-Ti Instruments

- Files of greater taper than .02
- Range .02-.12
- Tip design
- Radial lands
- Rake angle





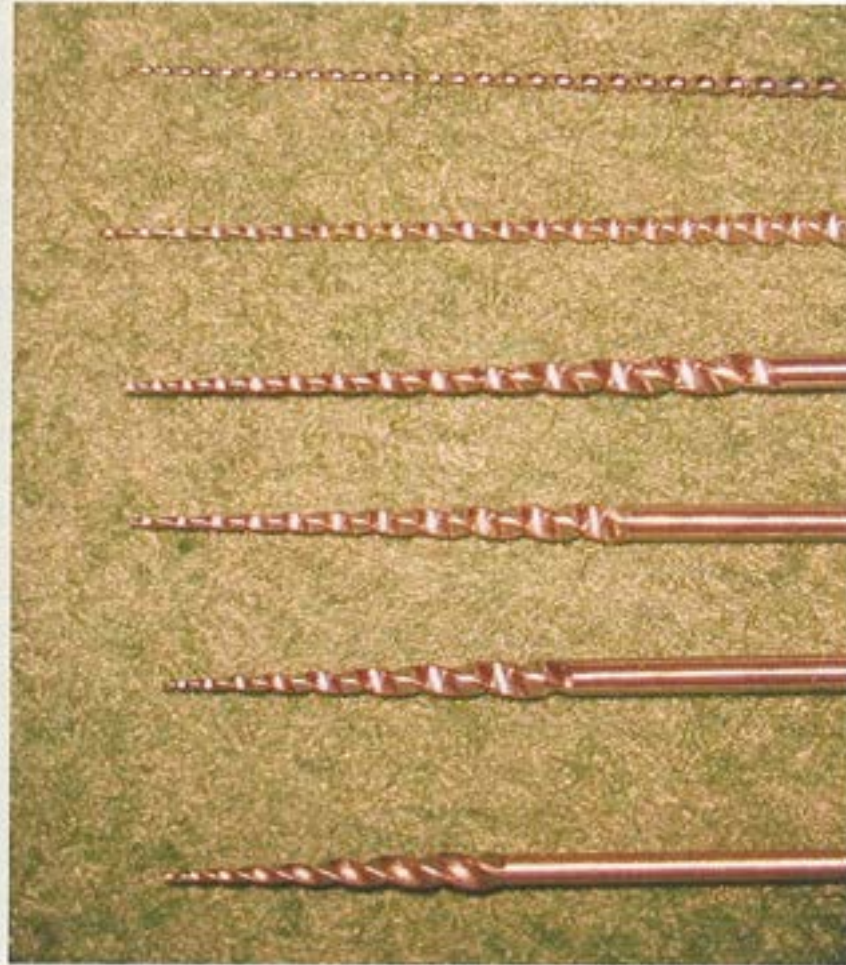


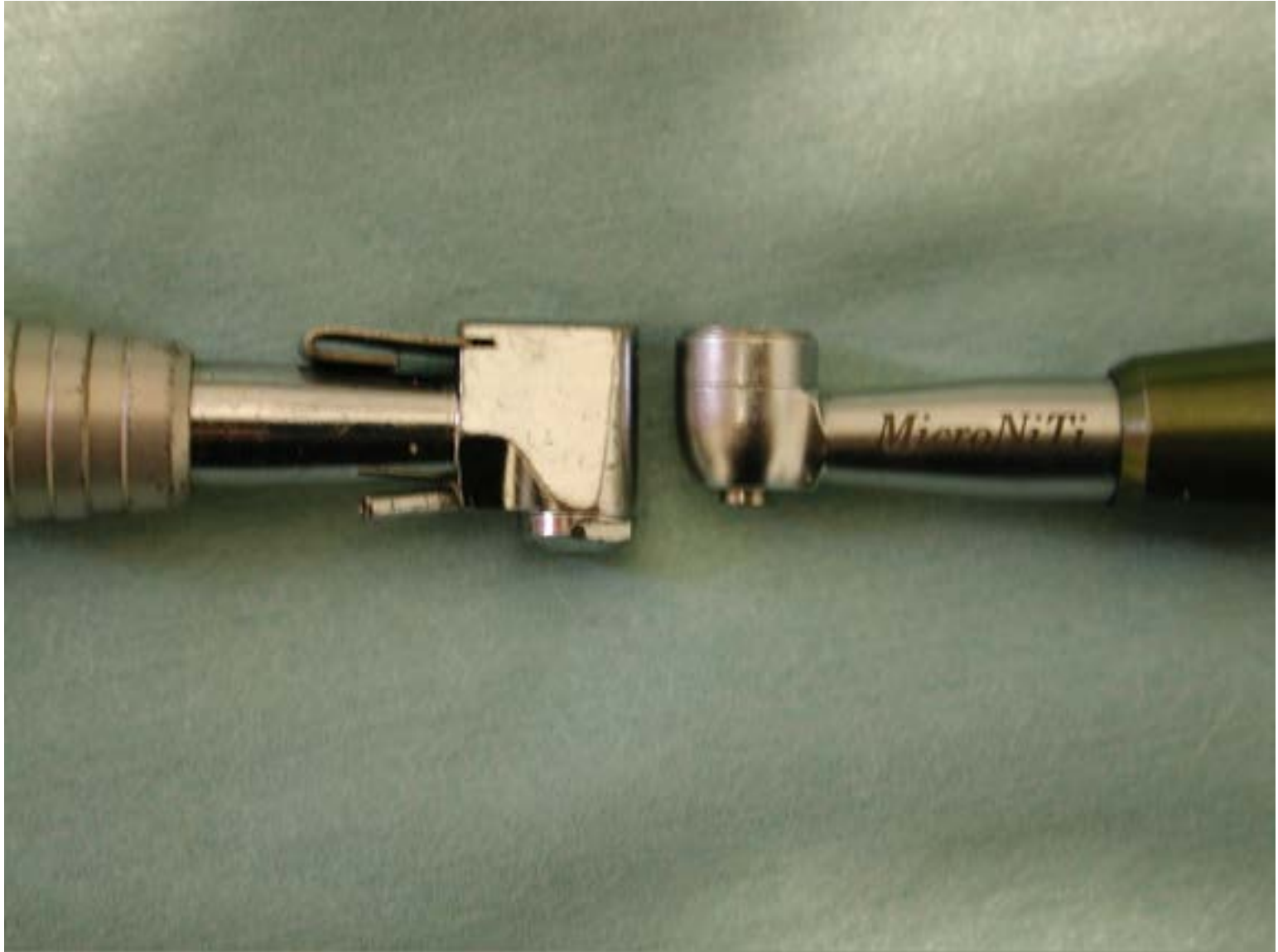
Fig. 16.20 Variably tapered instruments showing, in order from top, 02, 04, 06, 08, 10 and 12 tapers.



Engine Driven Ni-Ti Files

- Electric motor
- Variable speed motor 150-2000 RPM
- High torque
- Now variable torque
- Auto reverse
- Appropriate handpiece





POWER



RPM

1320

SPEED



AEU-17

© ASEPTICO

MODE

FOOT

FWD



HAND

REV

MOTOR





SHOCK

RATIO



- 3:1
- 1:1
- 1:16
- 1:64
- 1:256



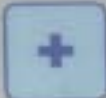
SIGNAL



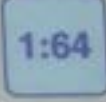
1.0







Endotek





Unit ^{DSC} electronic



1:1 10:1 15:1 20:1



Drehzahl
RPM Speed-Limit



Drehmoment
Torque



NaCl
(ml)



POWER
EIN-AUS







MORITA



Tri Auto ZX REF TRZX 6960

This unique unit is the only endodontic handpiece with built-in apex locator. The Tri Auto ZX has three automatic functions that significantly increase the accuracy and safety of root canal treatment.

Automatic Start/Stop: The handpiece automatically starts when the handpiece enters the canal and stops when it is removed.

Automatic Torque Reverse: The handpiece automatically stops and reverses the rotation of the nickel titanium file when too much pressure is applied.

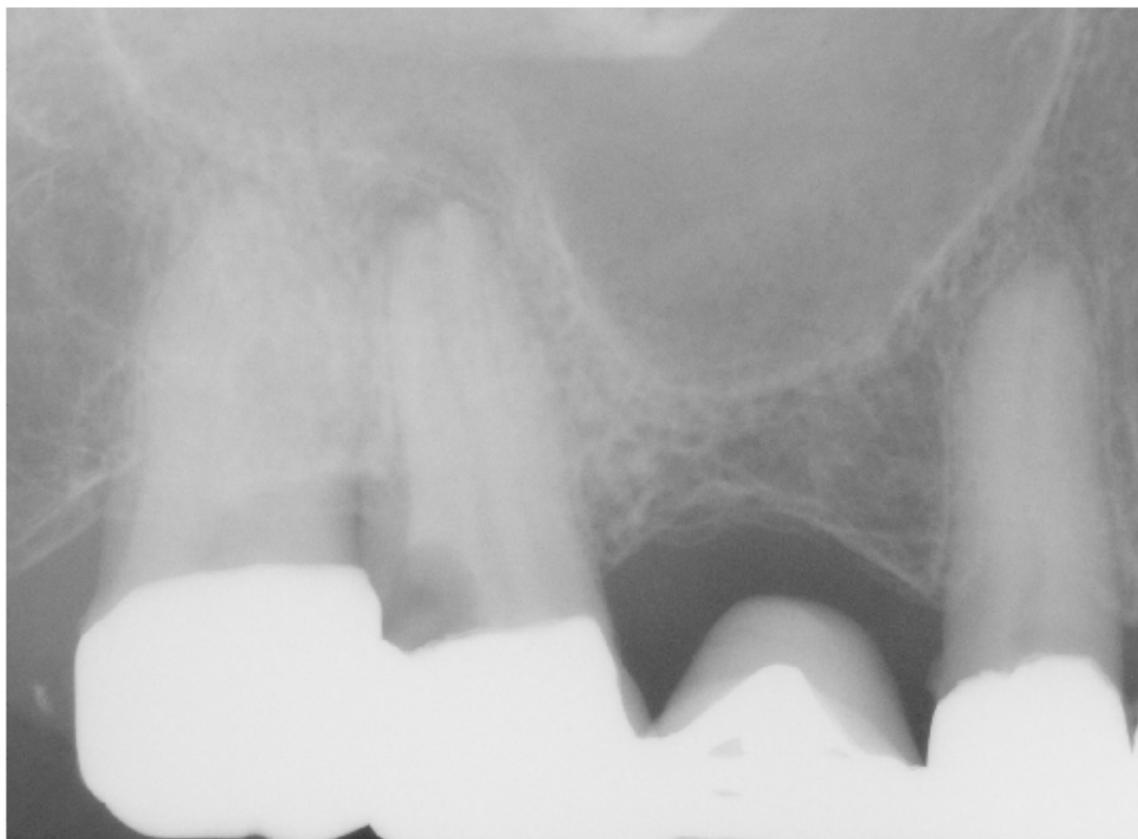
Automatic Apical Reverse: The handpiece automatically stops and reverses the rotation of the file when the tip reaches a distance from the apex pre-set by the clinician. The unit comes complete with all you need to perform endodontics with the utmost safety and accuracy.

The Tri Auto can be used successfully with most nickel titanium rotary systems.

£1375.00







TOTAL CONTROL WITH THE MC3 SLOW SPEED FROM BIEN-AIR

Bien-Air means QUALITY
Bien-Air means PERFORMANCE
Bien-Air means RELIABILITY

And now, with our outstanding MC3
Micromotor with slow-speed conver-
sion and optional digital read-out,



Bien-Air means TOTAL CONTROL

TOTAL CONTROL for:
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IMPLANTOLOGY
ORAL SURGERY
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- high torque at all speeds
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- speed selection with optional digital read-out
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- ideal for prophylactic work
- also suitable for all high-speed surgery work when combined with speed-increasing handpieces
- already have an MC3 Micromotor? No problem: upgrades available

 **Bien-Air**
SWITZERLAND



**TOTAL CONTROL
= TOTAL PEACE OF MIND
FROM BIEN-AIR**

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or Bien-Air Ltd at 67 The Street, Cressat, Geneva 1940, S.A. Tel: 04306 211205 / 719100





triniti™ Motor
See page 39
for details

General Guidelines with Ni-Ti Rotary Files

- Straight line access
- Crown down approach
- Keep well lubricated
- Do not overuse files





General Guidelines with Ni-Ti Rotary Files

- Use Light apical pressure
- Never force instrument apically
- Use in and out motion (light pecking pumping)
- Keep file in constant motion
- Never stop file in canal



Some Rotary Ni-Ti Systems

- Quantec files
- ProTaper
- Lightspeed
- K3
- Triniti
- GT files
- Hero files
- Profiles
- Race
- BioRace

M Two

Reciproc



NiTi system

traditional method
modern results



Endo
Easy
Efficient®



3

Mtwo [®] Taper .04	1 Ring
Mtwo [®] Taper .05	2 Rings
Mtwo [®] Taper .06	3 Rings
Mtwo [®] Taper .07	4 Rings

Depth markings

Silicone stopper

Taper rings



Instrument markings

10/.04

Diameter
per millimetre

- 0.74mm
- 0.70mm
- 0.66mm
- 0.62mm
- 0.58mm
- 0.54mm
- 0.50mm
- 0.46mm
- 0.42mm
- 0.38mm
- 0.34mm
- 0.30mm
- 0.26mm
- 0.22mm
- 0.18mm
- 0.14mm
- 0.10mm

16mm





atched easily with an ISO 15 (white)

M two sequence

- Negotiate full length of canal with size 10 hand file
- Followed by
- 10/.04
- 15/.05
- 20/.06
- 25/.06

M two further shaping

- If using vertical condensation or apex greater than .25mm
- 30/.04
- 35/.04
- 40/.04

M two further shaping

- Other instruments
- 25/.07

Reciproc

ProTaper

Virtuosity
is in your hands



PROTAPER
Progressively tapered
nickel titanium rotary files



ProTaper
is a registered trademark
of the Dentsply Group

Creating a life out of dentistry
DENTSPLY
Malibu Instruments
CH 1204 Bolligen
Switzerland
www.malibu.ch

ProTaper

Instrumentation

Starter Kit
 RT A-D400 SR, SI, S2, FI, F2, F3
 including one adaptive card and the instructions for use



Balls

RT A-D400-1	Shaping File 1-1		
RT A-D400-1 S1	Shaping File 1-2		•
RT A-D400-2 S1	Shaping File 1-3		•
RT A-D400-2 S2	Shaping File 1-4		•
RT A-D400-2 S3	Shaping File 1-5		•
RT A-D400-2 S4	Shaping File 1-6		•
RT A-D400-2 S5	Shaping File 1-7		•
RT A-D400-2 S6	Shaping File 1-8		•
RT A-D400-2 S7	Shaping File 1-9		•
RT A-D400-2 S8	Shaping File 1-10		•
RT A-D400-2 S9	Shaping File 1-11		•
RT A-D400-2 S10	Shaping File 1-12		•
RT A-D400-2 S11	Shaping File 1-13		•
RT A-D400-2 S12	Shaping File 1-14		•
RT A-D400-2 S13	Shaping File 1-15		•
RT A-D400-2 S14	Shaping File 1-16		•
RT A-D400-2 S15	Shaping File 1-17		•
RT A-D400-2 S16	Shaping File 1-18		•
RT A-D400-2 S17	Shaping File 1-19		•
RT A-D400-2 S18	Shaping File 1-20		•
RT A-D400-2 S19	Shaping File 1-21		•
RT A-D400-2 S20	Shaping File 1-22		•
RT A-D400-2 S21	Shaping File 1-23		•
RT A-D400-2 S22	Shaping File 1-24		•
RT A-D400-2 S23	Shaping File 1-25		•
RT A-D400-2 S24	Shaping File 1-26		•
RT A-D400-2 S25	Shaping File 1-27		•
RT A-D400-2 S26	Shaping File 1-28		•
RT A-D400-2 S27	Shaping File 1-29		•
RT A-D400-2 S28	Shaping File 1-30		•
RT A-D400-2 S29	Shaping File 1-31		•
RT A-D400-2 S30	Shaping File 1-32		•
RT A-D400-2 S31	Shaping File 1-33		•
RT A-D400-2 S32	Shaping File 1-34		•
RT A-D400-2 S33	Shaping File 1-35		•
RT A-D400-2 S34	Shaping File 1-36		•
RT A-D400-2 S35	Shaping File 1-37		•
RT A-D400-2 S36	Shaping File 1-38		•
RT A-D400-2 S37	Shaping File 1-39		•
RT A-D400-2 S38	Shaping File 1-40		•
RT A-D400-2 S39	Shaping File 1-41		•
RT A-D400-2 S40	Shaping File 1-42		•
RT A-D400-2 S41	Shaping File 1-43		•
RT A-D400-2 S42	Shaping File 1-44		•
RT A-D400-2 S43	Shaping File 1-45		•
RT A-D400-2 S44	Shaping File 1-46		•
RT A-D400-2 S45	Shaping File 1-47		•
RT A-D400-2 S46	Shaping File 1-48		•
RT A-D400-2 S47	Shaping File 1-49		•
RT A-D400-2 S48	Shaping File 1-50		•
RT A-D400-2 S49	Shaping File 1-51		•
RT A-D400-2 S50	Shaping File 1-52		•
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RT A-D400-2 S52	Shaping File 1-54		•
RT A-D400-2 S53	Shaping File 1-55		•
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RT A-D400-1 F99 Finishing File 1-99
RT A-D400-1 F100 Finishing File 1-100

RT A-D410 Sequence
 For more verification and operational sequence of a ProTaper™ system plus 2 hand files.



Creating in the art of dentistry

DENTSPLY MANIFEX

Multiflex Instruments
 201 216 Highway
 Bannockburn
 www.mfxdental.com

PROTAPER™

Progressively Tapered
Nickel Titanium Files

DENTSPLY
MAILLEFER

SWISS MADE • CH - 1328 BALLAGUETS

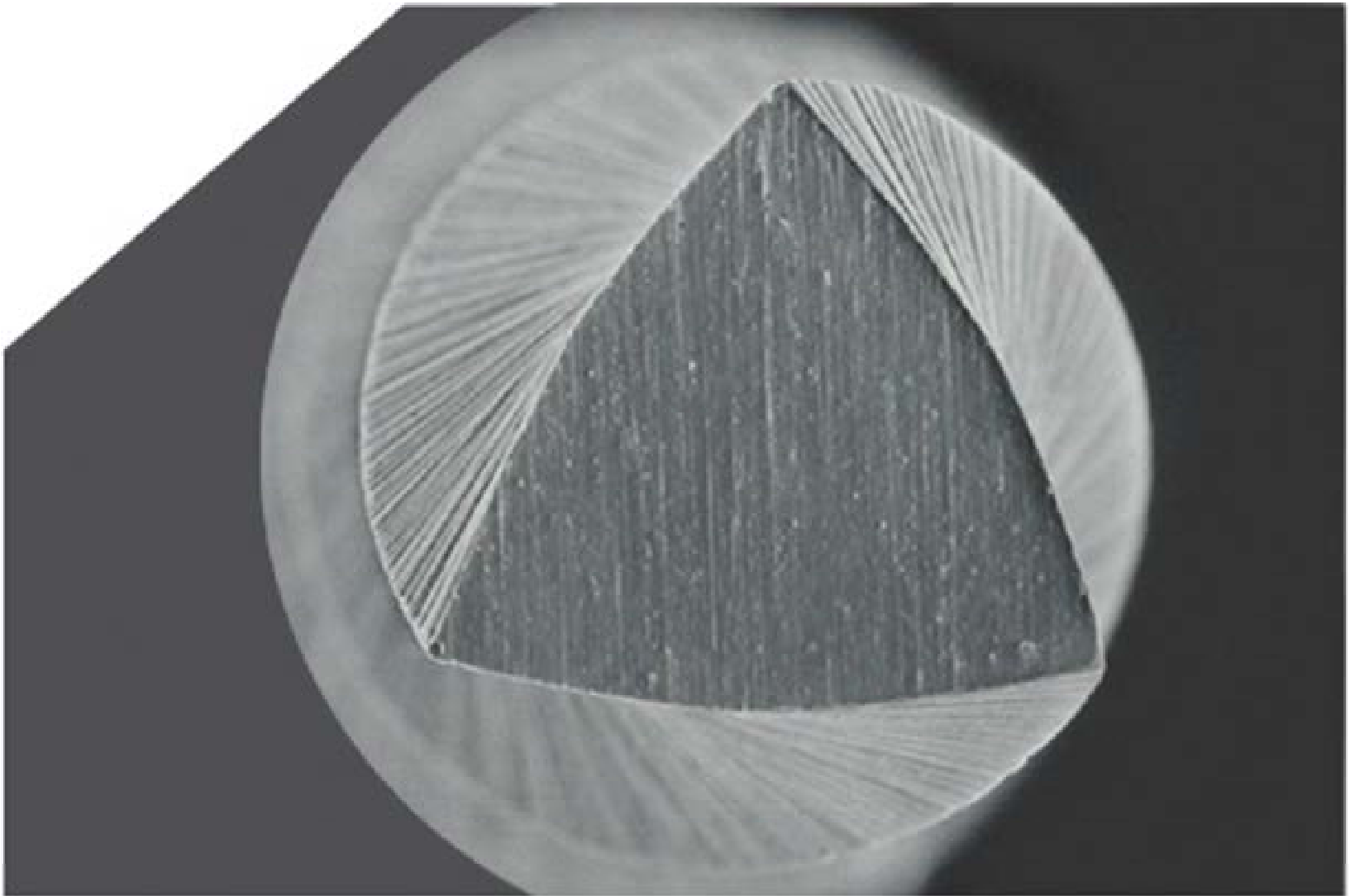


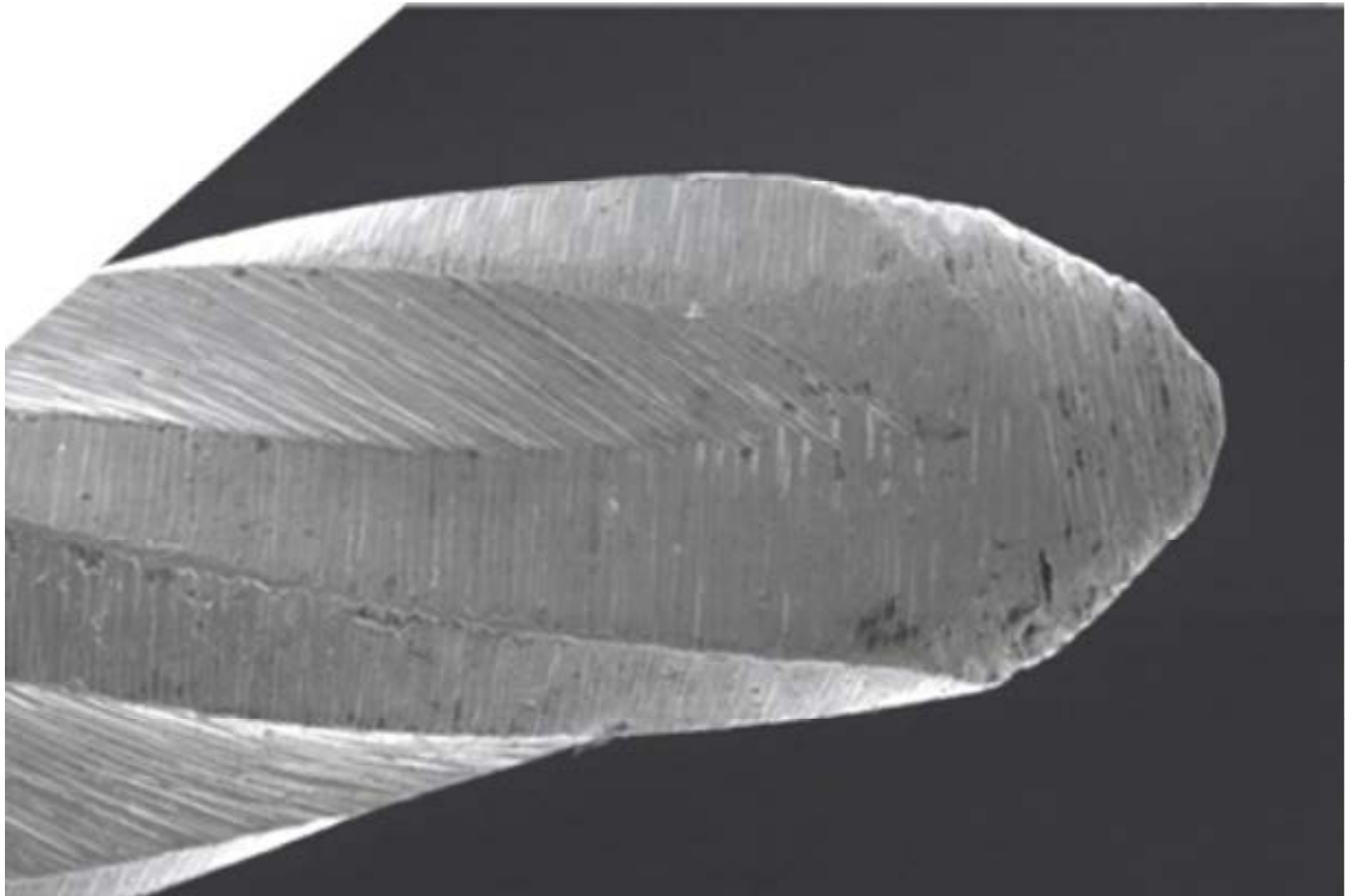
ProTaper™

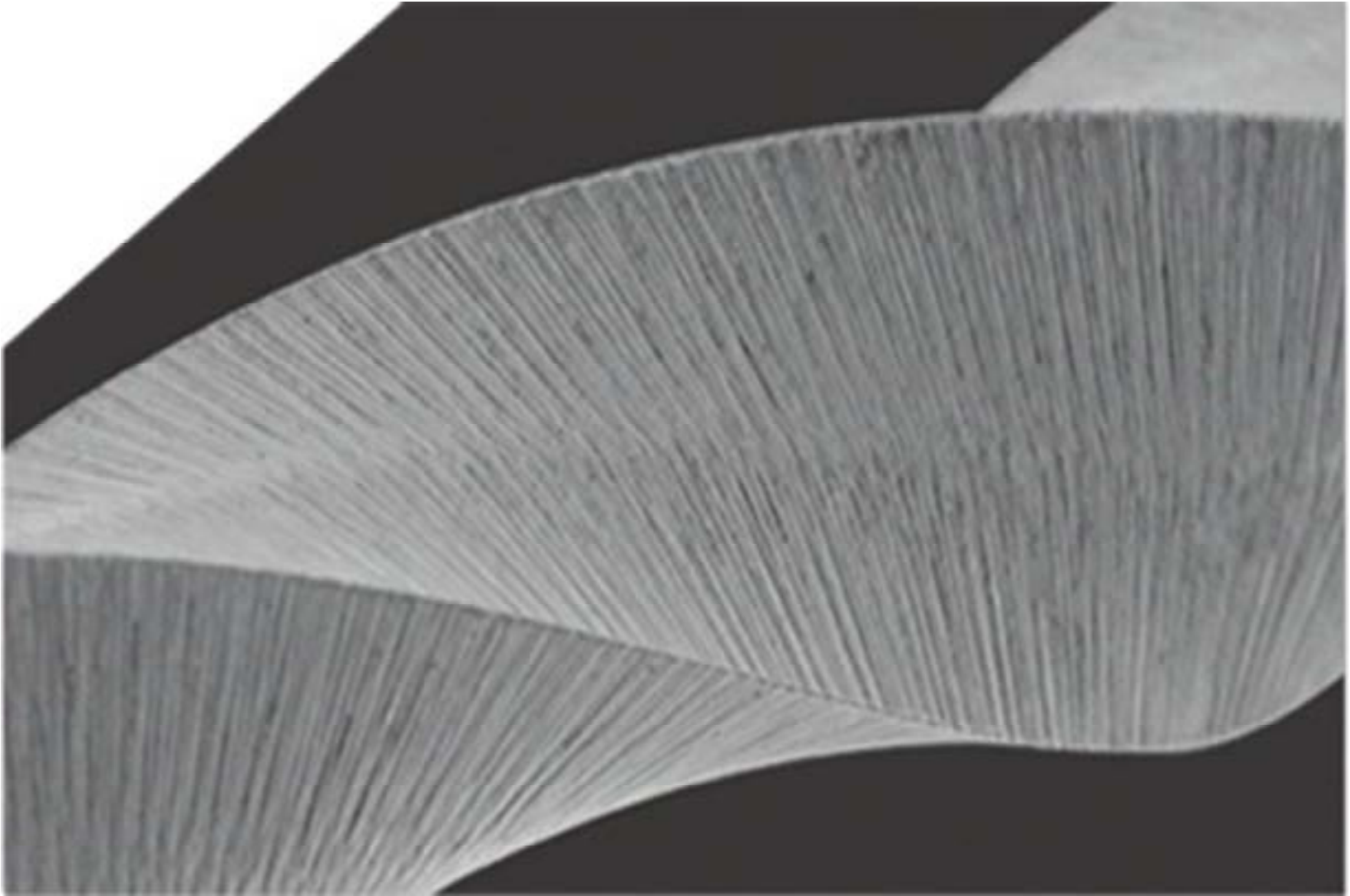


ProTaper

- Convex triangular cross section
- Helical angle and pitch
- Variable tip diameters
- Modified guiding tip
- Short handles
- 250-300 rpm







ProTaper



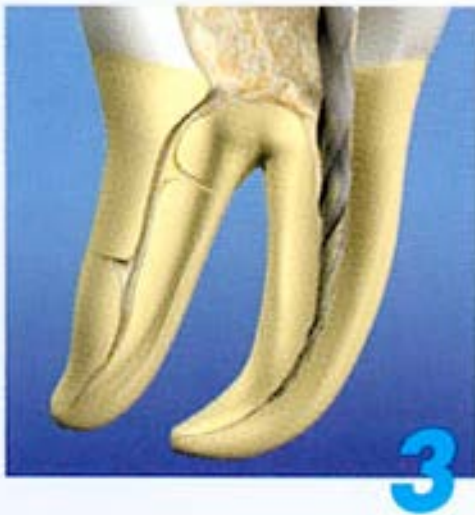
Explore the root canal with a stainless steel No. 10K hand file using a small reciprocating back and forth motion. Work passively and progressively until it is a few millimeters short of the estimated working length. Fill the pulp chamber full with either *GLYDE™* or Sodium Hypochlorite (NaOCl) for all initial negotiation procedures.

ProTaper



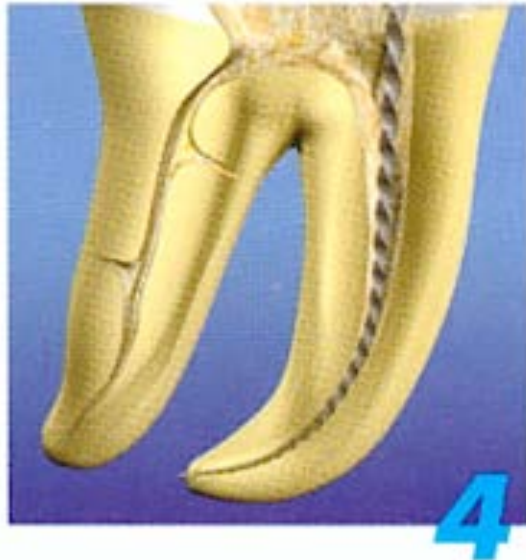
Now, start the *PROTAPER™* sequence with **Shaping file No. 1** which has purple ring. The S1 is carried into the canal and moved apically to just short of the depth of the hand files. In more difficult canals, one or two recapitulations may be necessary to enlarge the coronal two thirds of the canal. Irrigate and go back in with 10K hand file to break up debris and then re-irrigate.

ProTaper



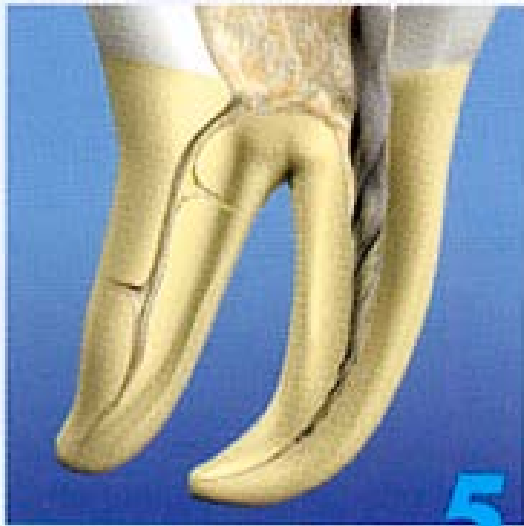
The Sx (no colour ring) is then used with a brushstroke action to selectively remove dentine, relocate the canal away from furcal danger and achieve straight line radicular access. With improved access, the SX is passively fit a little deeper into the canal until it encounters light resistance. Bounce off this resistance and brush out of the canal in an apical to coronal direction. Continue with the SX until about two thirds of the overall length of its cutting blades are below the orifice. Don't forget to irrigate.

ProTaper



Once the **pre-enlargement procedure is finished** with excellent coronal two thirds access, use a precurved 10K hand file to negotiate the rest of the canal, establish patency, and confirm working length. When working length is confirmed and a smooth *GLYDE™* path to the terminus is verified, **use Shaping file No. 1** to length.

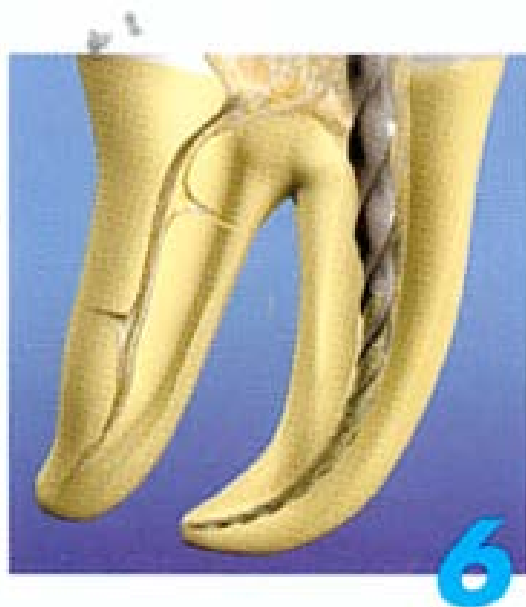
ProTaper



5

Following the use of S1, irrigate and use **Shaping File No. 2** which has a white ring on its handle. This file will typically go to full working length on the first pass. Following its use, irrigate.

ProTaper



When the coronal two thirds of the canal has been prepared, the apical one third can be finished. **The Finishing file No. 1** has a yellow ring (ISO 020) and with the canal flooded with irrigant, carefully take the F1 to working length and immediately withdraw.

ProTaper



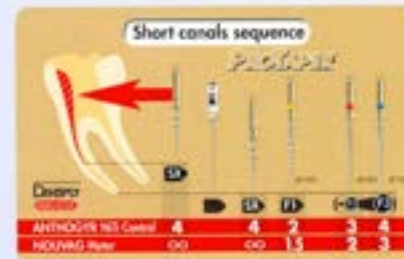
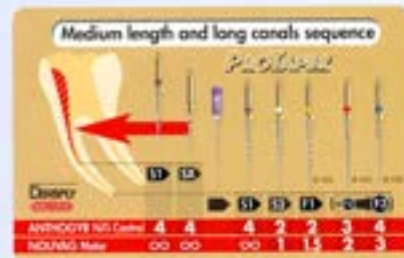
Gauge the size of the foramen

by placing a 20 K hand file to length. If snug at working length then the canal is prepared and ready to obturate.

If it is loose, use Finishing file No. 2

(red ring ISO 025). Irrigate and carry the F2 to length and gauge the size of the foramen by placing a 25 K hand file to length. If snug at length then the canal is prepared and ready to obturate. **If it is loose use Finishing file No. 3** (blue ring ISO 030) and carefully carry it to length. Gauge the foramen with the equivalent hand file. Normally, this would be as large as you would prepare a calcified and/or curved canal.

Working sequences



Guidelines

1. Work instruments to light resistance and never force them.
2. Only use instruments in a well irrigated and lubricated canal.
3. The appropriate finishing file passively follows the canal to the desired length... then is immediately withdrawn.
4. Use in constant rotation at a speed of 250-350 rpm.
5. Clean flutes frequently and check for signs of distortion or wear.

Medium length and long canals sequence



PROTAPER

S1 SX

Ø 020 Ø 025 Ø 030

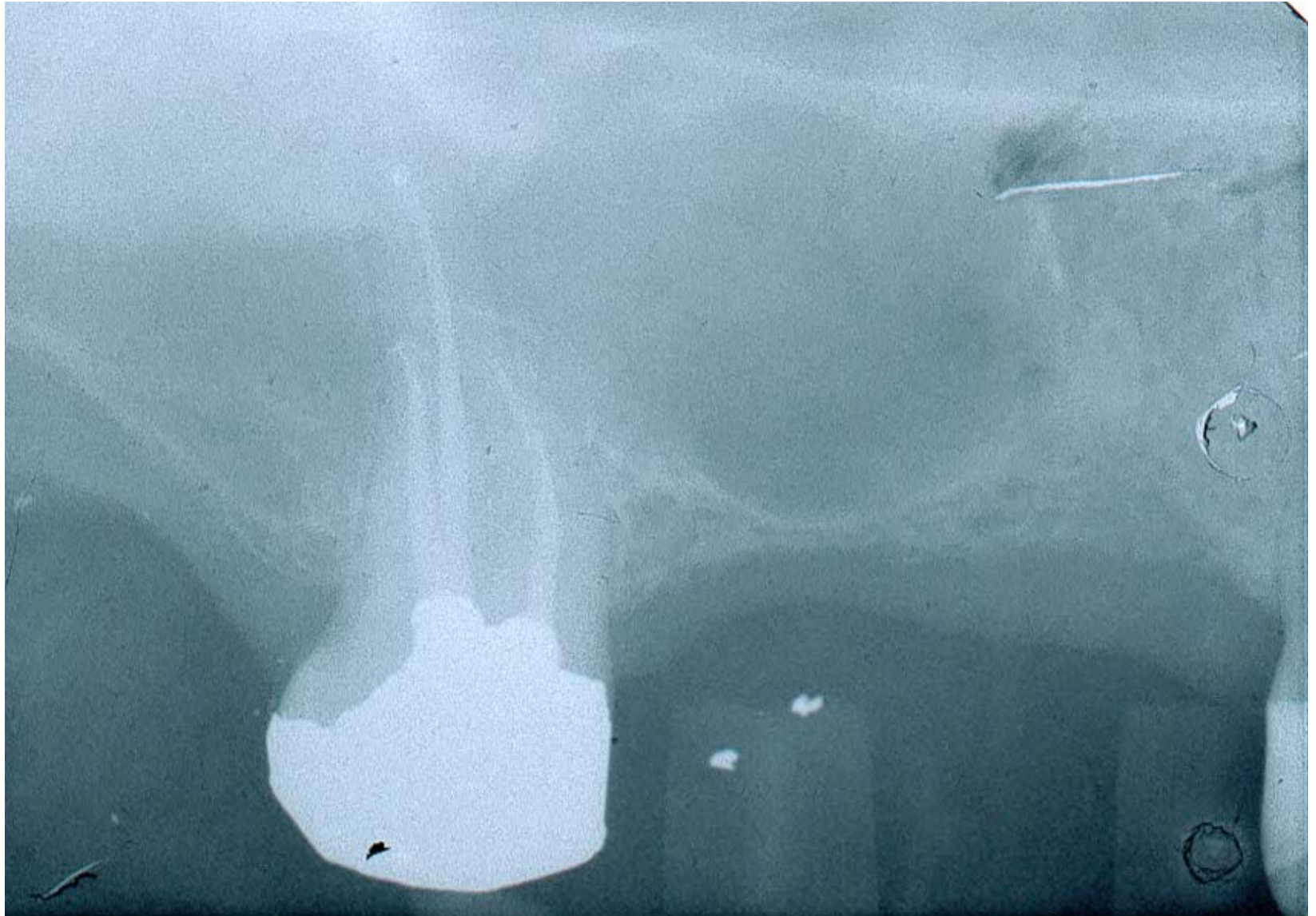
S1 S2 F1 (-F2) (F3)

ANTHOGRYR NiTi Control	4	4	4	2	2	3	4
NOUVAG Motor	∞	∞	∞	1	1.5	2	3

DENTSPLY
MAILLEFER





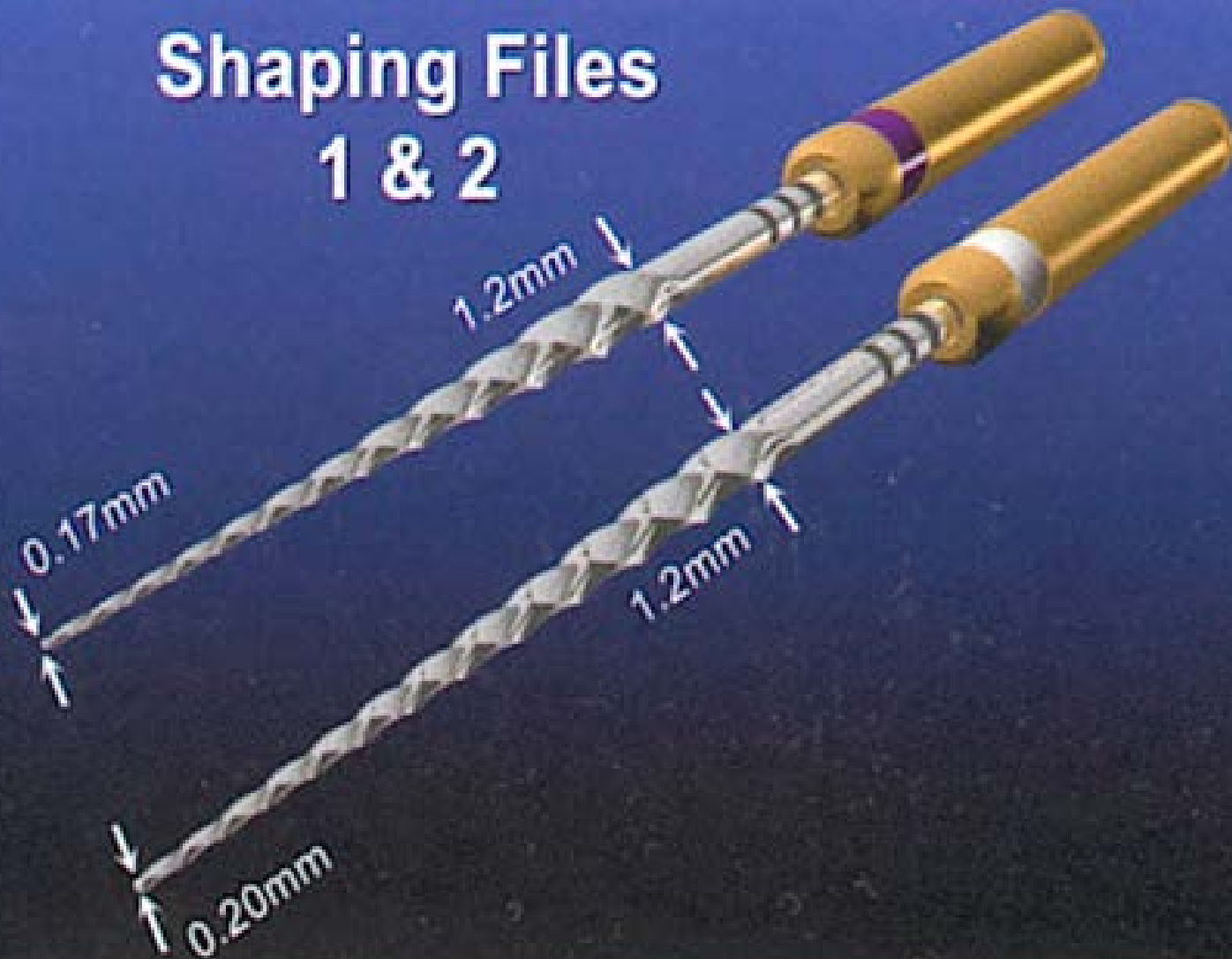




ProTaper™



Shaping Files 1 & 2



Finishing Files



ProTaper Dimensions

- SX tip 19 3mm 35 5mm 55
- S1 tip 17 3+mm30 5mm 50
- S2 tip 20 2mm 30 5mm 50

ProTaper dimensions

- F1 tip 20 3mm 45 4mm 50
- F2 tip 25 2mm 45 3mm 55 4+mm 60
- F3 tip 30 2mm 55

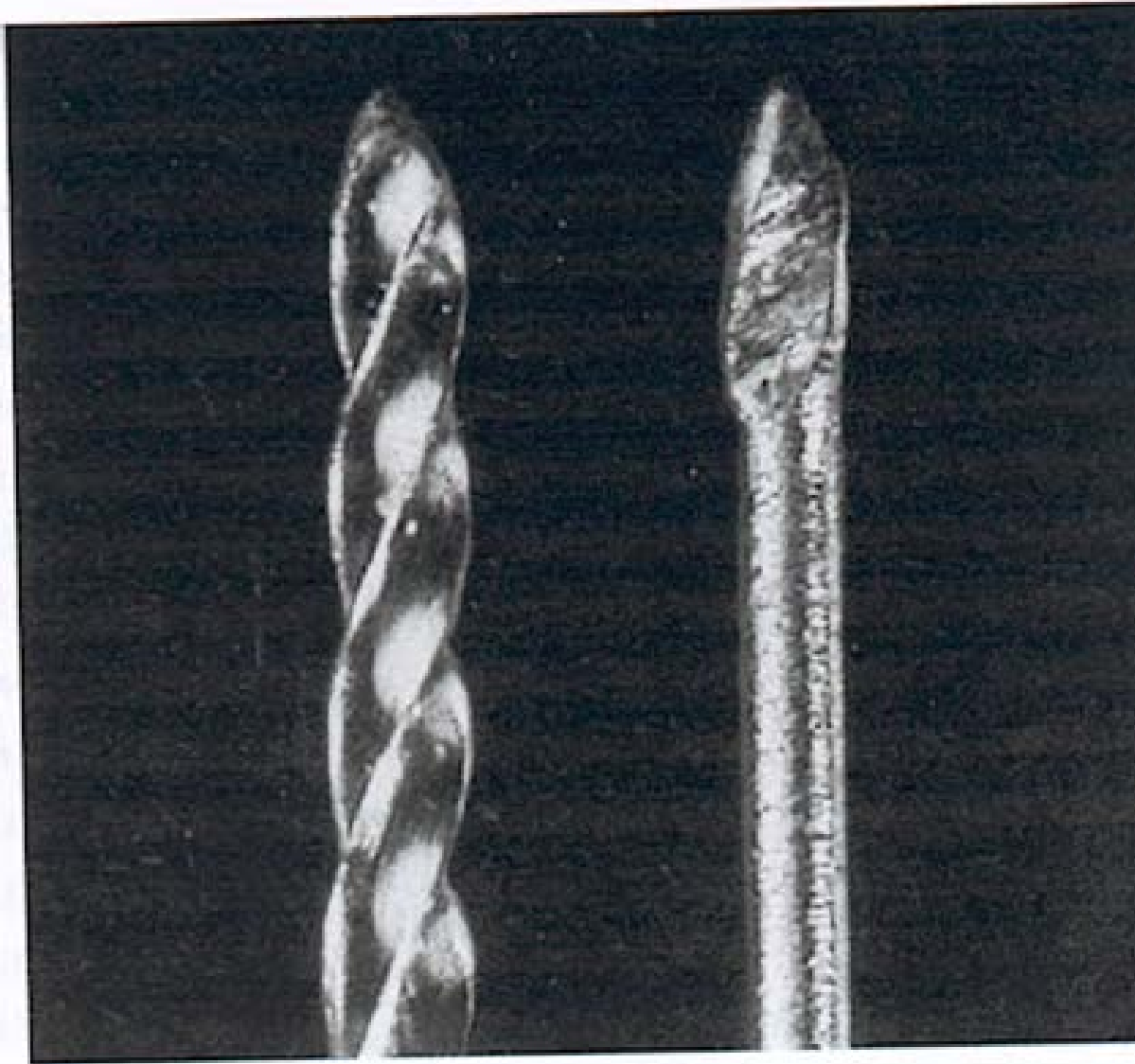
ProTaper

- Expand the deep shape- F2 2mm F 3mm
- Larger canal diameters
- Fixed taper pecking action –ProTaper lateral brushing action
- Speed of penetration clogging of blades



- The effect of instrument type and preflaring on apical file size determination

Tan and Messer IEJ Sept 2002



ProTaper

- 21 and 25 lengths
- Cost pack of six

**Morphometric observations on root
canals of human anterior teeth**

K. Kerekes and L. Tronstad,

JEndo January 1977

**Morphometric observations on root
canals of human molars**

K. Kerekes and L. Tronstad,

JEndo March 1977

Suggested First LIGHTSPEED Size to Bind (FLSB) and Estimated Master Apical Rotary (MAR) Sizes

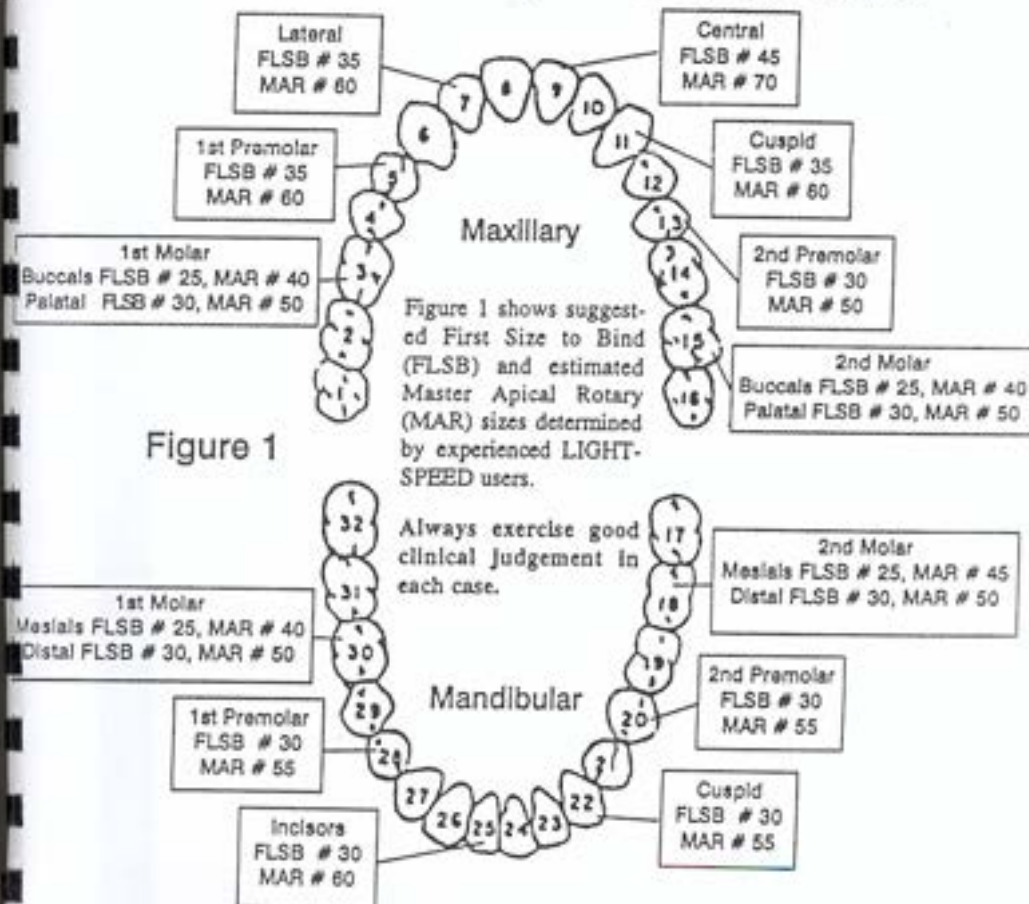


Figure 1. Experienced clinicians submit these recommendations.



K³ Technique

Instructions for use

The following instructions are a brief guide to the preparation of medium and small sized canals. Larger canals require less preparation in the coronal and middle portions but more cleaning with sodium hypochlorite. The guidelines below follow the principles of a crown-down technique.

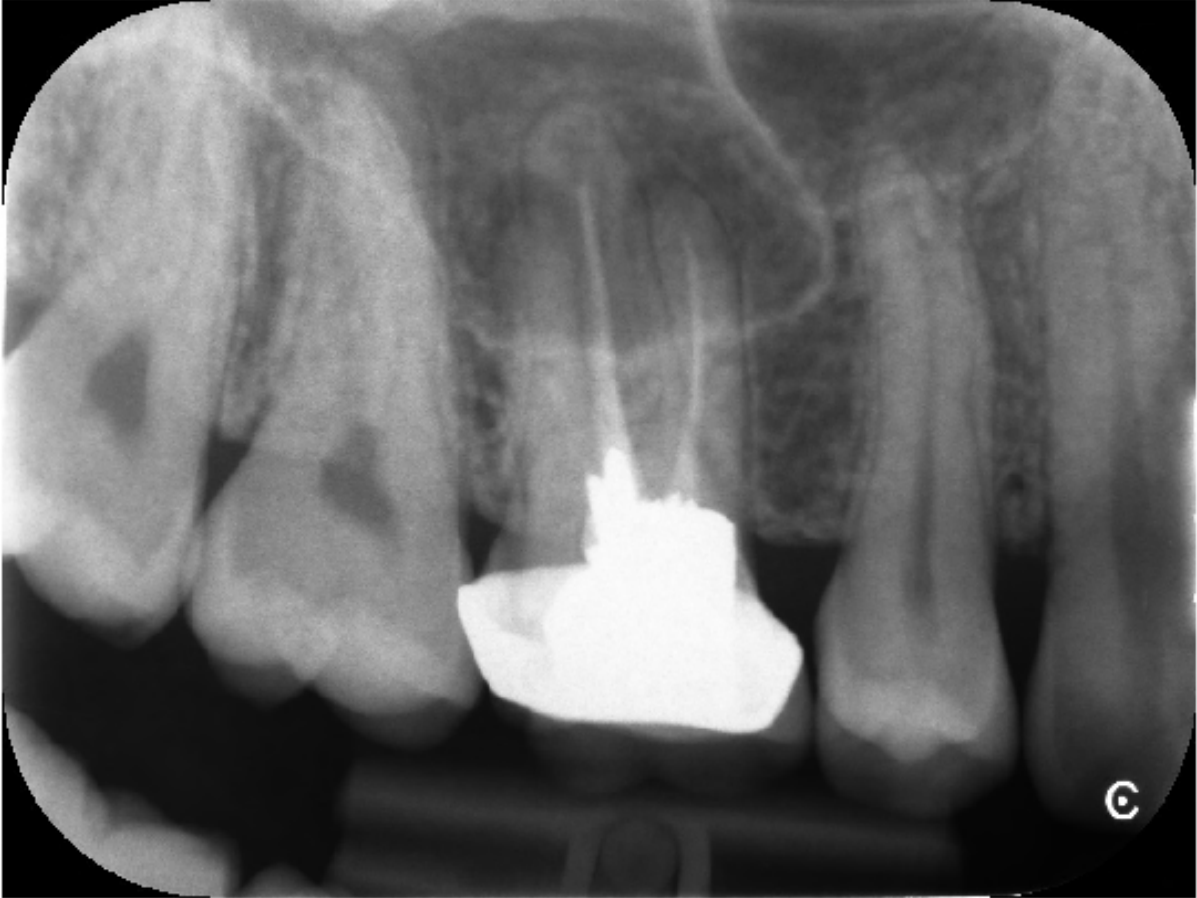
- 1 place rubber dam and cut an access cavity. Ensure there is straight-line access into at least the coronal portion of all the canals.
- 2 insert a size 10 Kfile into each canal to check there is an unobstructed pathway for at least $\frac{1}{2}$ to $\frac{3}{4}$ of the estimated canal length. Canal length estimated from pre-operative radiograph.
- 3 open the coronal third of the canal with a K3, 10 taper orifice opener.
- 3 place an EDTA lubricant into the canal openings and onto the floor of the pulp chamber. Work an 08 taper orifice opener 3-4 mms further into the canal.
- 5 irrigate with sodium hypochlorite using a gauge 27 or 30 irrigation needle
- 6 measure the working length of the canal with a Kfile with the aid of an apex locator or a radiograph. Establish apical patency by passing the 10 Kfile passively through the apex by no more than 1.0mm.
- 7 begin filing with K3 05 tapered instruments. Speed 300 rpm using light even pressure with a slow in and out movement. Use each instrument for about 6 seconds.
- 8 files used in sequence from the largest to the smallest. Place the rubber stops on all the instruments at the working length. Start with size 40, then 35, 30, 25, 20, in a run down to size 15. Repeat the crown down from size 40 until size 20 reaches the working length.
- 9 irrigate after alternate instruments and at completion of filing
- 10 check apical patency with size 10 Kfile.



Quantec

Modified crown down technique

- Negotiation
- Shaping
- Apical preparation



Quanteq Protocol

- Negotiation
- Establish straight line access
- Irrigate with sodium hypochlorite
- Identify canal orifices
- Explore canal orifices with size 10 and 15 hand files

Quantec New Protocol

- Negotiation continued
- Quantec .06 taper 25 tip to just short of apical one third
- Determine working length with 10 or 15 hand file
- Establish guide (glide) path for Ni-Ti instruments with hand files 15 –25 hand files

Quantec New Protocol

- Shaping- passive insertion of instruments
- .12 25
- .10 25
- .08 25
- .06 25
- .05 25
- .04 25
- .03 25
- Until .06 or .05 reaches working length

Quantec New Protocol

- Recheck working length
- Check the first hand file that binds at working length
- If larger resistance form required complete preparation with .02 40 or 45 Ni-Ti instruments
- EDTA
- Sodium hypochlorite

Problems with Rotary Ni-Ti Instruments

- Instrument Breakage
- Excessive surface engaged
- Plus inadequate cutting efficiency
- Too much apical pressure
- Staying too long in canal

Problems with Rotary Ni-Ti Instruments

- Natural obstructions and anatomical traps
- Torsional Overload
- Files tend to thread themselves into canal
- Difficult to access canals in handpiece
- Lost of tactile feel when shaping with tapered files
- Do not show curvature of canals elastic memory



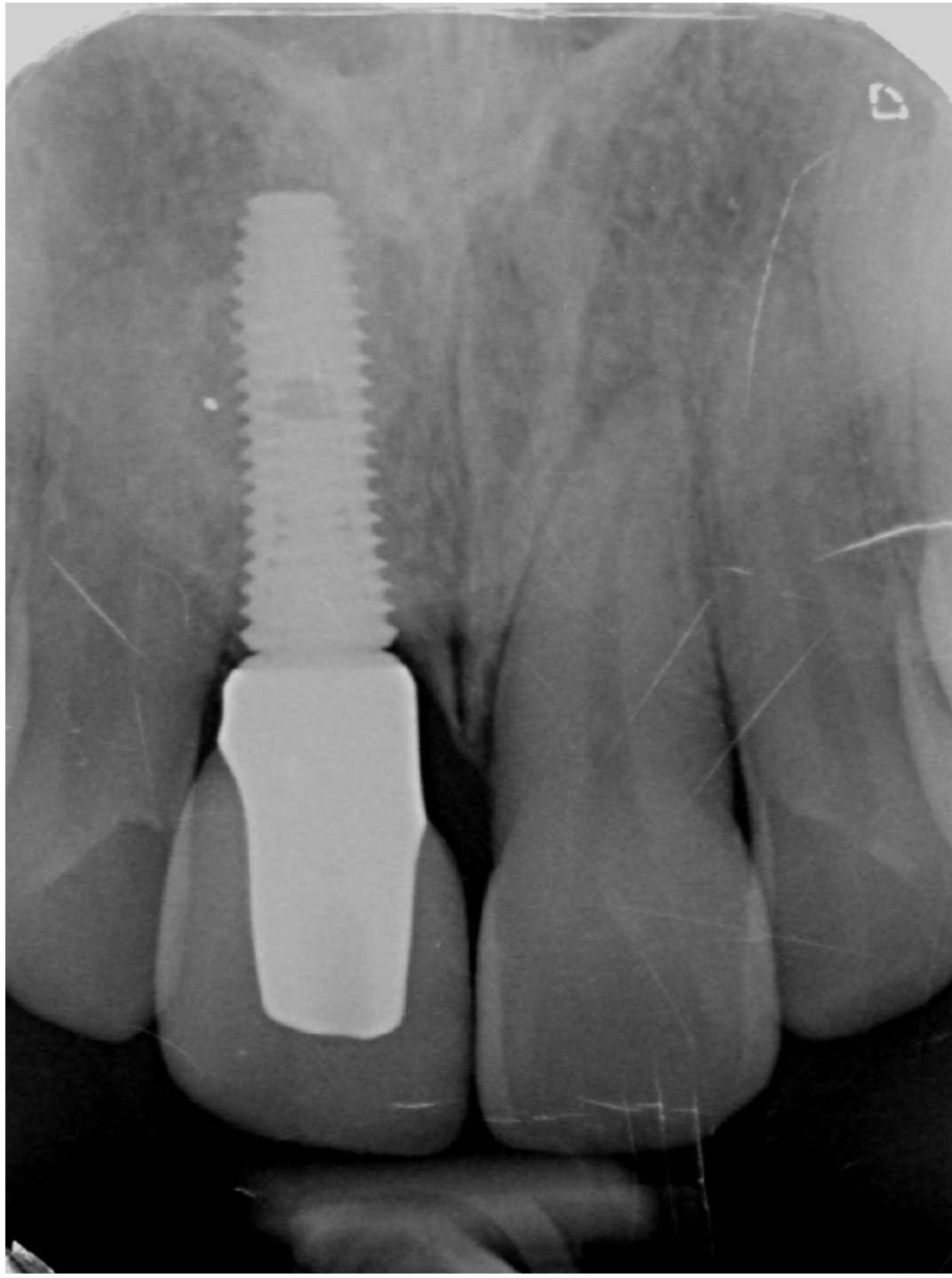


Research Finding

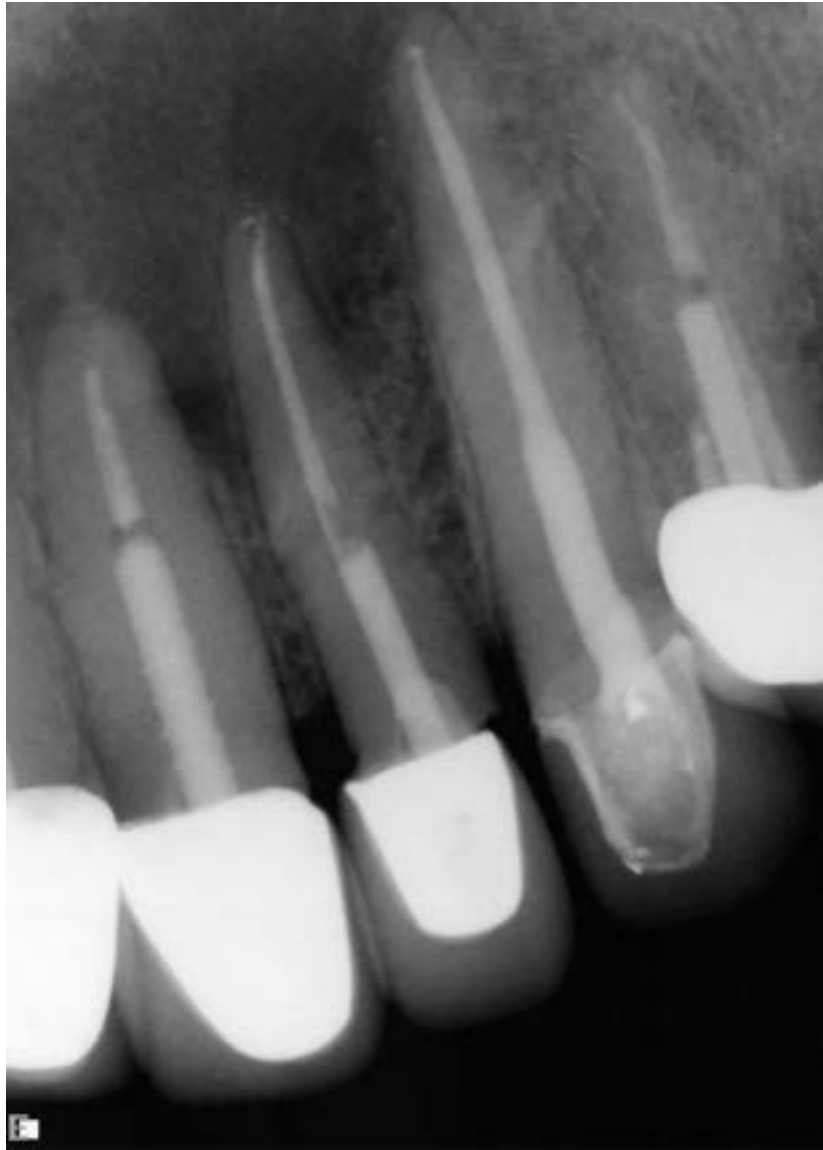
- Influence of rotational speed, torque and operator's proficiency on Profile failures
Yared Dagher and Machtou IEJ 2001
- Speed 150 250 and 350
- Torque
- Operator

Overview

- Problems with NiTi files
- Obturation Techniques
- Discussion











Obturation

- Lateral Condensation
- Vertical Condensation
- Chloroform dip
- Paste fillers
- Thermomechanical compaction
- Thermoplastisized GP Obtura Ultrafil
- Continuous wave
- Simplifil
- Use of Ultrasonics

Core concept 17.3 Classification of root canal sealers

Sealers commonly used are based on:

- Zinc oxide and eugenol (ZnOE)
- Polyketone
- Epoxy resin
- Glass ionomer cement
- Calcium hydroxide.

Sealers under investigation/recently marketed are based on:

- Composite resins/dentine bonding agents
- Calcium phosphate cements
- Silicones.

Core concept 18.2 Properties of different sealers

Zinc oxide–eugenol-based sealers

- Reasonable seal
- Dissolve in fluids
- Long-lasting cytotoxicity
- Sensibilization

Resin-based sealers

- Good seal
- Initial cytotoxicity
- Once set, biocompatible
- Allergenic

Gutta-percha-based sealers

- Moderate seal
- Initial cytotoxicity
- Shrinkage
- Plasticize gutta-percha

Dentine-adhesive sealers

- Good seal
- Set very quickly
- Good biocompatibility
- Difficult to remove

Formaldehyde-containing sealers

- Zinc oxide–eugenol based
- Severe long-lasting cytotoxicity
- Sensibilization

Calcium-hydroxide-containing sealers

- Release calcium hydroxide, which may result in disintegration
- Once set and integrity is maintained, no calcium hydroxide leaches out and no effect can be expected
- Initial antibacterial effect
- Risk of dissolution over time

Core concept 17.1 Requirements for an ideal root canal filling material

Technical

- No shrinkage.
- No solubility in tissue fluids, undisturbed setting in the presence of moisture.
- Good adhesion/adaptation to dentine or combining materials (cones, sealers).
- No pores and water absorption.
- No tooth discoloration.

Biological

- No general health problems or allergies for patients and dental personnel.
- No irritation of local tissues.
- Sterile.
- Antimicrobial – no enhanced bacterial growth.
- Stimulation of the periapical healing process.

Handling

- Radiopaque: ISO 6876 (62) requires > 3 mm aluminum (dentine has 0.6–0.7) (radiopacity of dental materials is measured as mm aluminum equivalent).
- Setting in an adequate time, allowing sufficient time for obturation and x-ray control.
- Easy to apply and easy to remove (e.g. for post placement or revision) using solvents, heat or mechanical instrumentation.

Core concept 18.3 Root filling techniques

Solid core techniques

Single cone

- Simple
- Quick
- Good length control
- Round standard preparation required

Lateral compaction

- Good length control
- Not one compact mass of gutta-percha
- Time-consuming technique
- Supposed risk of root fracture

Softened core techniques

Warm lateral compaction

- Moderate length control
- Time-consuming technique
- Heat may damage periodontium

Warm vertical compaction

- Poor length control
- Sealer extrusion
- Heat may damage periodontium

Injection-molded gutta-percha

- Quick technique
- Poor length control
- Heat may damage periodontium

Thermomechanical compaction

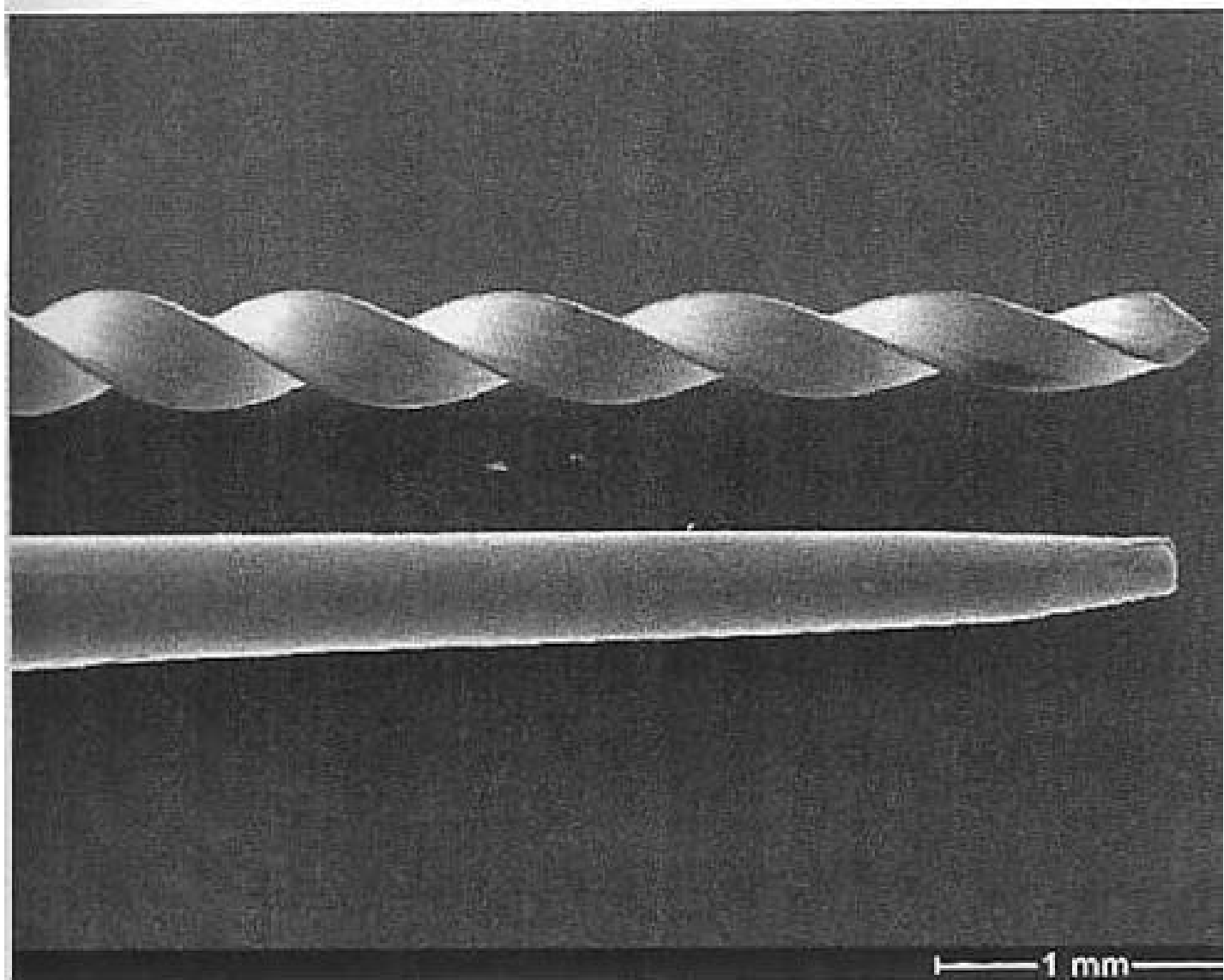
- Quick technique
- Poor length control
- Heat may damage periodontium
- Instrument fracture risk

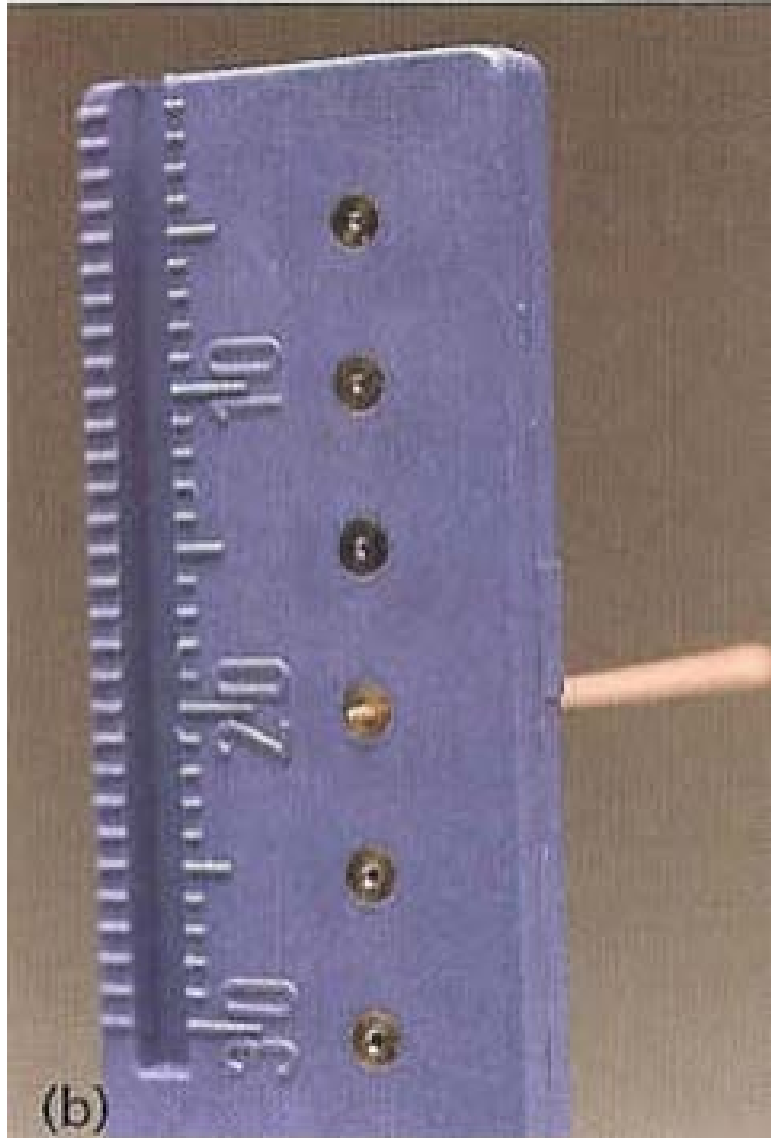
Core carrier

- Quick technique
- Sealer extrusion
- Gutta-percha may be stripped off carrier in curvature
- Difficult to remove for retreatment
- In combination with posts, inconvenient technique

Chloroform-resin

- Quick technique
- Potential health hazard effects on dental personnel over long time use





(b)

MicroSeal, unique as an obturation system, has the ability of sealing canals independent of shape and taper. It is very expeditious and effective in obturating the intricacies of the canal system when used by itself or in enhancing other obturation techniques.

— Dr. John T. McSpadden

NOUVAG TCM ENDO III

Nouvag TCM Endo III, 110v 815-9113
 Nouvag TCM Endo III, 220v 815-9114



MICROSEAL SPREADERS

Nickel-titanium finger or engine spreaders enable even distribution of condensation forces against the master cone, even around curvatures.

ENGINE SPREADERS (pkg of 5)

20/.02 21mm	815-6102
25/.02 21mm	815-6103
25/.04 21mm	815-6101
Asstd 21mm	815-6201
20/.02 25mm	815-6502
25/.02 25mm	815-6503
25/.04 25mm	815-6501
Asstd 25mm	815-6205

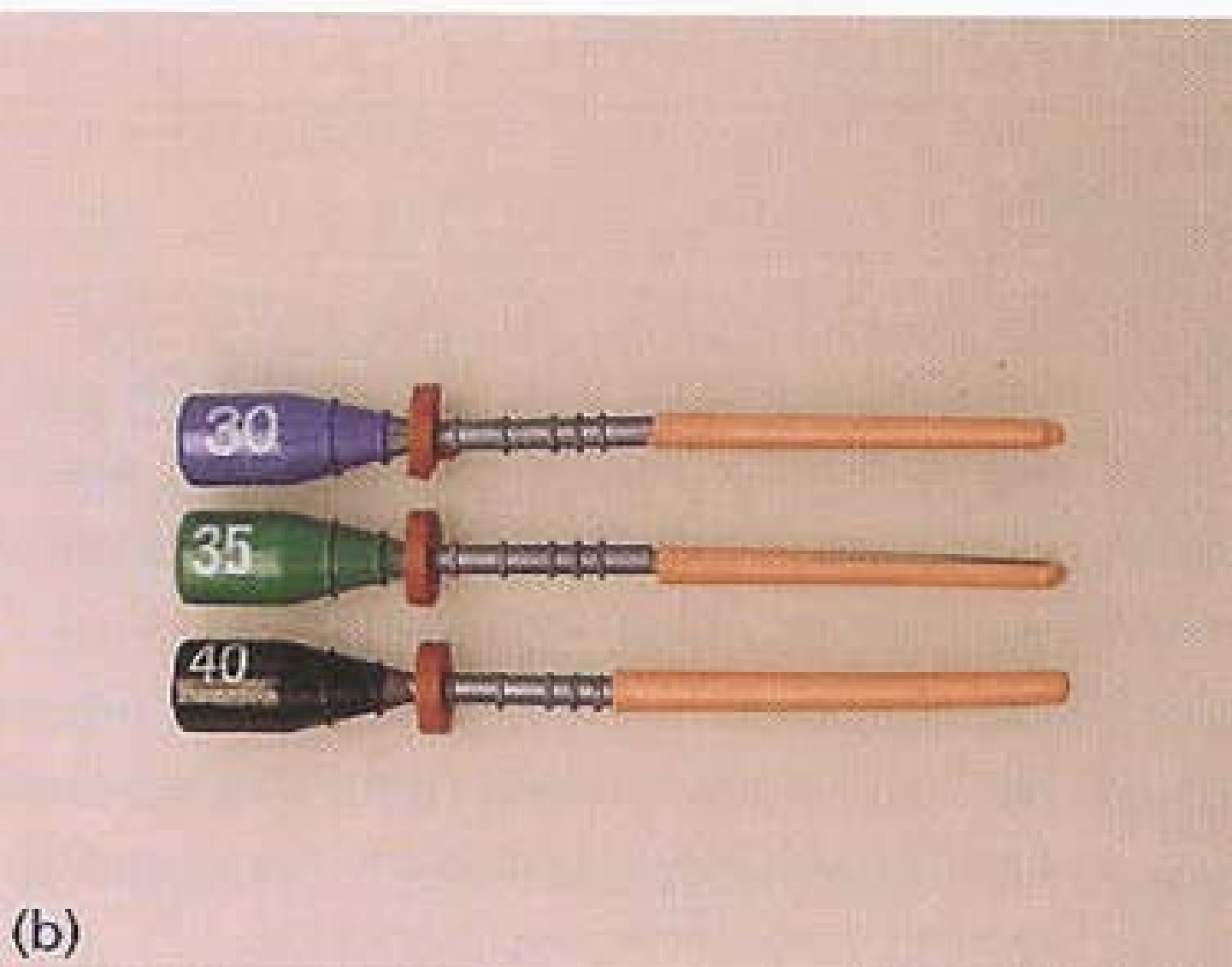
FINGER SPREADERS (pkg of 5)

20/.02 21mm	815-6122
25/.02 21mm	815-6123
25/.04 21mm	815-6121
Asstd 21mm	815-6221
20/.02 25mm	815-6522
25/.02 25mm	815-6523
25/.04 25mm	815-6521
Asstd 25mm	815-6225



ENGINE SPREADER FINGER SPREADER





(b)



Endodontic

 HYGENIC

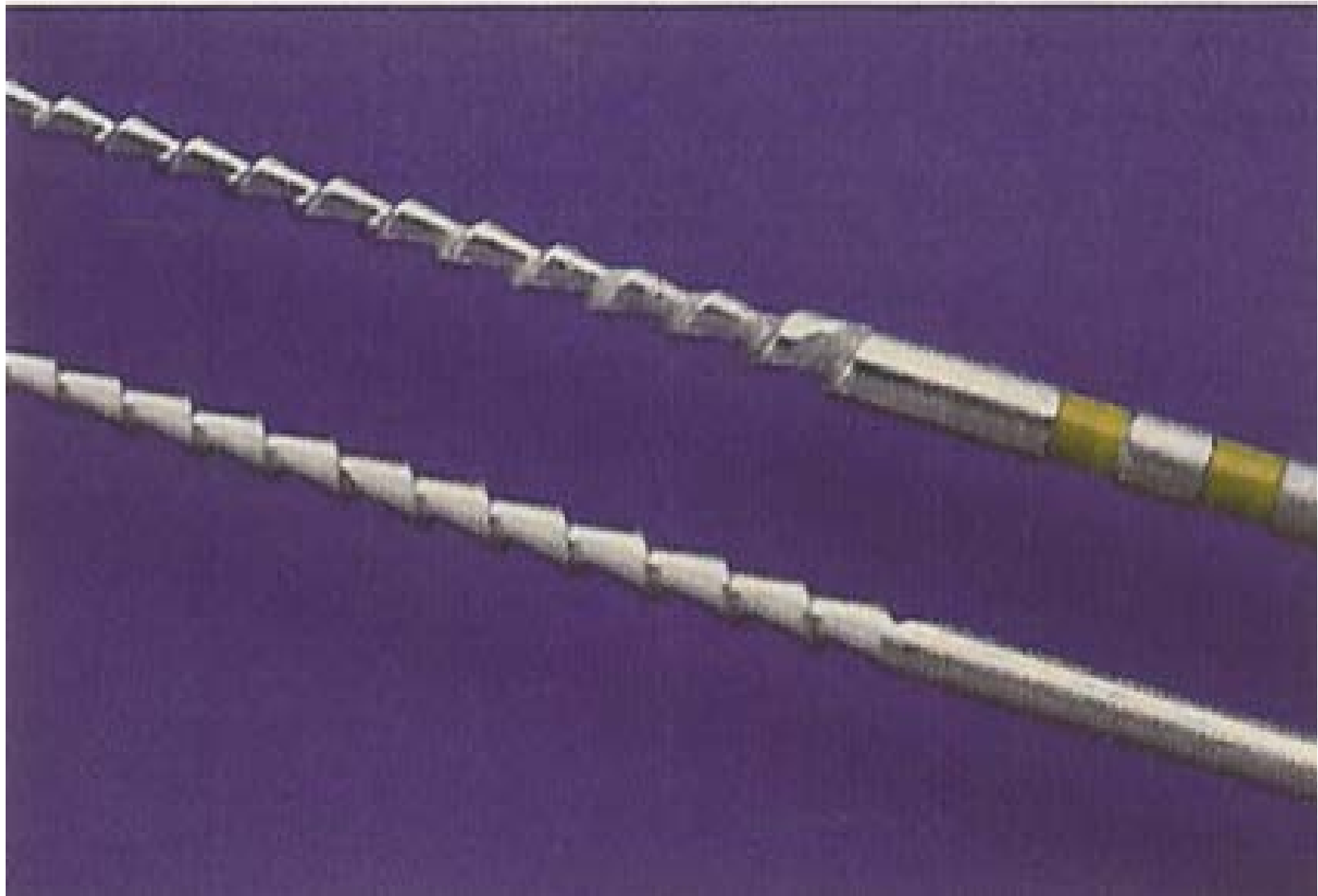


Ultrafil® 3D and SuccessFil®

Ultrafil® 3D

SuccessFil®







25
MICROSEAL Analytic
MICROFLOW MASTER CONES

50 Points - 28 mm long
Low-Fusing Gutta Percha
REF 815-9032

25
MICROSEAL Analytic
ABSORBENT PAPER POINTS
200 Points - 28mm long

P/N 815-9001
STERILE

Analytic
(800) 344-7676

POWER

HOT

MICROSEAL
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POWER ON

GUTTA-PERCHA HEATER

Analytic CE



Key literature 17.1

Saunders (54) studied histologically the effect of thermomechanical compaction (10,000 revolutions per minute) of gutta-percha with a calcium hydroxide sealer upon the cementum of ferret teeth. Twenty days after root filling, 20% of the experimental teeth showed signs of surface resorption of cementum in the central section of the root with no signs of inflammation. After 40 days, 28% showed resorption and, of these, 22% exhibited ankylosis of alveolar bone to cementum. Controls with lateral condensation showed no resorption or ankylosis. The authors conclude that heat generation by this method is sufficient to stimulate surface resorption and ankylosis in the longer term.

Core concept 17.2 Factors influencing leakage

- (1) *Root canal anatomy and preparation.* Oval and keyhole-shaped profiles of the root canals and unsuitable cleaning and shaping impede the correct application of the root canal filling material.
- (2) *Access cavity.* Bacteria may penetrate an obturated root canal within a few days/weeks if the access cavity is not sufficiently sealed (coronal leakage).
- (3) *Smear layer.* Removal using citric acid (10–50%) or EDTA (ethylenediaminetetraacetic acid) (17%) may influence leakage, although results are unequivocal. The effect depends apparently upon the sealer used.
- (4) *Hemostasis/dryness of the root canal.* The wall of the root canal must be clean and dry for a tight adaptation of the sealer to the wall.
- (5) *Root canal filling material.* Stability, adhesion to dentine and lack of pores.
- (6) *Sealer thickness and obturation technique.* Thick layers of root canal sealers (e.g. a ZnOE sealer or a calcium hydroxide sealer) showed more leakage than a thin one (40), which may be due to the fact that most sealers contain pores or dissolve faster in thick layers. A thin layer of root canal sealer is therefore generally recommended.

Obturation

- Cold lateral condensation
- Warm lateral condensation
- Vertical condensation
- Continuous wave condensation
- Thermoplastisized techniques
- Cements

Discussion

















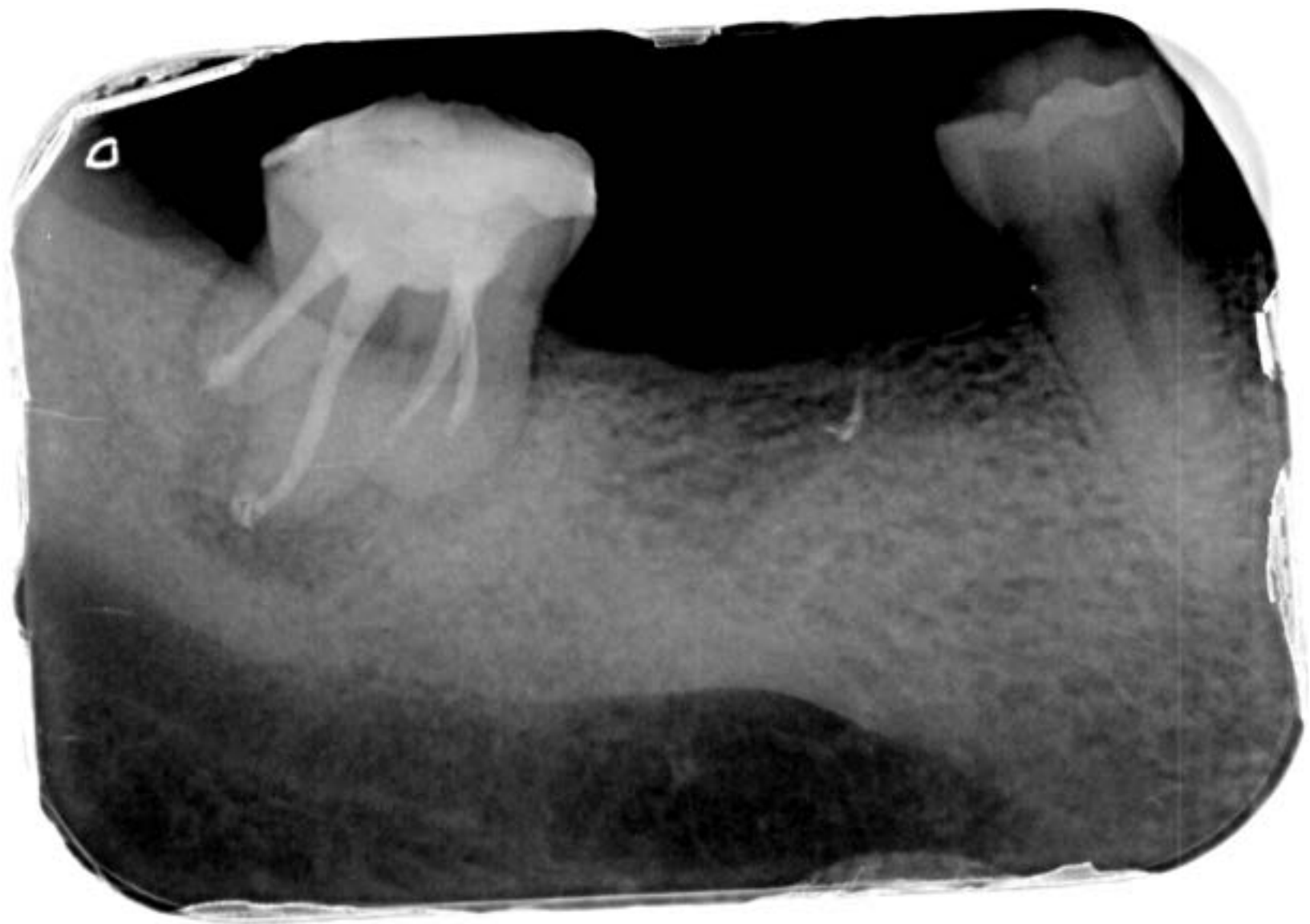








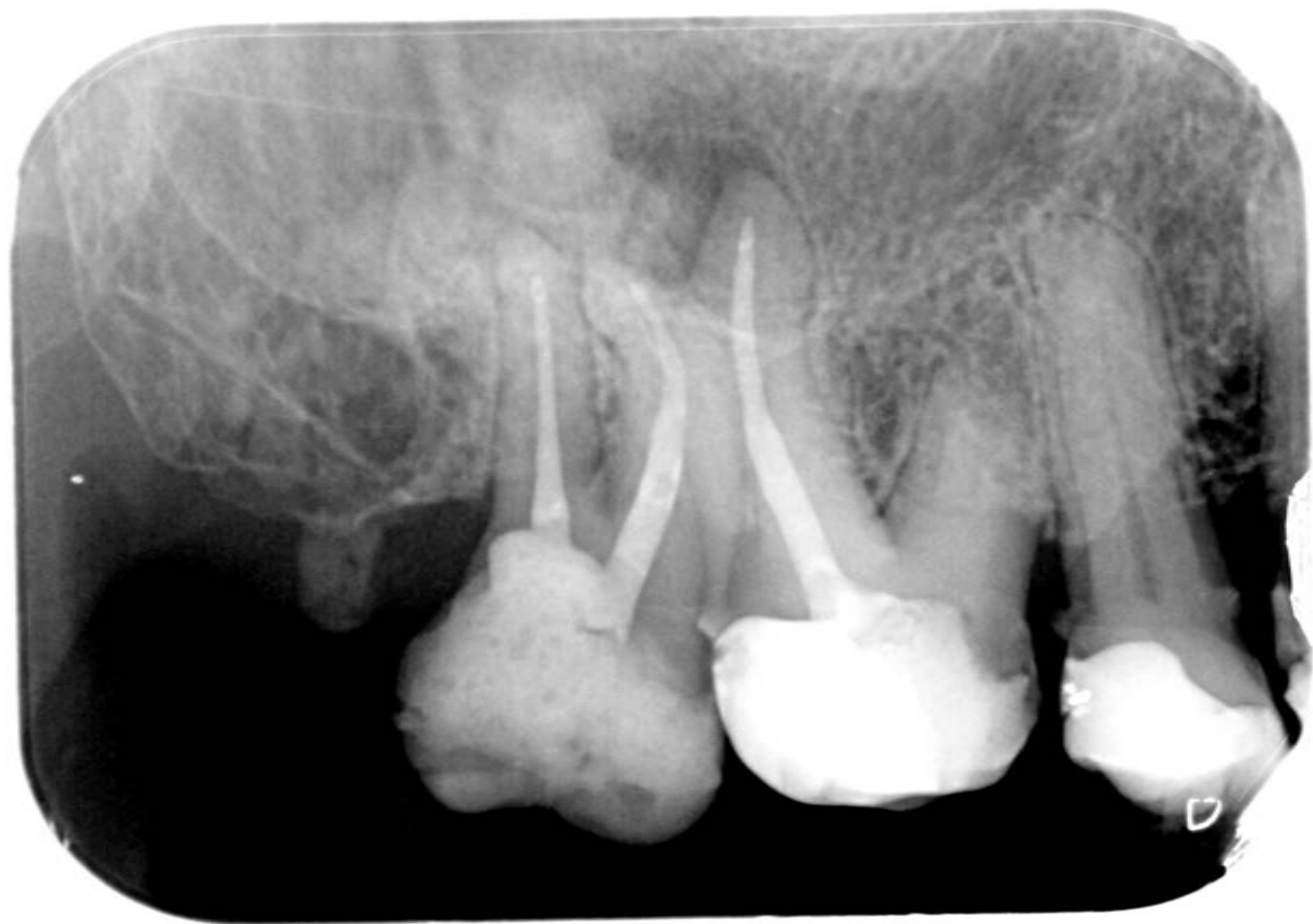










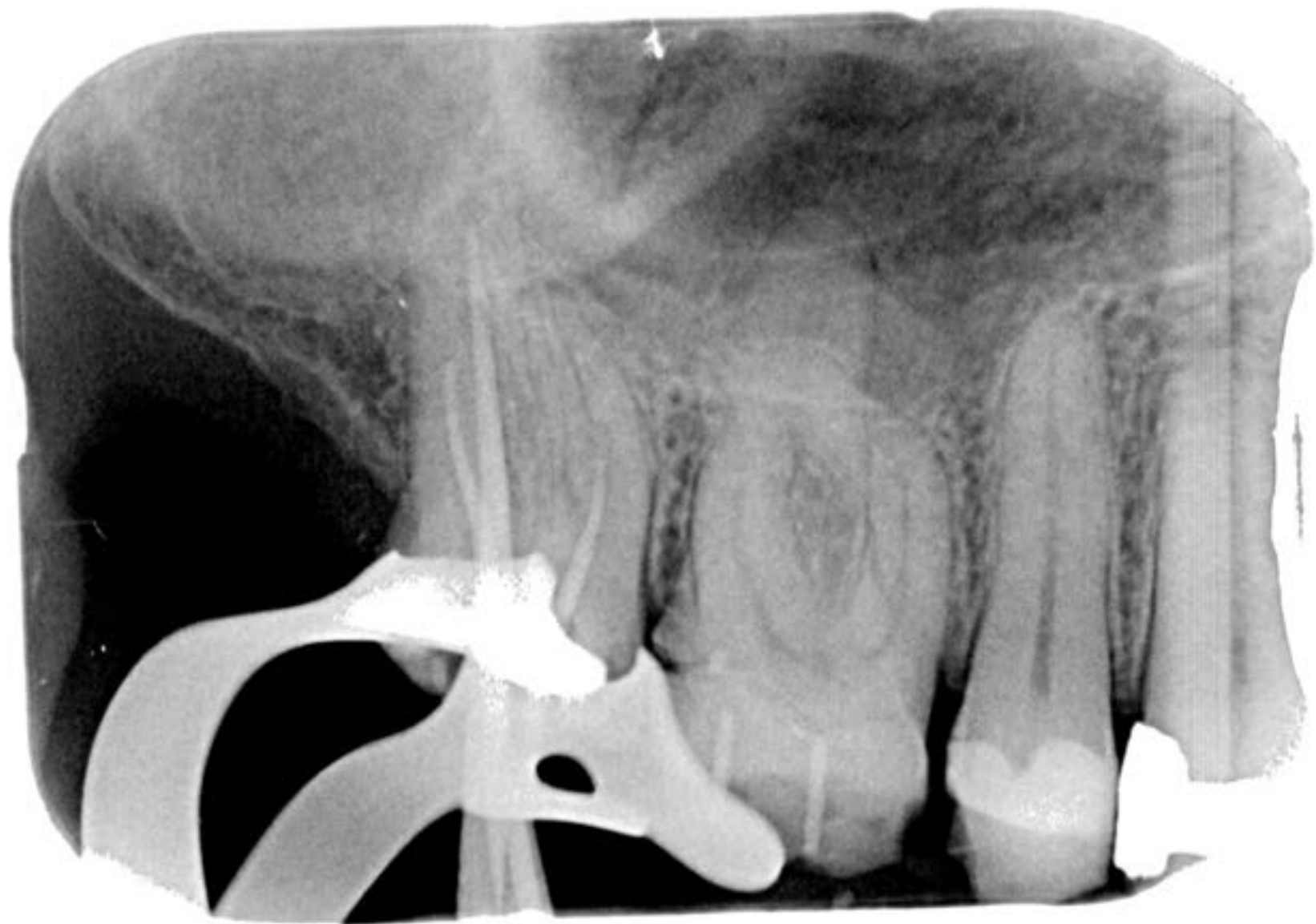








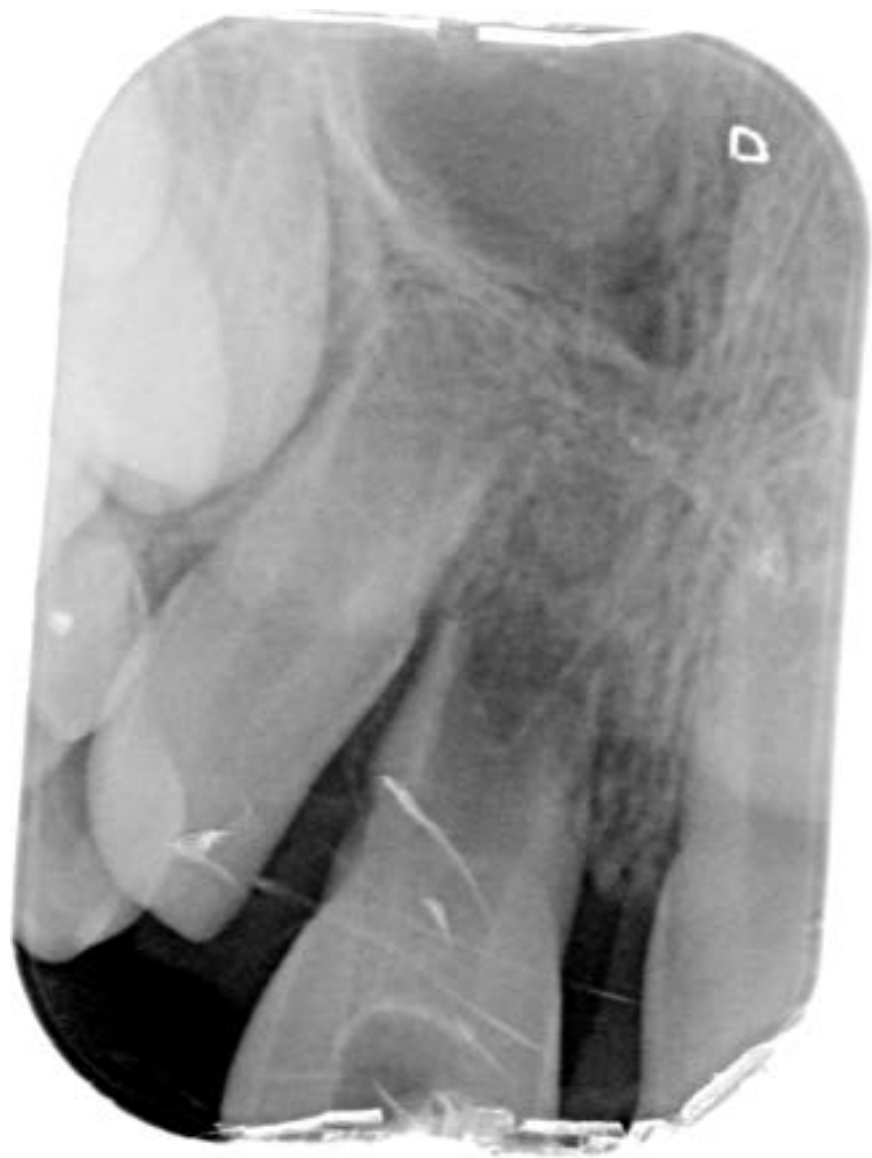


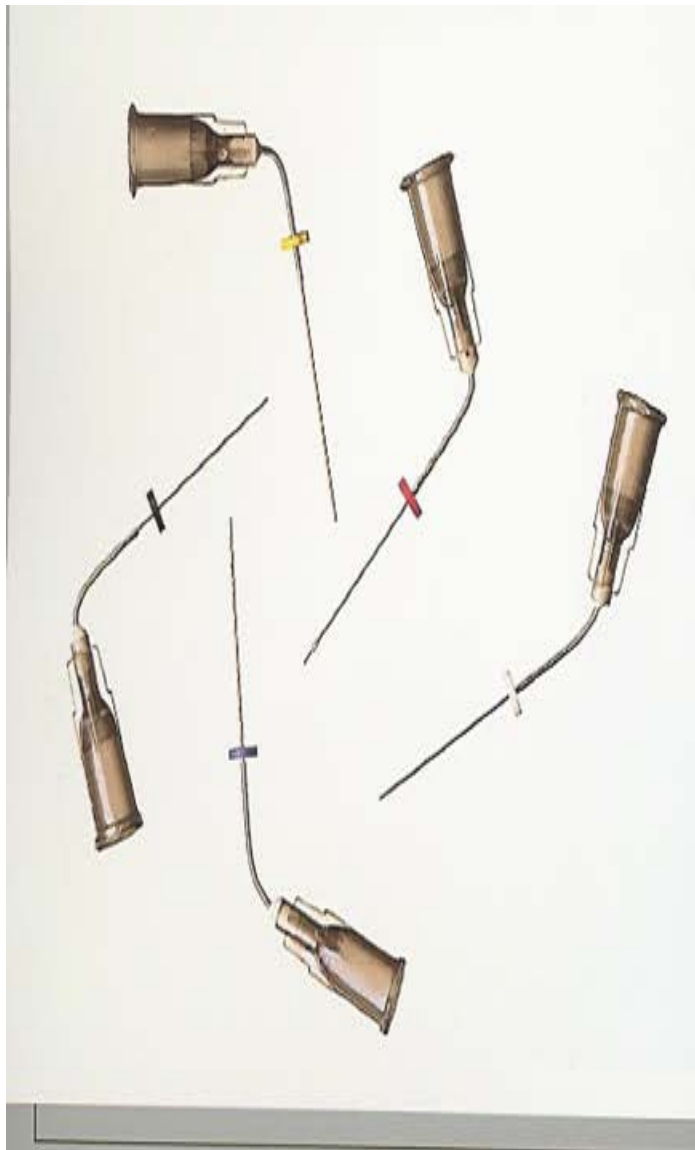












STROPKO NITI FLEXI-TIPS™*

SybronEndo's 30 gauge Nickel Titanium Irrigating Needle tips are flexible enough to facilitate access in any canal. The tips are slotted and side vented for safe irrigation. Not only are they fully autoclavable, but also coated on the inside and outside to protect against the corrosive effects of sodium hypochlorite. The universal luer style design is available in 17mm & 25mm working lengths.

17mm

973-1004

25mm

973-1005

