06-02-2026

Shape Less, Seal Better

THE WORKSHOP

DR GIANLUCA FUMEI

Dr Gianluca Fumei

Professore a contratto e titolare dell'insegnamento di
"Odontoiatria Conservativa ed Endodonzia 2"
CLOPD Università dell'Insubria Varese

Socio Attivo

Socio Attivo

European Society of Endodontology
Certified Member 2017

specialist member

Socio Attivo

ShapeIT®





PICCOTTI BALOCCO FUMEI SUARDI BUCCI

Sharing is the key to success

WHY DENTAL WORLD PRODUCTS IN ENDO?

Endodontics

The recovery of a tooth
affected by pulpal or periradicular pathology
and the restoration of its function.

Treatment Objectives

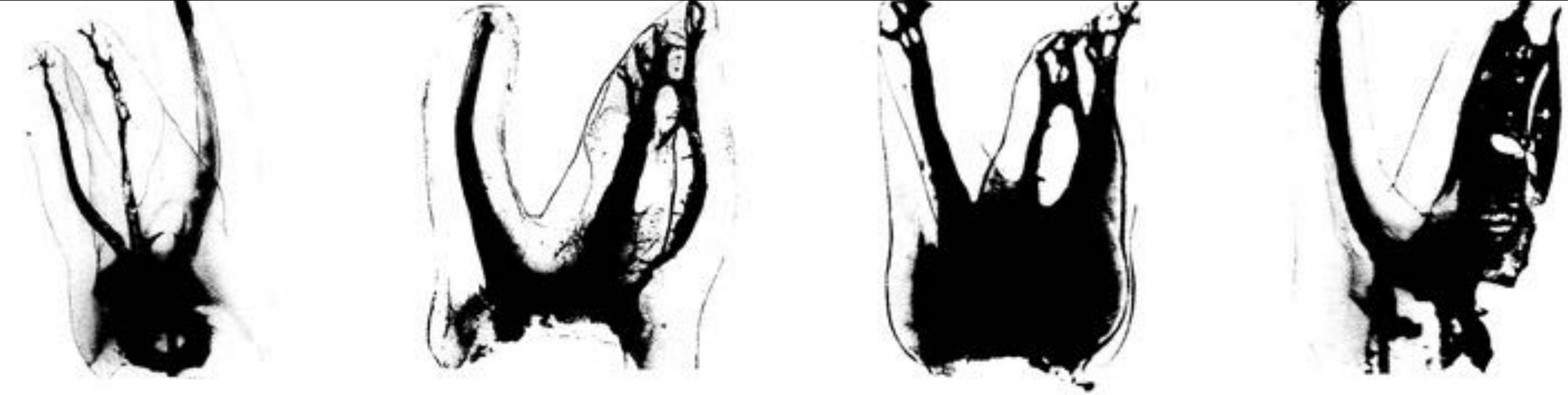
Mechanical

- Continuous Taper from Crown to Apex
- Preserve Canal Curvature
- Preserve Apical Diameter

Biological

- Remove Diseased Pulp
- Reduce Bacterial Load

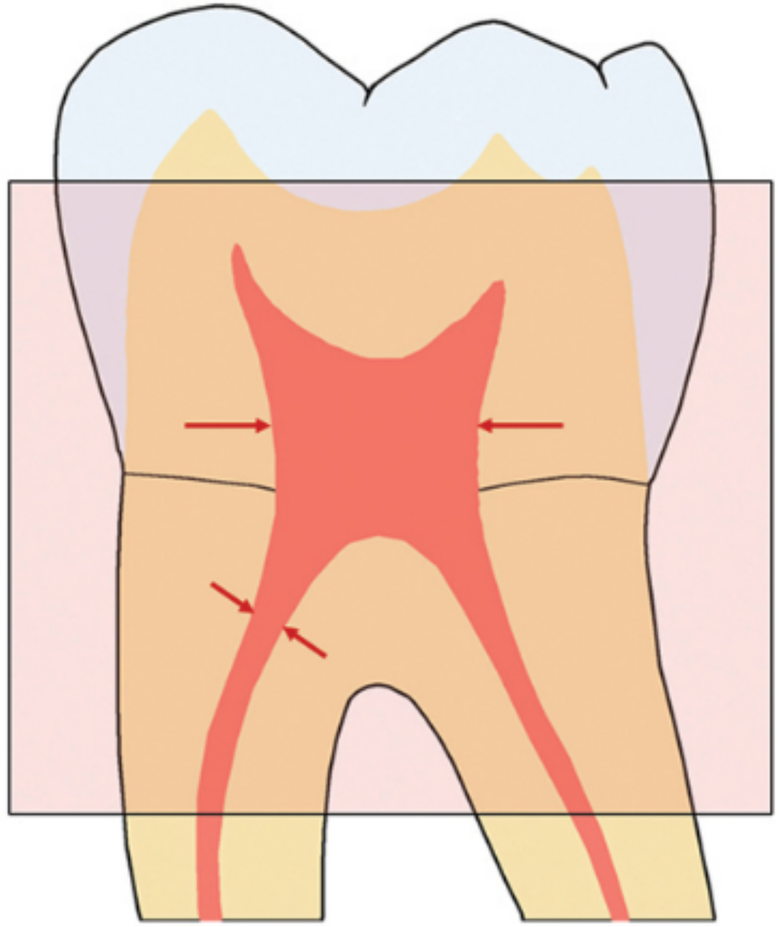
Minimally Invasive Endodontics

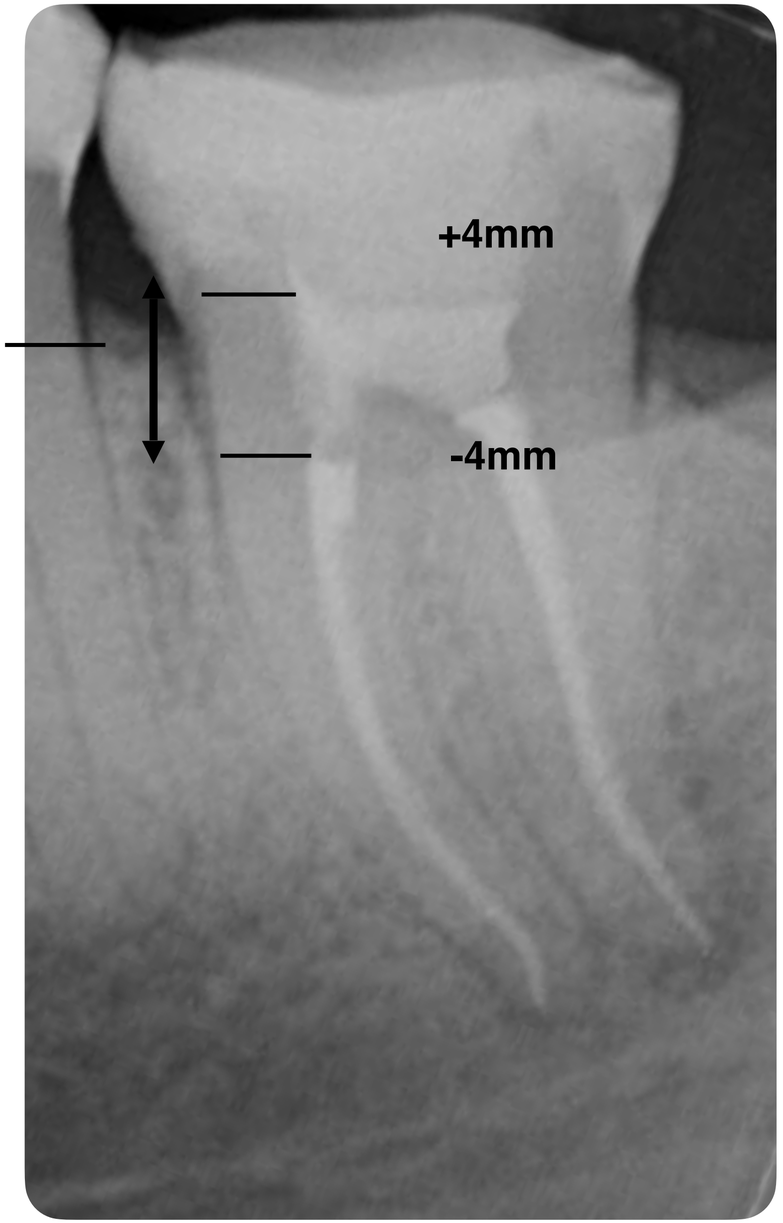


ROOT CANAL ANATOMY VARIETY

CONSERVAZIONE DELLA

DENTINA PERICERVICALE





1. PERICERVICAL DENTIN IS GENERALLY LOCATED 4MM CORONALLY AND APICALLY TO THE ALVEOLAR CREST
2. PERICERVICAL DENTIN IS IRREPLACEABLE

J Endod. 2002 Mar;28(3):211-6.

Roentgenographic investigation of frequency and degree of canal curvatures in human permanent teeth.

Schäfer E[1], Diez C, Hoppe W, Tepel J.

Author information

Abstract

Canal curvatures of 700 permanent human teeth were determined by measuring the angle and the radius of the curvatures and the length of the curved part of the canal. For each type of tooth (except third molars) 50 were selected at random and were investigated. Size 08 silver points were inserted into the canals, and the teeth were radiographed from a facial and proximal view by using a standardized technique. All radiographs were analyzed by a computerized digital image processing system. Of the 1163 root canals examined, 980 (84%) were curved and 65% showed an angle < or = 27 degrees with radii < 40 mm. Thirteen percent displayed angles between 27 degrees and 35 degrees with radii not greater than 15 mm, and 9% of all canals that were investigated had curves > 35 degrees with the greatest radius of 13 mm. The greatest angle of all the teeth was 75 degrees with a radius of 2 mm. To define the canal curvature mathematically and unambiguously, the angle, the radius, and the length of the curve should be given.

J Endod. 2002 Mar;28(3):211-6.

Roentgenographic investigation of frequency and degree of canal curvatures in human permanent teeth.

Schäfer E[1], Diez C, Hoppe W, Tepel J.

Author information

Abstract

Canal curvatures of 700 permanent h… e curvatures and the length of the curved part of the canal. For each type of to… ed. Size 08 silver points were inserted into the canals, and the teeth were ra… nique. All radiographs were analyzed by a computerized digital image processin… d 65% showed an angle < or = 27 degrees with radii < 40 mm. Thirteen percent … ter than 15 mm, and 9% of all canals that were investigated had curves > 35 d… eth was 75 degrees with a radius of 2 mm. To define the canal curvature mather… curve should be given.

1163 roots examined:
980 (84%) curved

65% angle <27°
30% angle 27-35°
9% angle > 35°

DAILY PRACTICE

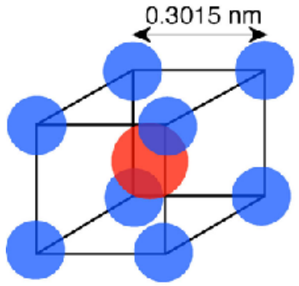
MANUAL FILES

ROTARY FILRS

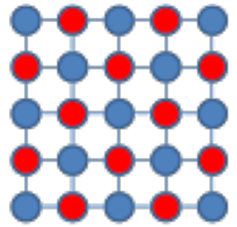
Nitinol

Nickel **Ti**tanium **N**aval **O**rdnance **L**aboratory

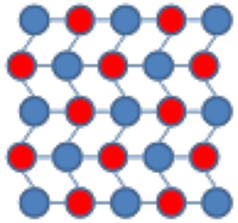
William J Buehler -1963- US Navy Polaris Project



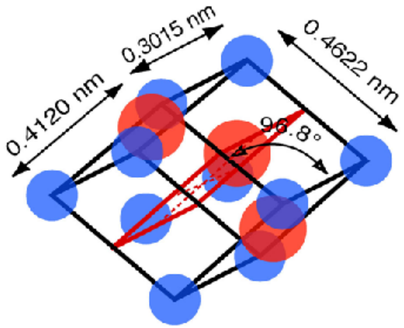
Austenite



The alloy can have two atomic conformations: Austenite is the more "rigid and stable" form with a cubic lattice. Martensite is the less stable and more plastic form with a close-packed hexagonal lattice.

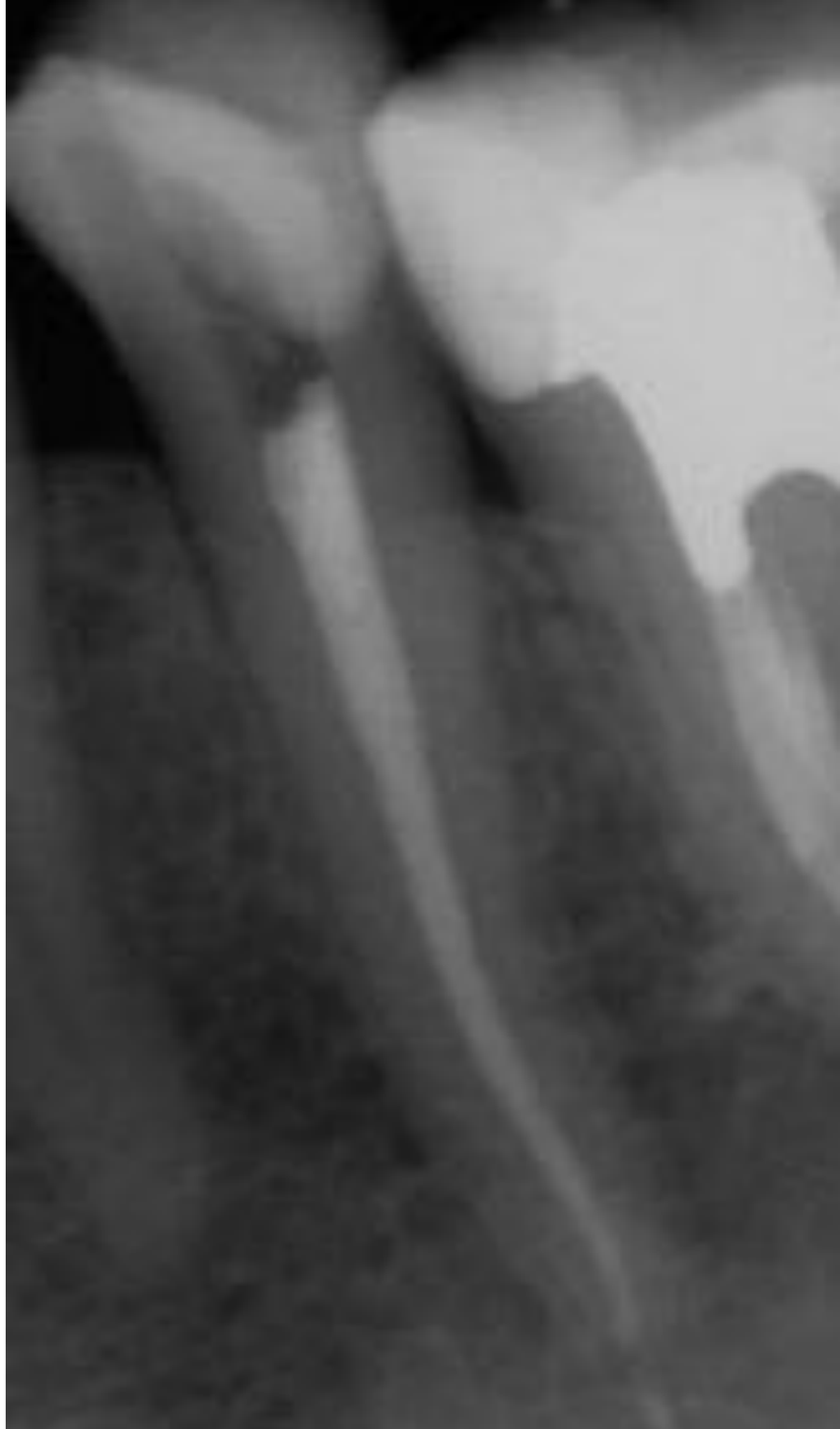


Martensite



The austenitic alloy will be hard, rigid, and have greater superelasticity properties.

The martensitic alloy, on the other hand, will be soft, ductile, and easily deformable, with shape memory properties.



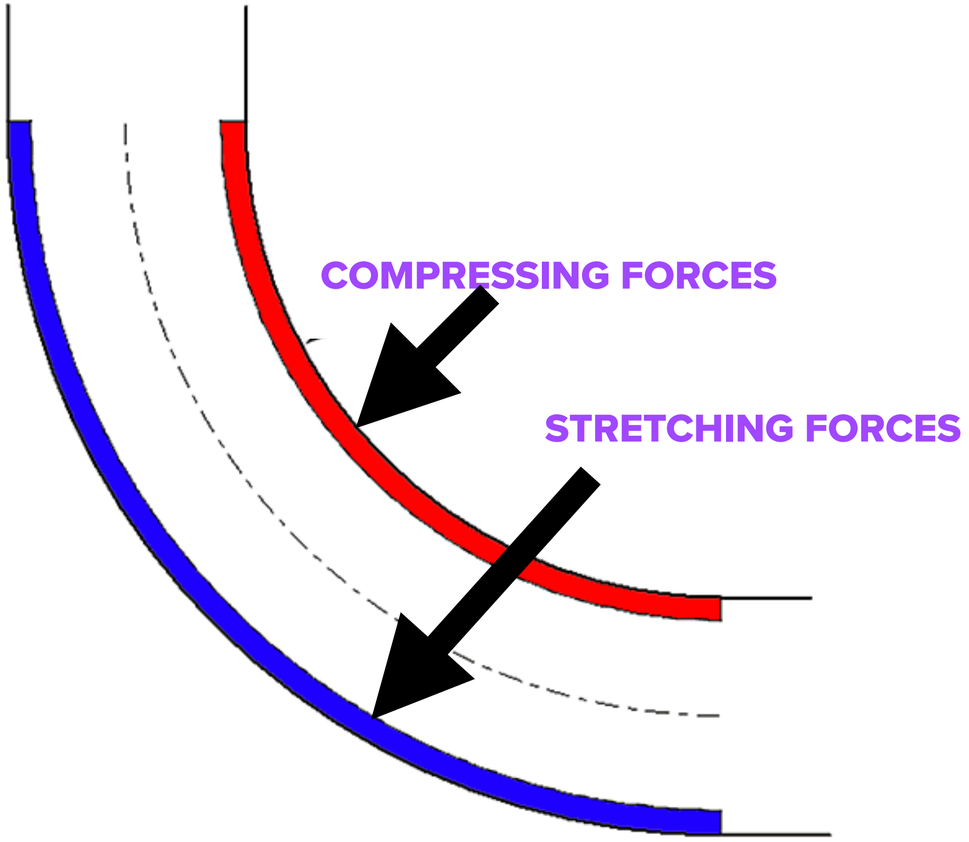
NI-TI ROTARY FILE

- Preserve anatomy
- Stay centered in the canal
- Cutting efficiency
- Reduced number of passes/short sequence
- Resistant

TORSIONAL STRESS

- It occurs when one part of the rotating instrument (usually the tip) becomes blocked and the remaining part continues to rotate at the preset speed due to the torque action of the endodontic motor.

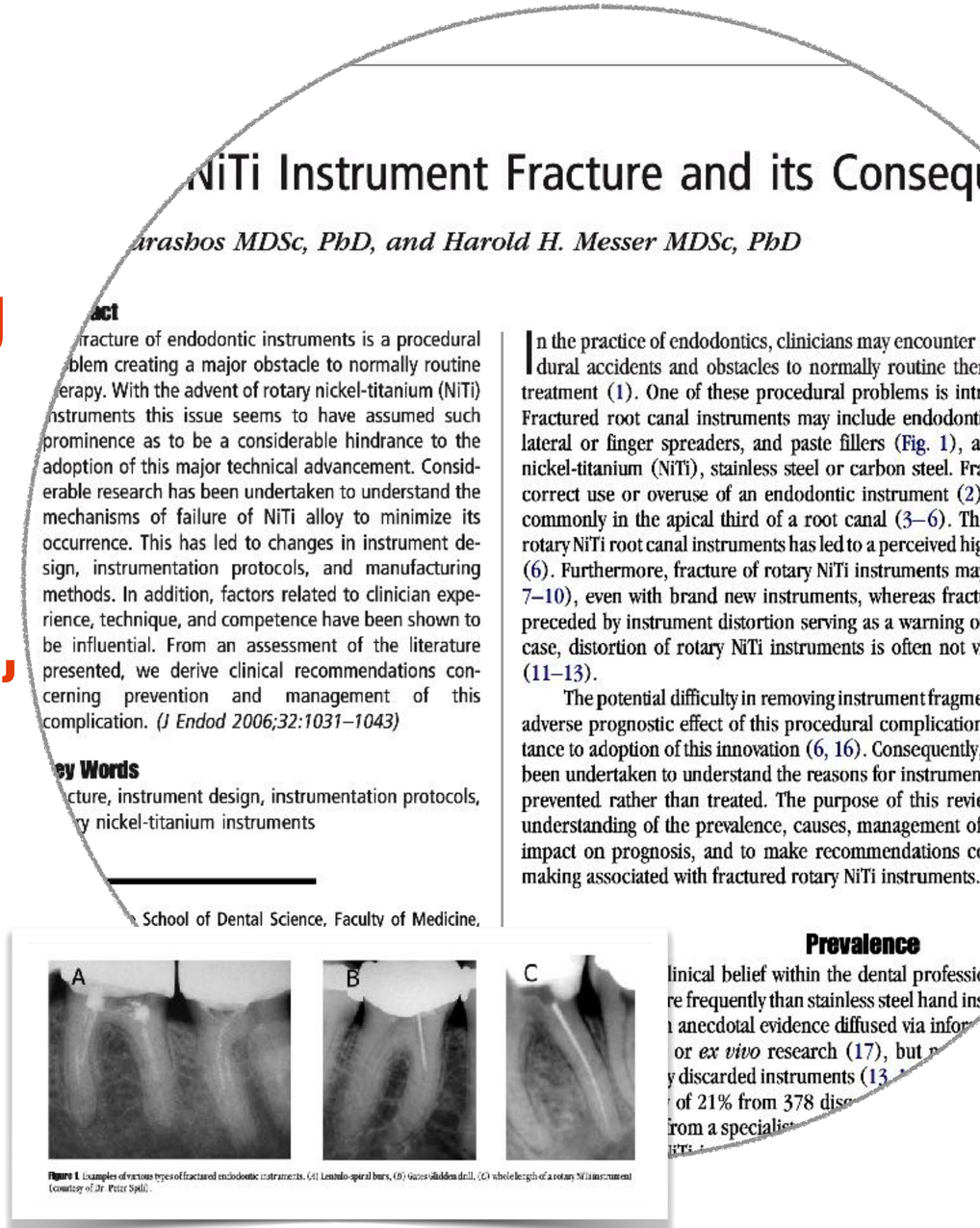
CYCLIC FATIGUE



Rotary NiTi Instrument Fracture and its Consequences

This has led to changes in instrument design, instrumentation protocols, and manufacturing methods. In addition, factors related to clinician experience, technique, and competence have been shown to be influential

Peter Parashos and Harold H. Messer 2006



NiTi Instrument Fracture and its Conseq

arashos MDSc, PhD, and Harold H. Messer MDSc, PhD

act

racture of endodontic instruments is a procedural blem creating a major obstacle to normally routine erapy. With the advent of rotary nickel-titanium (NiTi) nstruments this issue seems to have assumed such prominence as to be a considerable hindrance to the adoption of this major technical advancement. Considerable research has been undertaken to understand the mechanisms of failure of NiTi alloy to minimize its occurrence. This has led to changes in instrument design, instrumentation protocols, and manufacturing methods. In addition, factors related to clinician experience, technique, and competence have been shown to be influential. From an assessment of the literature presented, we derive clinical recommendations concerning prevention and management of this complication. *(J Endod 2006;32:1031–1043)*

ey Words

cture, instrument design, instrumentation protocols, y nickel-titanium instruments

n the practice of endodontics, clinicians may encounter dural accidents and obstacles to normally routine ther treatment (1). One of these procedural problems is intr Fractured root canal instruments may include endodont lateral or finger spreaders, and paste fillers (Fig. 1), a nickel-titanium (NiTi), stainless steel or carbon steel. Fra correct use or overuse of an endodontic instrument (2) commonly in the apical third of a root canal (3–6). Th rotary NiTi root canal instruments has led to a perceived hig (6). Furthermore, fracture of rotary NiTi instruments ma 7–10), even with brand new instruments, whereas fract preceded by instrument distortion serving as a warning o case, distortion of rotary NiTi instruments is often not v (11–13).

The potential difficulty in removing instrument fragme adverse prognostic effect of this procedural complication tance to adoption of this innovation (6, 16). Consequently been undertaken to understand the reasons for instrumen prevented rather than treated. The purpose of this revie understanding of the prevalence, causes, management of impact on prognosis, and to make recommendations co making associated with fractured rotary NiTi instruments.

School of Dental Science, Faculty of Medicine,

Prevalence

linical belief within the dental professio re frequently than stainless steel hand ins anecdotal evidence diffused via infor or *ex vivo* research (17), but y discarded instruments (13 of 21% from 378 disc from a specialist

Figure 1. Examples of various types of fractured endodontic instruments. (A) Lentulo-spiral burs, (B) Gates Glidden drill, (C) whole length of a rotary NiTi instrument (courtesy of Dr. Peter Split).


2011

Heat Treated/activated Alloys

Current Challenges and Concepts of the Thermomechanical Treatment of Nickel-Titanium Instruments

Ya Shen, DDS, PhD, Hui-min Zhou, DDS, PhD,† Yu-feng Zheng, PhD,‡ Bin Peng, DDS, PhD,§ and Markus Haapasalo, DDS, PhD**

Abstract

Introduction: The performance and mechanical properties of nickel-titanium (NiTi) instruments are influenced by factors such as cross-section, flute design, raw material, and manufacturing processes. Many improvements have been proposed by manufacturers during the past decade to provide clinicians with safer and more efficient instruments. **Methods:** The mechanical performance of NiTi alloys is sensitive to their microstructure and associated thermomechanical treatment history. Heat treatment or thermal processing is one of the most fundamental approaches toward adjusting the transition temperature in NiTi alloy, which affects the fatigue resistance of NiTi endodontic files. The newly developed NiTi instruments made from controlled memory wire, M-Wire (Dentsply Tulsa Dental Specialties, Tulsa, OK), or R-phase wire represent the next generation of NiTi alloys with improved flexibility and fatigue resistance. The advantages of NiTi files for canal cleaning and shaping are decreased canal transportation and ledging, a reduced risk of file fracture, and faster and more efficient instrumentation. The clinician must understand the nature of different NiTi raw materials and their impact on instrument performance because many new instruments are introduced on a regular basis. **Results:** This review summarizes the metallurgical properties of next-generation NiTi instruments, the impact of thermomechanical treatment on instrument flexibility, and the resistance to cyclic fatigue and torsion. **Conclusions:** The aim of this review was to provide clinicians with the knowledge necessary for evidence-based practices by optimizing the benefits from the selection and application of NiTi rotary instruments for root canal treatment.

J Endod 2013;39:163–172)

From the *Division of Endodontics, De…
†Center for Biomedical Materials and Engi…
ratory for Turbulence and Complex Systems…
Key Laboratory Breeding Base of Basic …
Stomatology, Wuhan University, Wuhan…
Address requests for reprints to Dr …
Wesbrook Mall, Vancouver, BC, Canad…

http://dx.doi.org/10.1016/j.joen.201…

TABLE 1. A List of Literature on the Mechanical Properties of Thermomechanically Treated NiTi Instruments with Continuous Rotation

	Phase transformation	Flexible property	Cyclic fatigue	Torsional fracture
CM Wire (HyFlex CM, TYPHOON Infinite Flex NiTi)	Shen et al, 2011 (44)	Testarelli et al, 2011 (105); Zhou et al, 2012 (42)	Shen et al, 2011 (39); Shen et al, 2012 (40); Peters et al, 2012 (92)	Casper et al, 2011 (95); Peters et al, 2012 (92)
M-Wire (ProFile GT Series X, ProFile Vortex, Vortex Blue)	Alapati et al, 2009 (47); Shen et al, 2011 (44); Ye and Gao, 2012 (45)	Gao et al, 2012 (41)	Gambarini et al, 2008 (66); Johnson et al, 2008 (68); Larsen et al, 2009 (69); Kramkowski and Bahcall, 2009 (90); Gao et al, 2010 (38); Al-Hadlaq et al, 2010 (67); Hilfer et al, 2011 (84); Gao et al, 2012 (41); Plotino et al, 2012 (86)	Johnson et al, 2008 (68); Kramkowski and Bahcall, 2009 (90); Casper et al, 2011 (95); Bardsley et al, 2011 (100); King et al, 2012 (96); Gao et al, 2012 (41)
R-phase wire (K3XF, TFs)	Hou et al, 2011 (43); Shen et al, 2011 (44)	Gambarini et al, 2008 (48); Hou et al, 2011 (43)	Gambarini et al, 2008 (66); Larsen et al, 2009 (69); Kim et al, 2010 (70); Bhagabati et al, 2011 (71); Rodrigues et al, 2011 (72); Pedullà et al, 2011 (73); Hilfer et al, 2011 (84)	Gambarini et al, 2009 (98); Park et al, 2010 (93); Gambarini et al, 2010 (97); Casper et al, 2011 (95); King et al, 2012 (96)

conventional NiTi wire (Fig. 2*A–D*). Hence, it is not surprising that CM series files had fatigue resistance superior to that of files made from conventional NiTi alloy.

Endodontic instruments are used to prepare the root canal in the presence of an irrigating solution. A recent study (40) showed that 2 CM Wire instruments (ie, TYP CM and NEXY CM) yielded a 4–9 times longer fatigue life than conventional NiTi files with the same design under various solutions. The fatigue life of 3 conventional SE NiTi instruments was unaffected by the environments, whereas the fatigue life of the 2 CM file types was much longer in liquid media than in air. This may imply that the fatigue of NiTi alloys is sensitive to temperature, both locally and environmentally. A function of the aqueous media in metal fatigue behavior is to carry the heat away from the metal-to-metal contact. Therefore, an aqueous medium seems to serve as an effective heat sink to facilitate the long fatigue life of the CM instrument.

M-Wire

A few years ago, a modification of the SE508 NiTi alloy used for endodontic instruments was developed (65) by Dentsply (M-Wire). Several studies have examined the fatigue resistance of M-Wire NiTi files (38, 41, 66–68). However, the results from these studies cannot easily be compared with one another because of variations in the experimental design and testing model.

A major drawback of most laboratory testing of the fatigue behavior of NiTi rotary instruments is the inability to eliminate several confounding factors, such as material properties, design, and

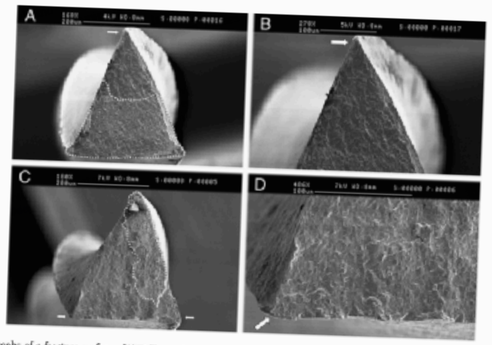


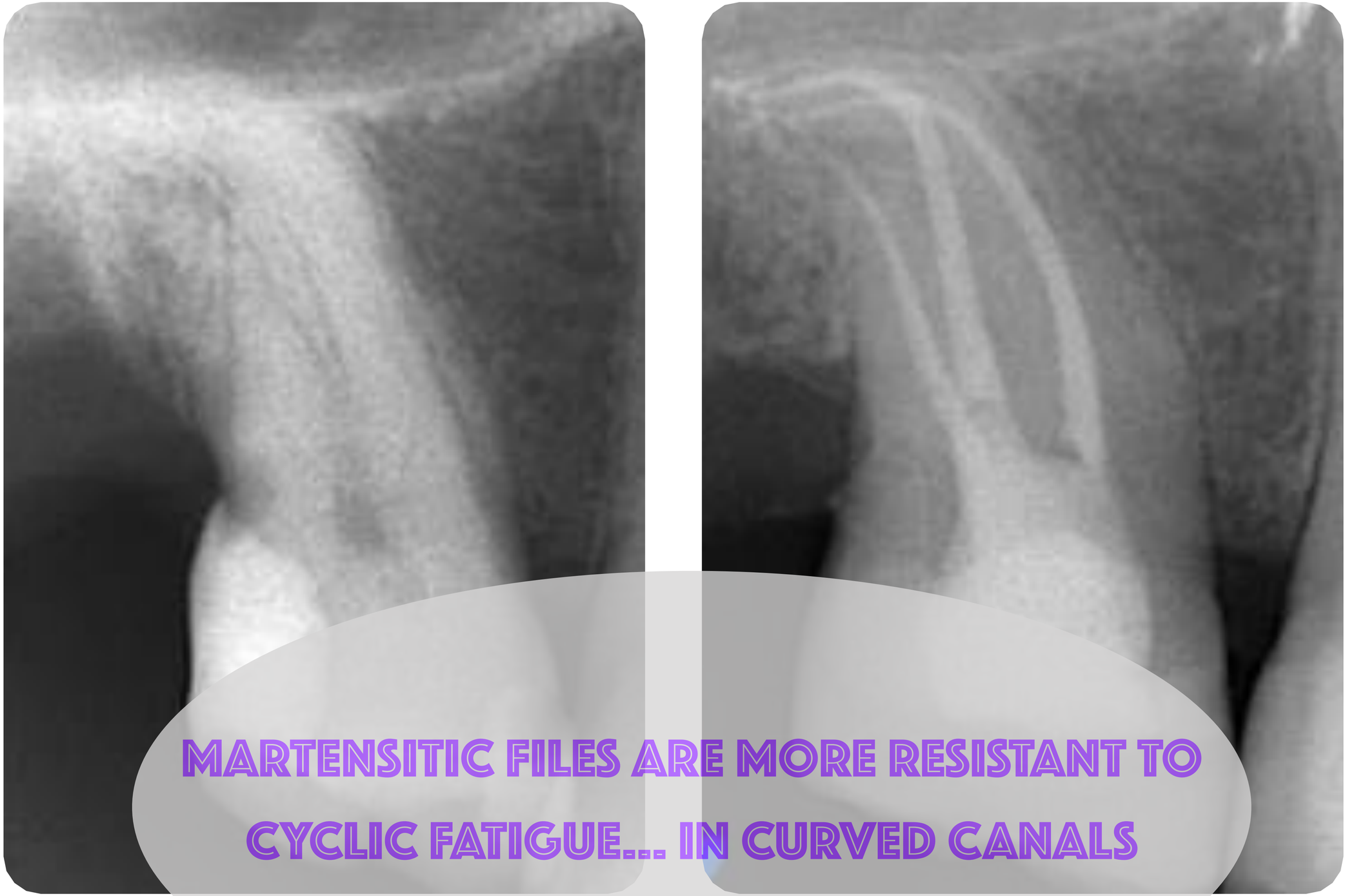
Figure 2. Photomicrographs of a fracture surface of TYP files with the region of fatigue crack propagation and dimple area outlined (*dotted line*) with crack origins (*arrows*). (*A*) The overall view of the TYP file (N_f = 345, dimple area is 69%). (*B*) A high-magnification view of the crack origin (*arrow*). (*C*) An overall view of the TYP CM file with 2 crack origins (*arrows*) (N_f = 1280, dimple area is 36%). (*D*) A high-magnification view of 1 crack origin (*arrow*).

2013

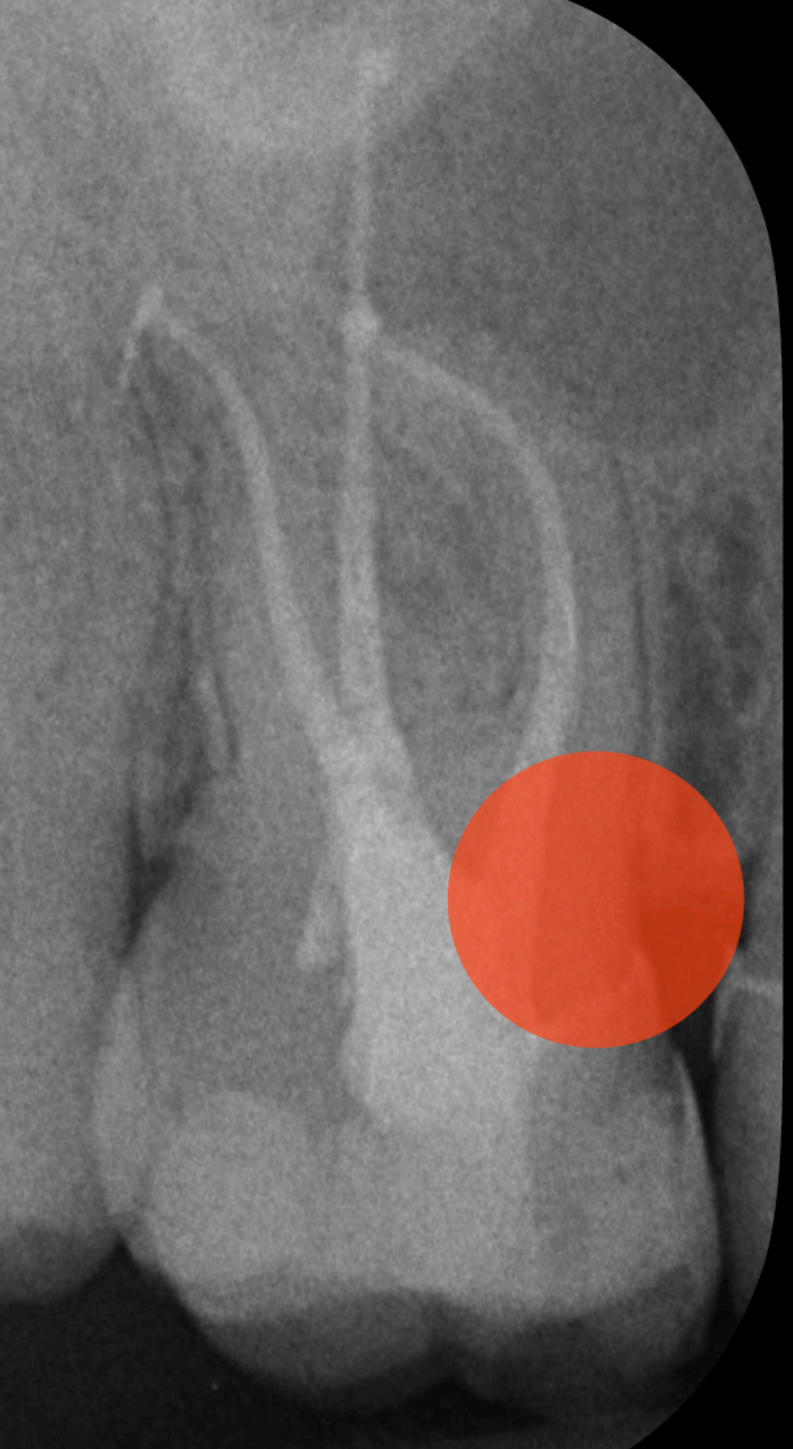
YA SHEN et AL JOE

2013 YA SHEN et AL

into a single process. The newly developed thermomechanical treatment of NiTi files gives them better flexural fatigue resistance than files of similar design and size made from conventional NiTi alloy. The unique material properties make them particularly suited for endodontic treatment. Although the details of the thermomechanical



MARTENSITIC FILES ARE MORE RESISTANT TO CYCLIC FATIGUE... IN CURVED CANALS



Clark e Khademi 2010 - Boveda e Kishen 2015 - Plotino 2017

Preserving PCD reduces loads on roots

& reduces the risk of root fracture

Endodontic Heat Treated Ni-Ti Rotary Files

Cyclic Fatigue

Torsional Stress

250-300
500-800

TORQUE
FORCE

Low
1,5-2,5 N/cm

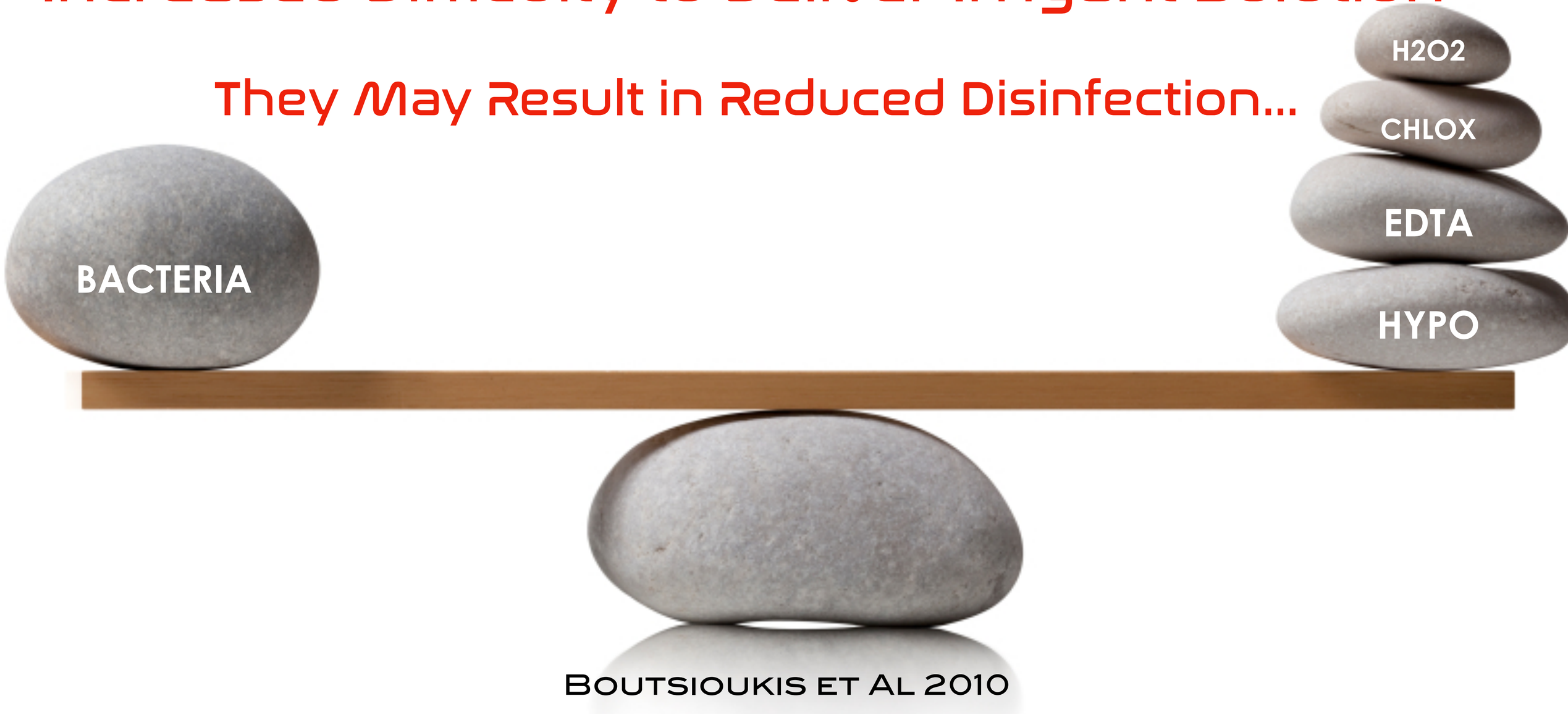
Disinfection Protocol to Reduce the bacterial Load Beneath A Subcritical threshold

Siqueira et AL. Braz Dent Journ. 2007

Smaller Apical Preparation in Higly Curved Canals are Safer...

Increased Difficulty to Deliver Irrigant Solution

They *M*ay Result in Reduced Disinfection...



Boutsioukis et al 2010

Shaping Apical Diameter

Minimum diameter to allow Irrigants to work

#30 - 35.

Journal of International Oral Health 2015; 7(6):92-96

Received: 28th January 2015 *Accepted: 20th April 2015* *Conflicts of Interest: None*

Source of Support: Nil

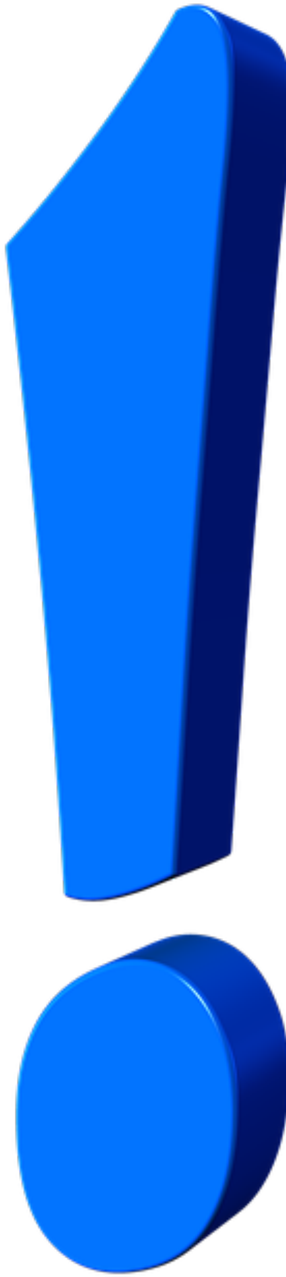
Original Research

Minimal Apical Enlargement for Penetration of Irrigants to the Apical Third of Root Canal System: A Scanning Electron Microscope Study

P Srikanth[1], Amaravadi Gopi Krishna[2], Siva Srinivas[3], E Sujayeendranatha Reddy[4], Someshwar Battu[5], Swathi Aravelli[1]

Usually, the More Severe the Canal Curvature, The Greater the Risk of Transportation And Unexpected Fracture

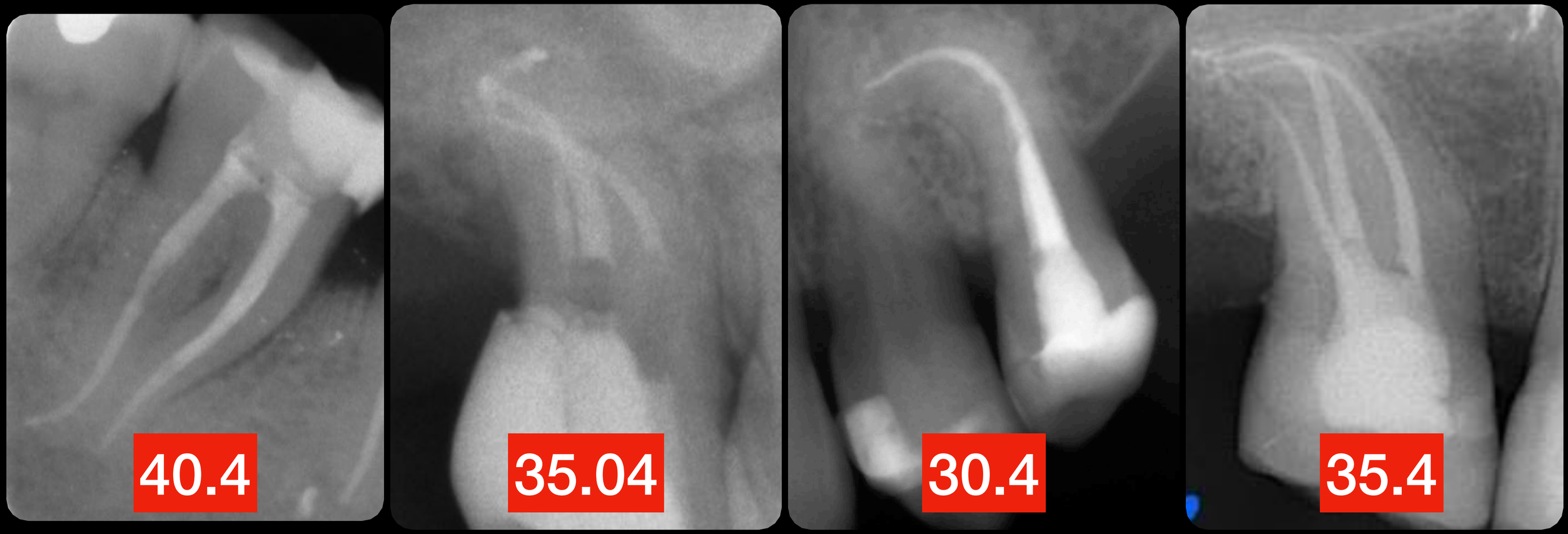
...When Larger Apical Preparations Are Targeted



Shafer 2009

FINITURA
FINISHING

Increasing diameter



Decreasing taper

DOI: 10.1111/iej.13782

REVIEW ARTICLE

INTERNATIONAL ENDODONTIC JOURNAL | WILEY

2022

Effectiveness of root canal instrumentation for the treatment of apical periodontitis: A systematic review and meta-analysis

Sebastian Bürklein[1] | Ana Arias[2]

CONCLUSION

- higher incidence of procedural errors and associated lower success rate for primary root canal treatment of teeth prepared with stainless steel files compared with the use of NiTi instruments;
- higher intensity of PP when retreatment procedures were performed with reciprocation instead of rotation even up to day 7;
- using contemporary endodontic techniques in general for initial root canal treatments reduces the need of further nonsurgical or surgical retreatments (Fleming et al., 2010).

WHY DENTAL WORLD PRODUCTS?

DENTAL WORLD BENEFITS?

RESPECT OF THE ROOT ANATOMY

DENTAL WORLD
ITALIAN MANUFACTURER

HEAT TREATED NI-TI ROTARY FILES

PRO FLEX NHA

NANO RIVESTITO ATTIVAZIONE TERMICA

NEW ENTRY!!!

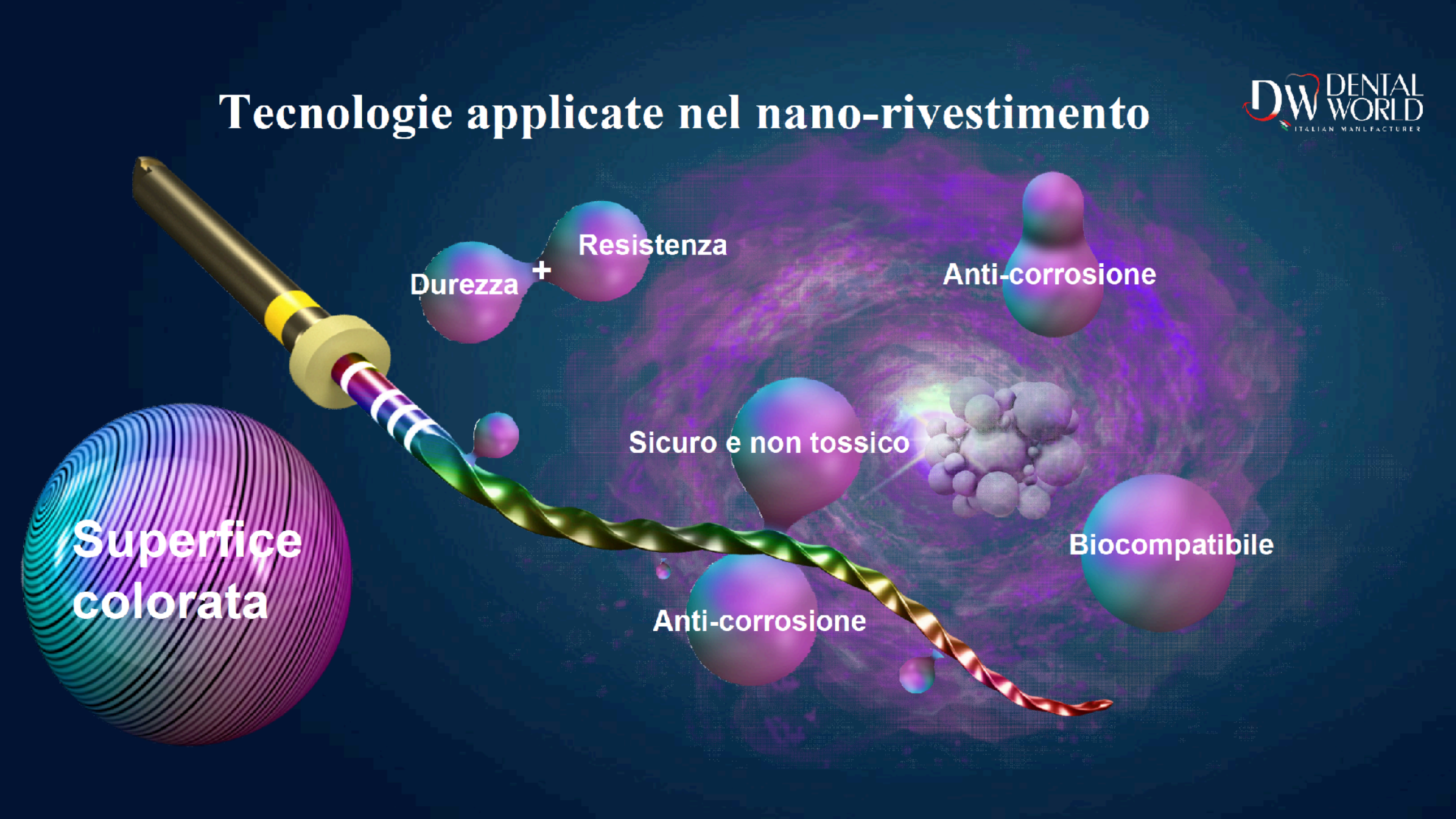
NEW ENTRY!!!

NEW ENTRY!!!

HT Ni-ti /Martensitic

- Reduced restoring force
- Heat activated shape memory
- Martensitic phase stable at room temperature

Tecnologie applicate nel nano-rivestimento



Perché i nanomateriali hanno prestazioni migliori dei materiali tradizionali?

BETTER PHYSICAL PROPERTIES SUCH AS HARDNESS, TOUGHNESS, HEAT AND CORROSION RESISTANCE

DW DENTAL WORLD
ITALIAN MANUFACTURER

DENTAL WORLD
ITALIAN MANUFACTURER

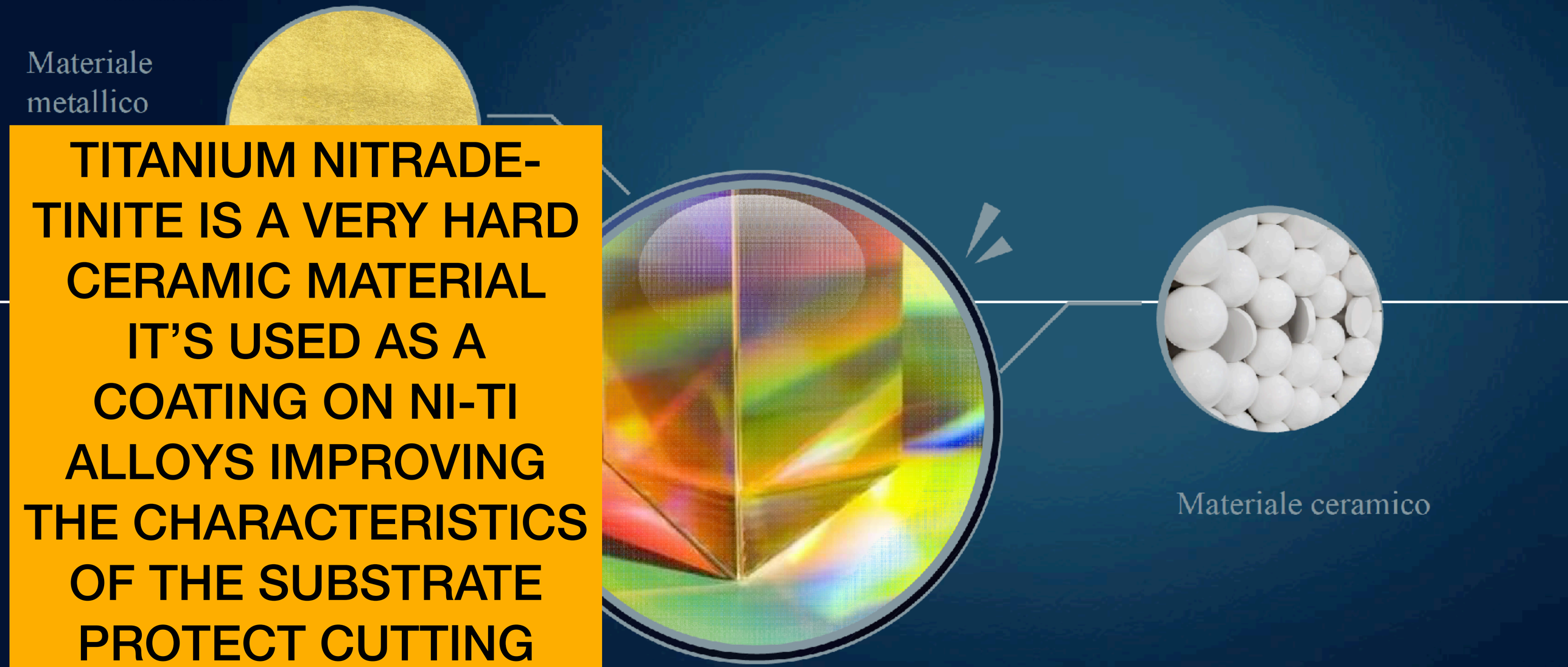
Cos'è il nano-rivestimento

NANO FILMS HAVE UNIQUE FUNCTIONS IN TERMS OF OPTICAL, ELECTRICAL AND MECHANICAL PROPERTIES

Caratteristiche del nano-rivestimento

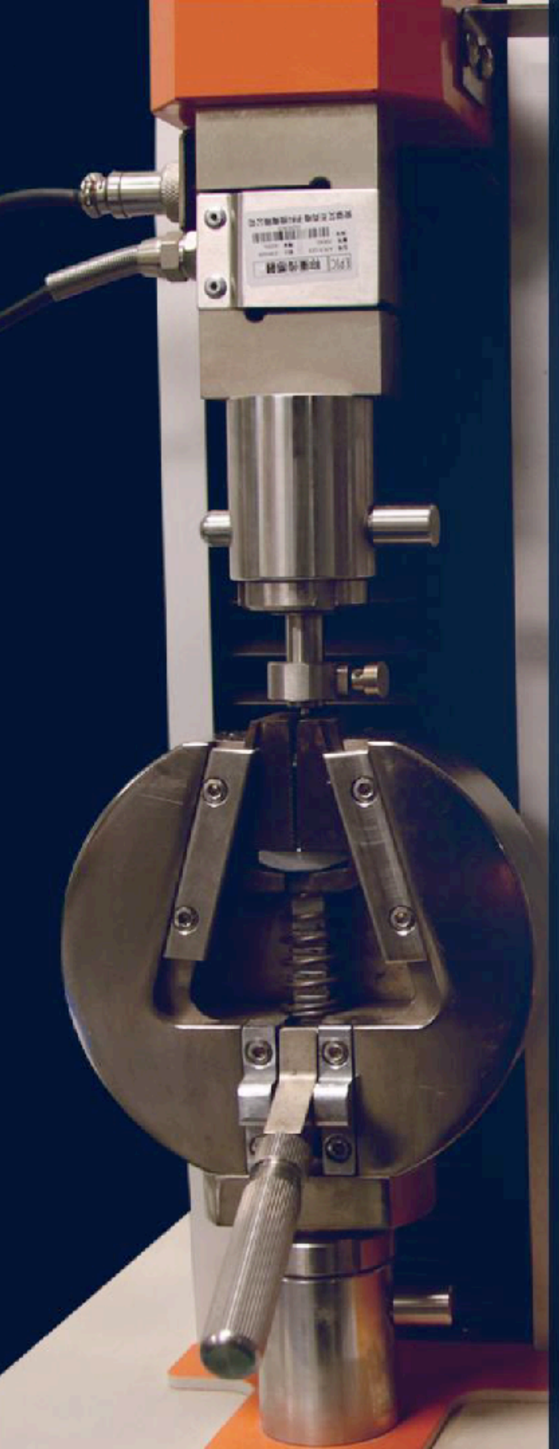
DENTAL WORLD
ITALIAN MANUFACTURER

Materiale metallico



Materiale ceramico

TITANIUM NITRADE-TINITE IS A VERY HARD CERAMIC MATERIAL IT'S USED AS A COATING ON NI-TI ALLOYS IMPROVING THE CHARACTERISTICS OF THE SUBSTRATE PROTECT CUTTING SURFACE



DENTAL WORLD
ITALIAN MANUFACTURER

Tinite

Caratteristiche della ceramica

La durezza del rivestimento è estremamente elevata - più di tre volte la durezza dell'acciaio per utensili e stampi - e può addirittura raggiungere valori superiori a 4000 HV. Il rivestimento è s iciente di attrito.

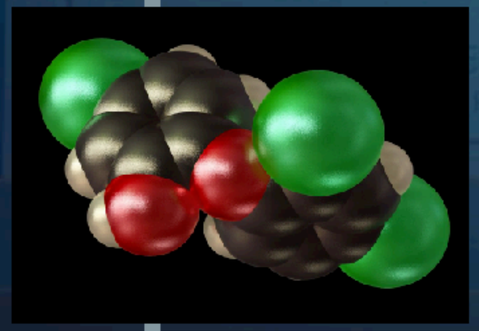
Lo strato di rivestimen tallo, evitando l'accumulo di detriti e migliorando la qualit ati. Il rivestimento presenta una buona stabilità termica; alcuni rivestimenti possono persino resistere a temperature di lavoro superiori a 1000°C.

HARDNESS

Caratteristiche del metallo

Tenacia, resistenza agli urti, resistenza agli shock, conduttività e proprietà magnetiche superiori.

RESISTANCE

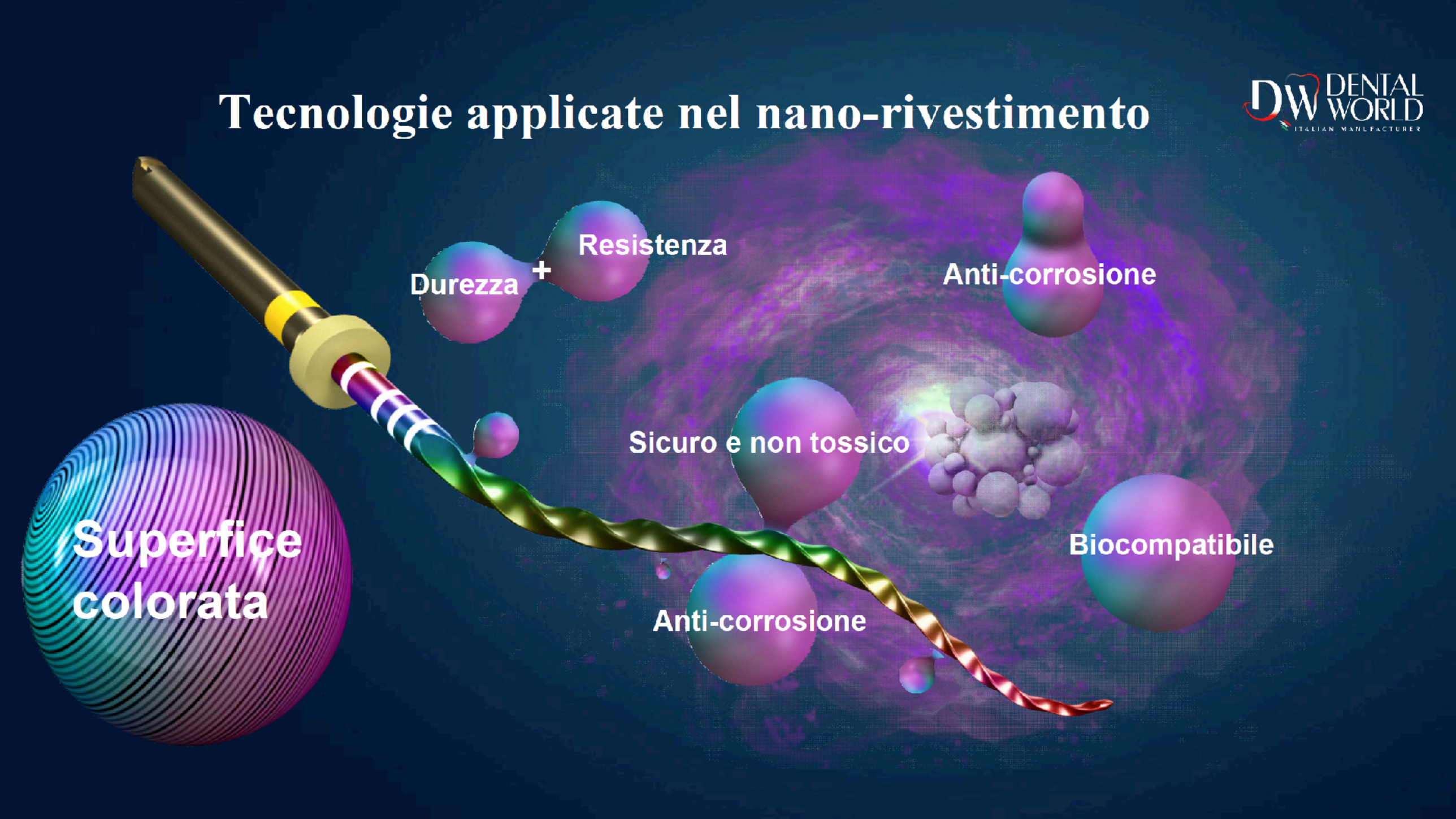


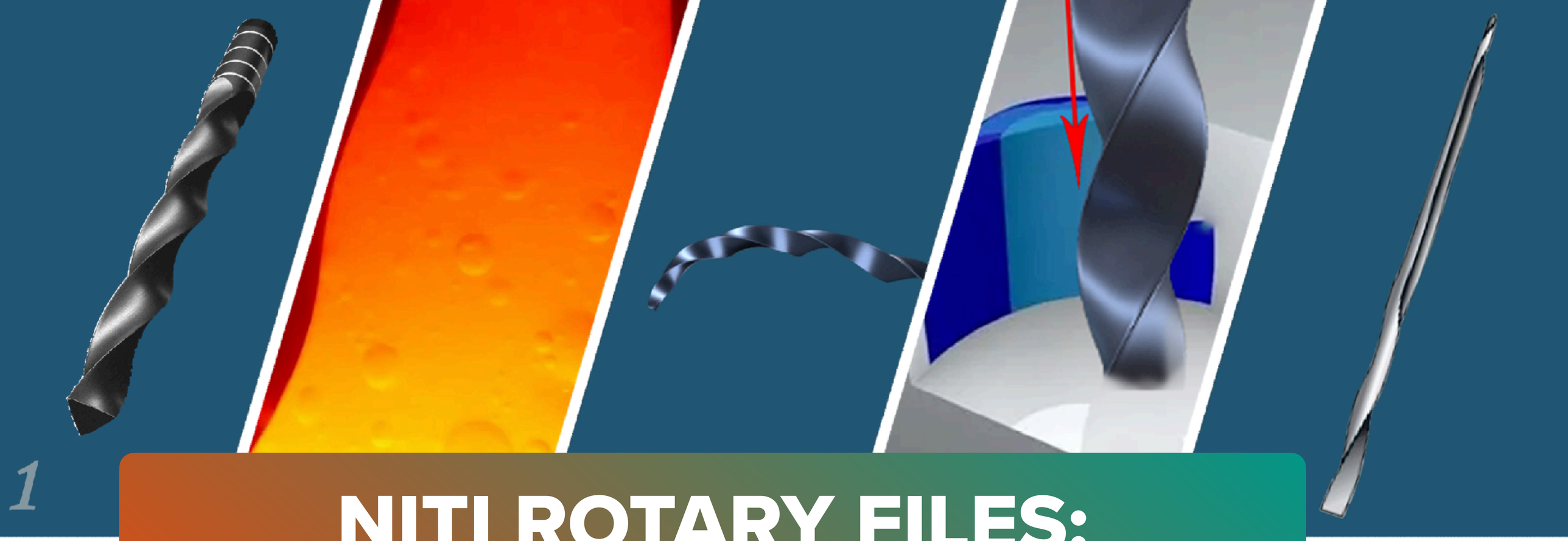
Altre caratteristiche

I grani del rivestimento sono estremamente piccoli e la struttura è eccezionalmente compatta, garantendo una
Il rivestimento è quindi adatto a dispositivi me empio, macchine per la produzione di succhi di frutta) e applicazioni simili.

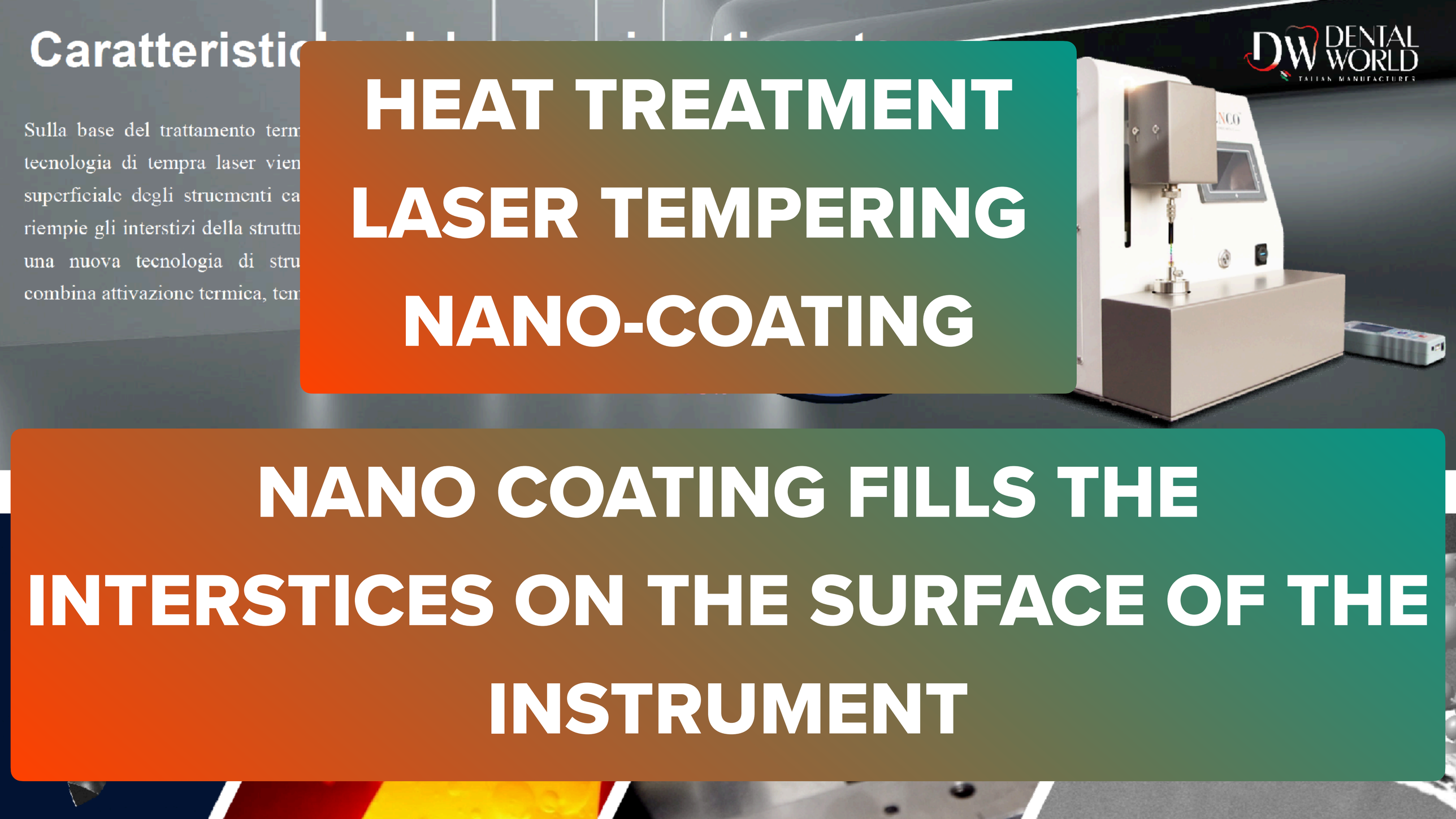
SMALL GRANULES AND COMPACT SURFACE

Tecnologie applicate nel nano-rivestimento

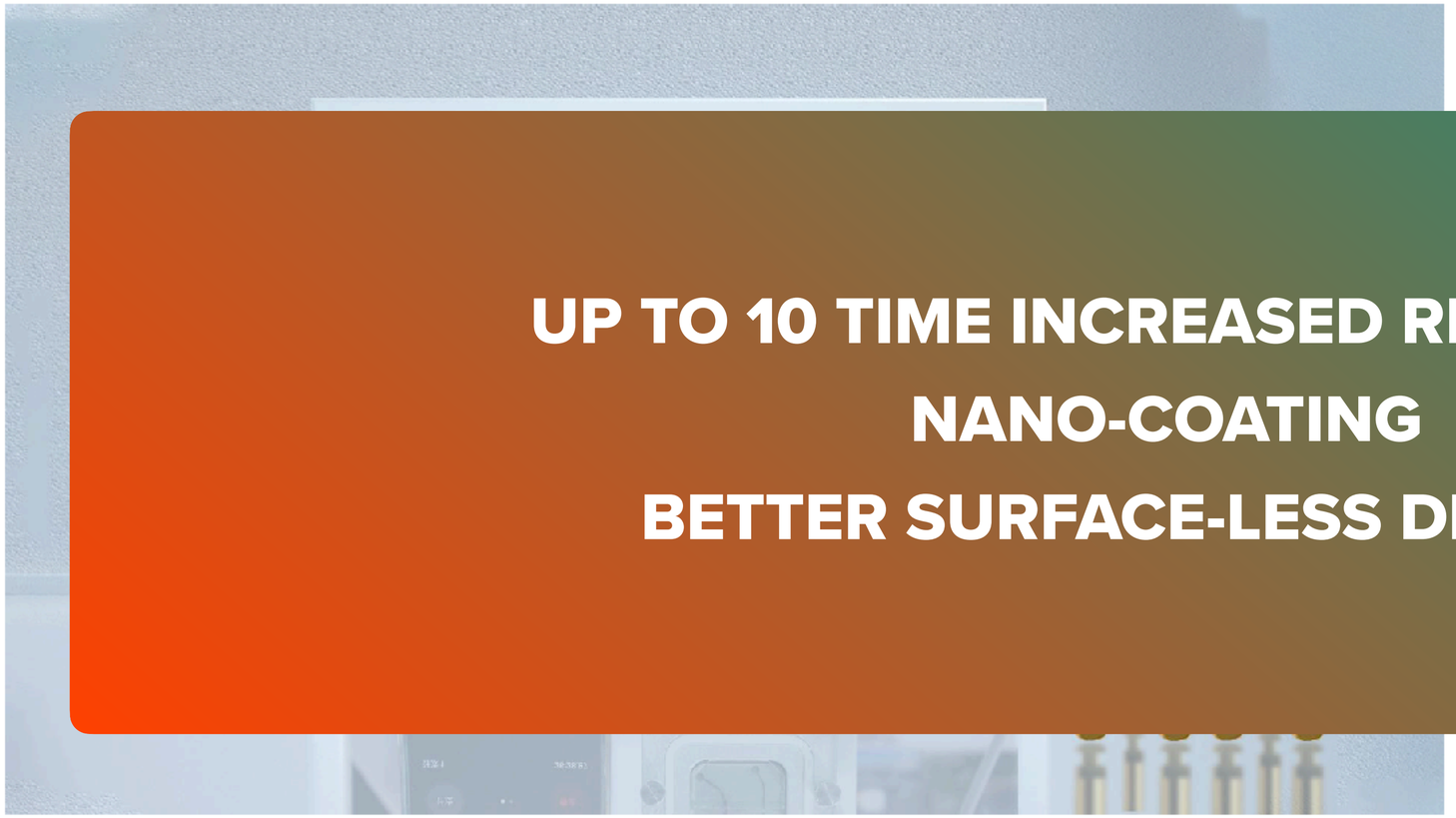




NITI ROTARY FILES: INCREASED FLEXIBILITY REDUCED CUTTING


Caratteristic
Sulla base del trattamento term
tecnologia di tempra laser vien
superficiale degli strumenti ca
riempie gli interstizi della struttu
una nuova tecnologia di stru
combina attivazione termica, ter
DW DENTAL WORLD
ITALIAN MANUFACTURER
HEAT TREATMENT
LASER TEMPERING
NANO-COATING
NANO COATING FILLS THE
INTERSTICES ON THE SURFACE OF THE
INSTRUMENT

FEATURES-ADVANTGES



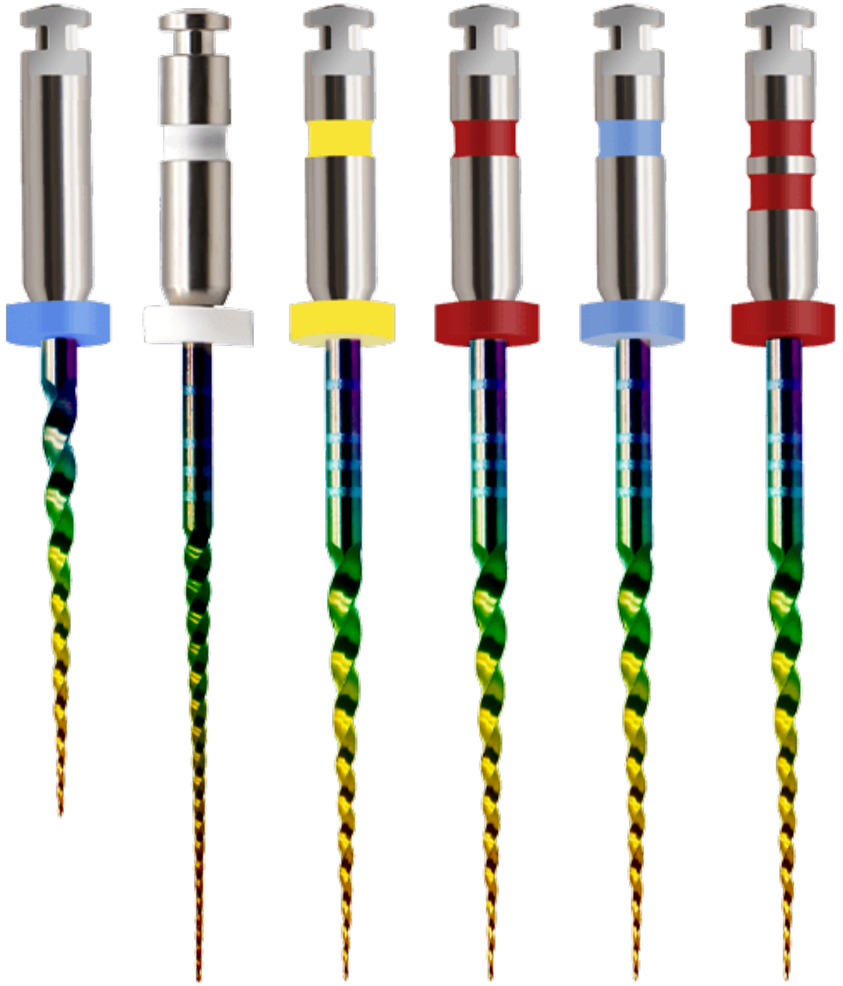
UP TO 10 TIME INCREASED RESISTANCE

NANO-COATING

BETTER SURFACE-LESS DEFECTS

PRO FLEX NHA

NANO RIVESTITO ATTIVAZIONE TERMICA



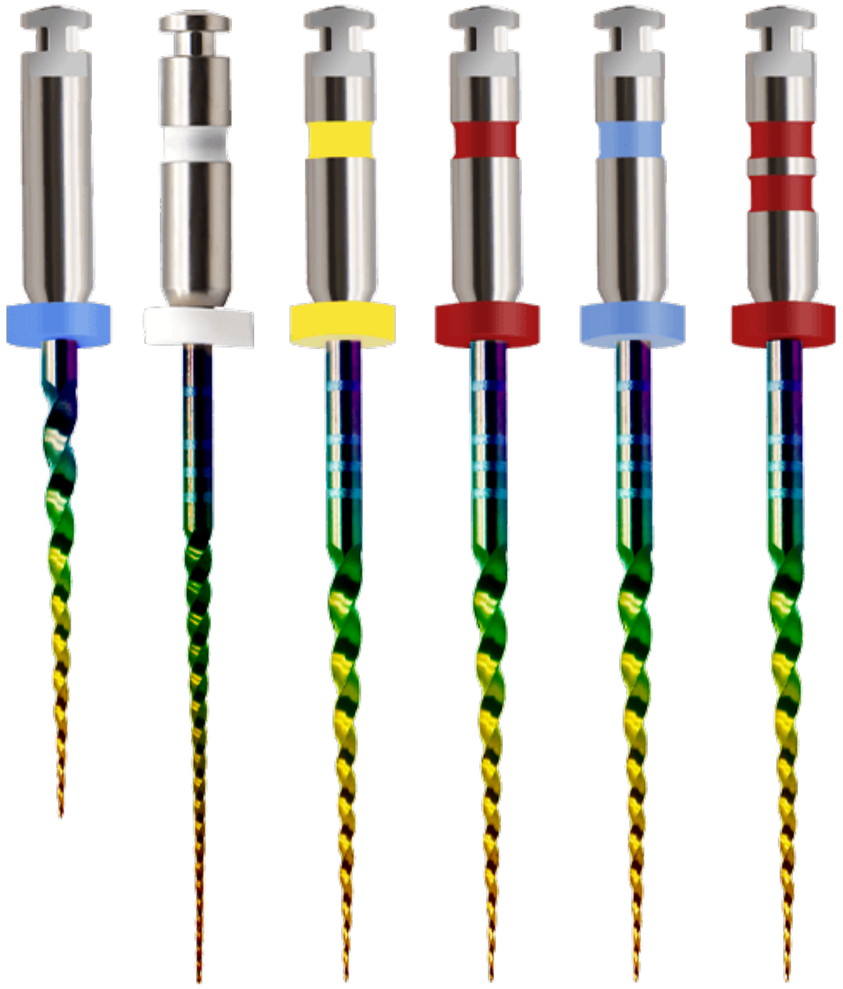
CONTROL MEMORY

Ni Ti Heat Brown

Continuous

PRO FLEX NHA

NANO RIVESTITO ATTIVAZIONE TERMICA



CONTROL MEMORY

NiLi Rainbow

Continuous

CONTROL MEMORY

La tecnologia ***Control Memory*** degli strumenti canalari garantisce stabilità e precisione durante la pulizia del canale radicolare anche quando non viene applicata forza sullo strumento.

NI-TI RAINBOW

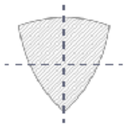
Il nuovo materiale ***Ni-Ti Rainbow*** garantisce resistenza e flessibilità durante il trattamento endodontico, offrendo una maggiore durata e resistenza nella pulizia dei canali radicolari grazie alle sue proprietà avanzate.

ROTAZIONE CONTINUA

Gli strumentini canalari ***Pro Flex NHA*** sono ***compatibili con i motori endodontici a rotazione continua***, garantendo una maggiore velocità di lavoro, una maggiore capacità di rimuovere i detriti durante la sagomatura e una maggior linearità del taglio.

PRO FLEX *NHA*

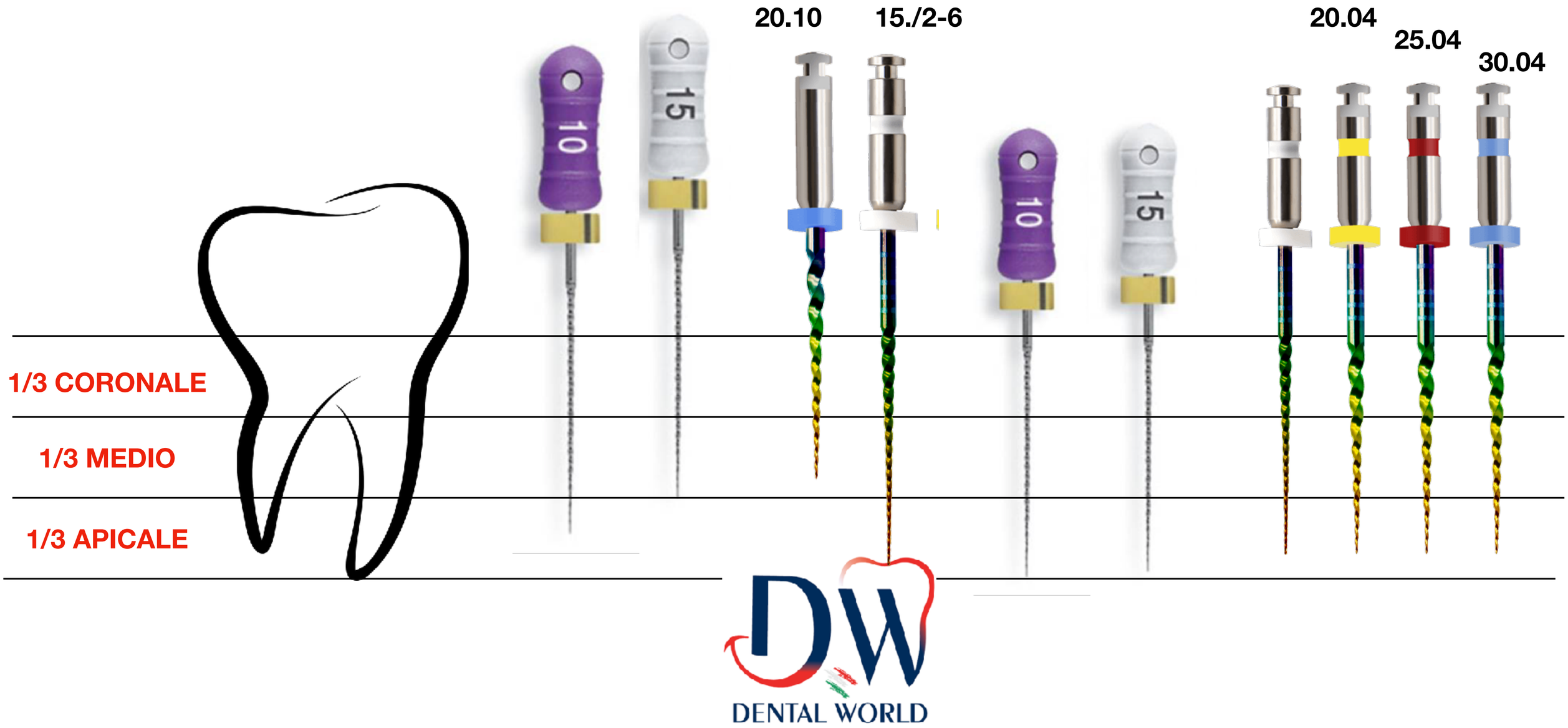
	Ø	%	N/cm	RPM	21 mm	25 mm	31 mm	Cross-section	Match gutta point
R	20	10	2,5	350	17 mm	REF: 144900550			-
○ 016	15	2-6	2,5	300	144900551	144900561	144900571		-
● D1	20	4	2,5	250-300	144900552	144900562	144900572		20/04
● D2	25	4	2,5	250-300	144900553	144900563	144900573		25/04
● D3	30	4	2,5	250-300	144900554	144900564	144900574		30/04
●● D4	25	6	2,5	250-300	144900555	144900565	144900575		25/06
016-D4	--	--	2,5	--	144900556	144900566	144900576		-



Legenda / *Legend*
- Ø Diametro / *Diameter*
- % Conicità / *Taper*
- N/cm Torque
- RPM Velocità / *Speed*

* La velocità e il torque sono indicativi e possono variare a seconda del dispositivo utilizzato e delle preferenze dell'operatore
Speed and torque are approximated and can change in relation to the device and to the operator choices

PRO FLEX H.A. SEQUENCE



DENTAL WORLD

PRO FLEX NHA

NANO RIVESTITO ATTIVAZIONE TERMICA

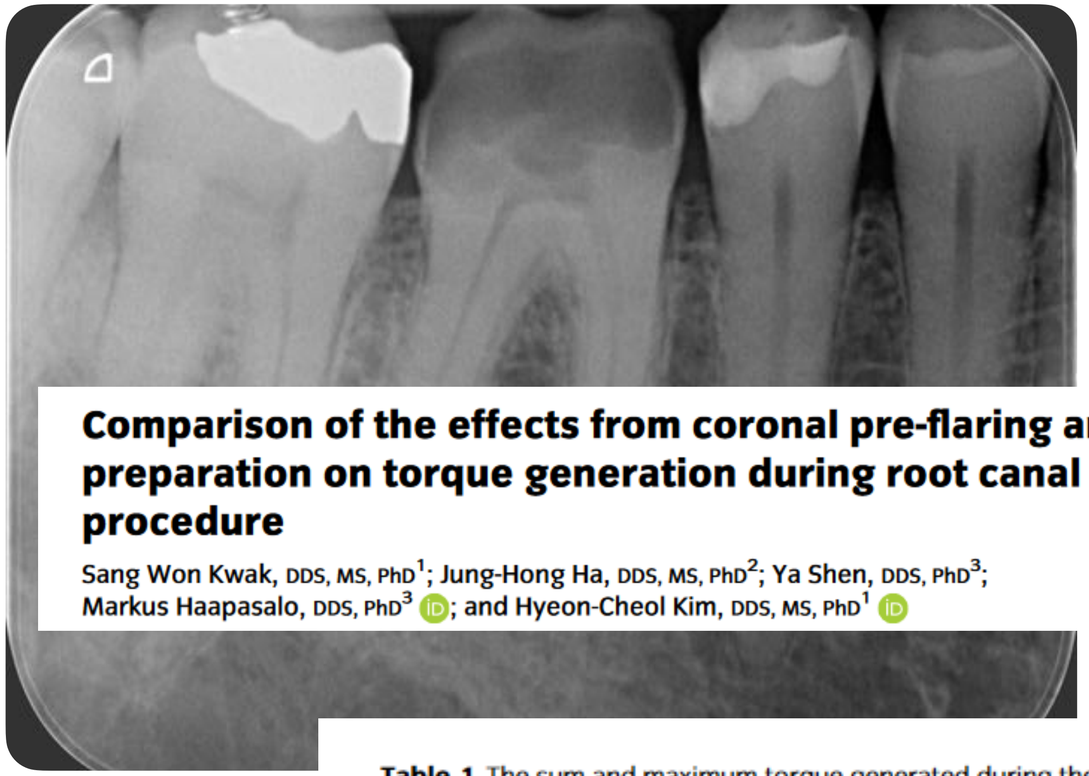
Orifice opener take out the stress of the other files

PREFLARING

PRO FLEX NHA

NANO RIVESTITO ATTIVAZIONE TERMICA

Orifice opener take out the stress of the other files



Comparison of the effects from coronal pre-flaring and glide-path preparation on torque generation during root canal shaping procedure

Sang Won Kwak, DDS, MS, PhD[1]; Jung-Hong Ha, DDS, MS, PhD[2]; Ya Shen, DDS, PhD[3]; Markus Haapasalo, DDS, PhD[3]; and Hyeon-Cheol Kim, DDS, MS, PhD[1]

Table 1 The sum and maximum torque generated during the experiment (Ncm) (mean ± SD) (n = 15)

	Group 1 OC	Group 2 OG + OC	Group 3 OF + OC	Group 4 OF + OG + OC
Sum of Torque	14.75 ± 2.98[a]	12.68 ± 2.30[b]	10.79 ± 2.39[c]	10.20 ± 1.91[c]
Maximum Torque	2.63 ± 0.48[a]	2.58 ± 0.54[a]	2.23 ± 0.50[b]	2.06 ± 0.34[b]

Note: [a,b,c]Different lower-case superscripts indicate significant differences amongst the groups in rows (P < 0.05).

Abbreviation: OC, OneCurve; OF, OneFlare; OG, OneG.

BASIC RESEARCH – TECHNOLOGY

Cyclic Fatigue Resistance of Nickel-titanium Rotary Instruments according to the Angle of File Access and Radius of Root Canal

Eugenio Pedullà, DDS, MS, PhD, Giusy Rita Maria La Rosa, DDS,* Chiara Virgillito, DDS,* Ernesto Rapisarda, DDS,* Hyeon-Cheol Kim, DDS, MS, PhD,† and Luigi Generali, DDS‡*

ABSTRACT

Introduction: The aim of this study was to compare the influences from different access angles and curvature radii on cyclic fatigue resistance of nickel-titanium rotary files. **Methods:** Two file systems (2Shape [TS; MicroMega, Besançon, France] and HyFlex CM [HCM; Coltène/Whaledent, Altstätten, Switzerland]) were used. A total of 192 instruments of TS #25/.04 (TS1), TS #25/.06 (TS2), HCM #25/.04, and HCM #25/.06 were evaluated at 3 insertion angles (0°, 10°, and 20°) and 2 radii (5 mm and 3 mm) in 16-mm stainless steel artificial canals with a 60° curvature. Cyclic fatigue resistance was determined by the number of cycles to failure (NCF) using a customized testing device. Data were analyzed statistically with the significance level established at 95%. **Results:** In the 3-mm radius canal, the instruments showed lower cyclic fatigue resistance than in the 5-mm radius canal ($P < .05$). HCM #25/.06 and all .04 taper instruments had a significant NCF reduction at 20° and 10° in the 3-mm radius canal ($P < .05$), whereas TS2 showed no significant differences. In the 5-mm radius of curvature, although .06 taper instruments had no significant NCF reduction for each angle tested, .04 taper files exhibited significant NCF reduction when tested at 20° ($P < .05$). Comparing the same size instruments, HCM had higher NCF than TS ($P < .05$). Instruments with a .04 taper exhibited higher NCF than the .06 ones with the same heat treatment ($P < .05$). **Conclusions:** An inclined insertion into the canals decreased cyclic fatigue resistance of thermal-treated instruments with a .04 taper at all radii of curvature tested. The synergistic effect of a small radius of curvature and access angulation of heat-treated instruments decreases their fatigue resistance. *(J Endod 2020;46:431–436.)*

SIGNIFICANCE

The angulated file access and/or severe curved canal curvature with a small radius could influence (reduce) cyclic fatigue resistance of heat-treated nickel-titanium instruments.

KEY WORDS

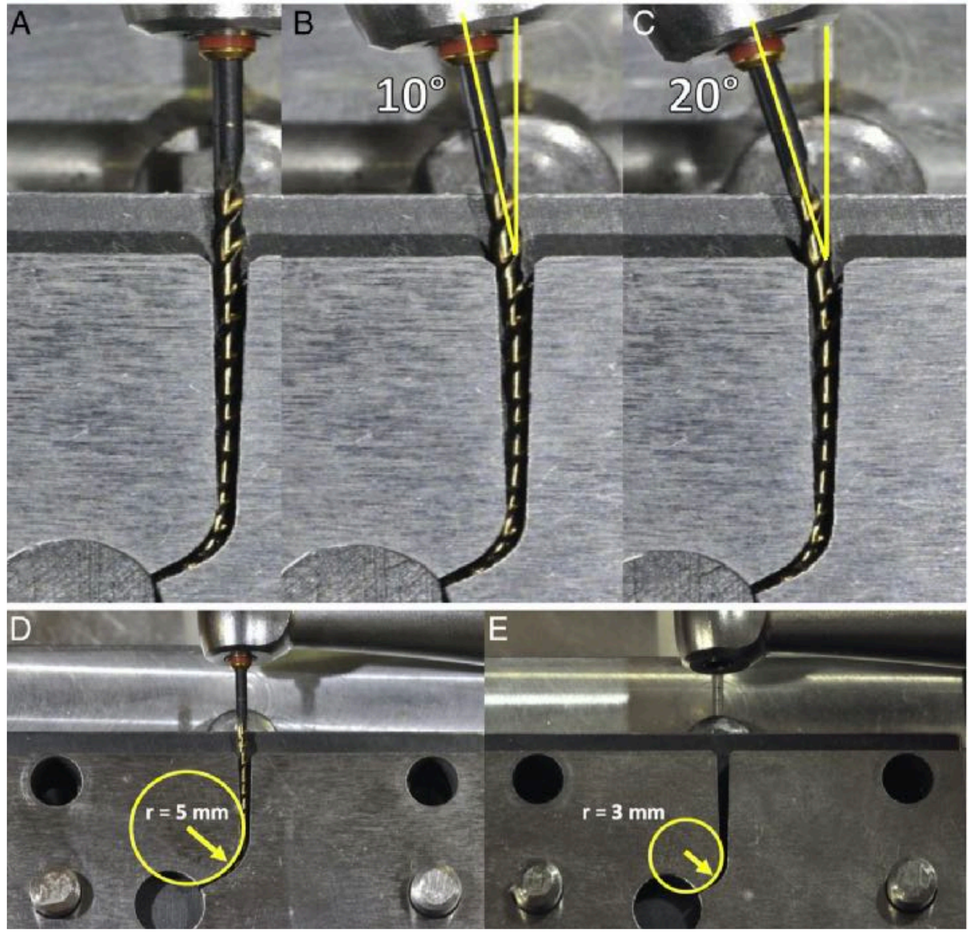
2Shape; angle of file access; canal curvature; canal radius; cyclic fatigue resistance; HyFlex CM

From the *Department of General Surgery and Surgical-Medical Specialties, University of Catania, Catania, Italy; †Department of Conservative Dentistry, School of Dentistry, Dental and Life Science Institute, Dental Research Institute, Pusan National University, Yangsan, Korea; and ‡Department of Surgery, Medicine, Dentistry and Morphological Sciences with Transplant Surgery, Oncology and Regenerative Medicine Relevance (CHIMOMO), University of Modena and Reggio Emilia

Nickel-titanium (NiTi) rotary instruments may exhibit a higher risk of intraoperative fracture within the root canal[1]. Fracture may occur due to torsional failure or cyclic fatigue[2,3]. Cyclic fatigue appears to be the more prevalent cause
crack propagation o
canal[2,3].

Several factors
treatment, and metal
instrument fracture is
shaped curvatures[4,1
anatomic access co
endodontics, the rec
NiTi instruments[1,2].

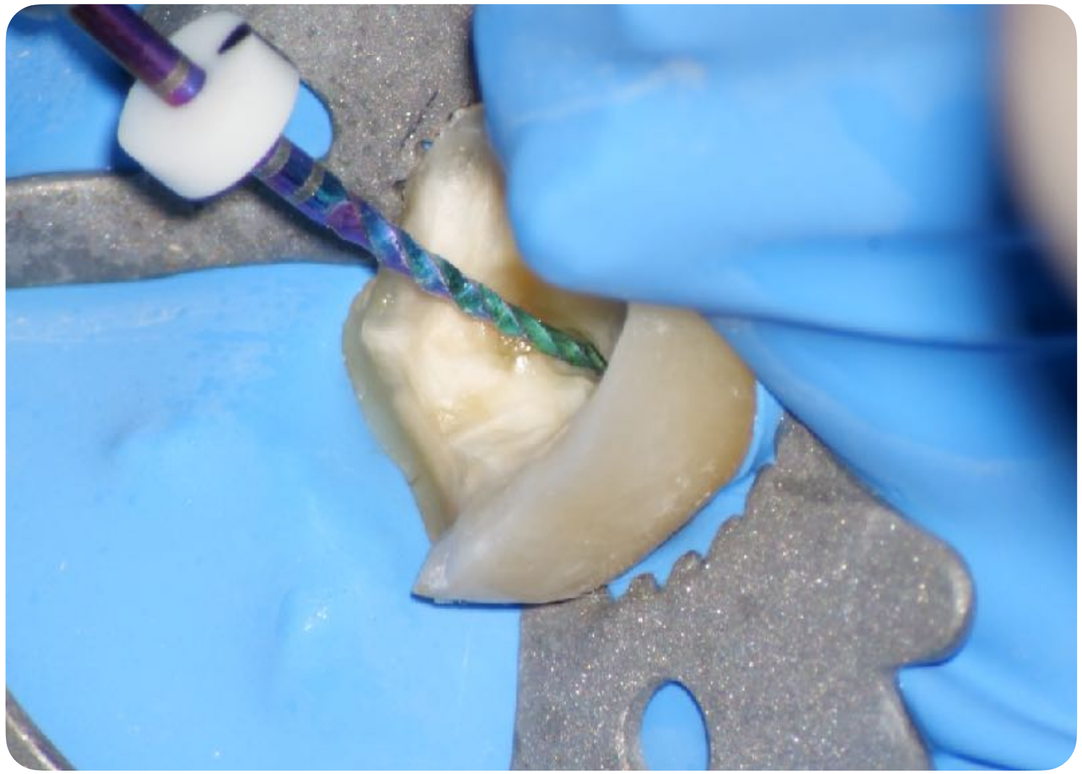
Heat treatment
characteristics of trad



.05). **Conclusions:** An inclined insertion into the canals decreased cyclic fatigue resistance of thermal-treated instruments with a .04 taper at all radii of curvature tested. The synergistic effect of a small radius of curvature and access angulation of heat-treated instruments decreases their fatigue resistance. *(J Endod 2020;46:431–436.)*

PRO FLEX NHA

NANO RIVESTITO ATTIVAZIONE TERMICA



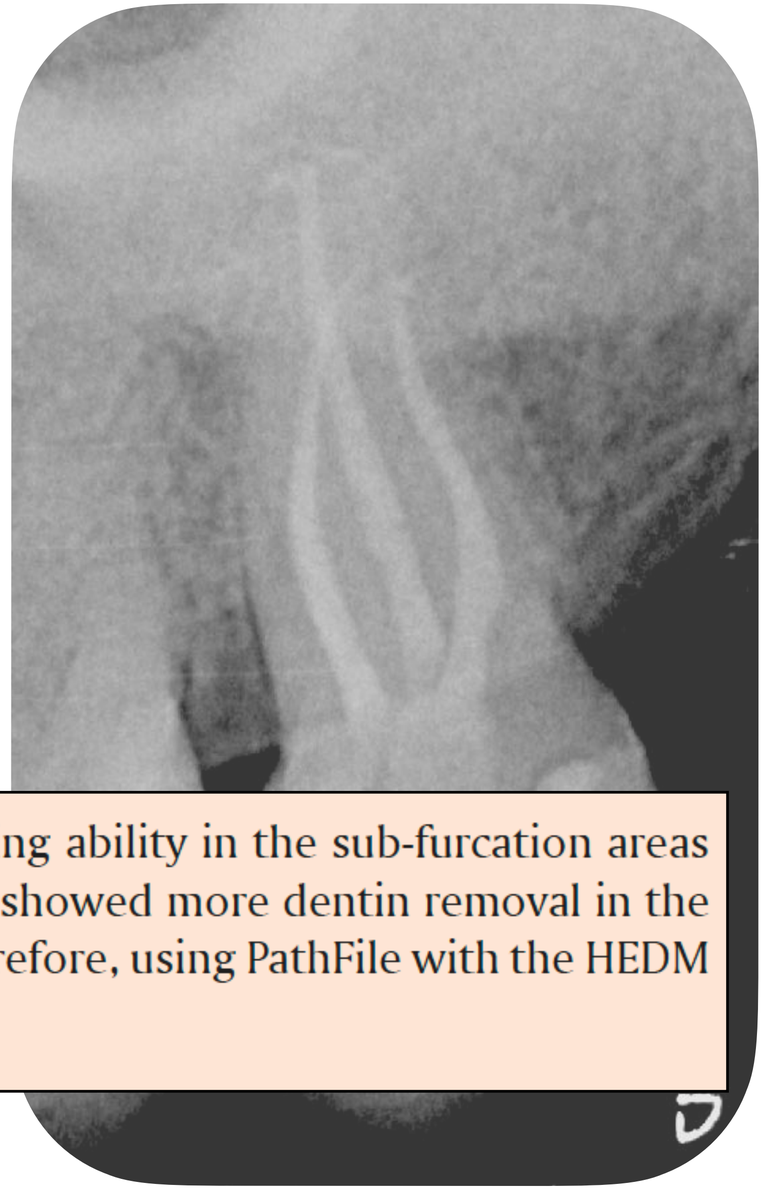
GLIDEPATH

Original Article

Shaping ability of HyFlex EDM and ProTaper Gold files with or without using glide path files: An *in vitro* study

Maryam Gharechahi, Harir Ahmadi[1], Maryam Forghanirad, Melika Hoseinzadeh[2], Anahita Nouri[3]

Departments of Endodontics and [3]Prosthodontics, School of Dentistry, Mashhad University of Medical Science, [2]Dentist, Research Assistant, Dental Research Center, Mashhad Dental School, Mashhad University of Medical Sciences, [1]Dentist, Mashhad, Iran



Abstract

Introduction: The necessity of using a glide path before the canal preparation is inconclusive. Therefore, this study aimed to assess the shaping ability of two rotary systems in the maxillary first molars' first mesiobuccal canal (MB1), with or without employing the glide path files.

Materials and Methods: The MB1 canals of 100 extracted molars were randomly prepared using either HyFlex EDM (HEDM) or ProTaper Gold (PTG) systems (n = 50 each). Half of the samples in each group were prepared using ProGlider (PG) or HyFlex EDM Glide (HEG). The cone-beam computed tomography scanning was conducted before and after the instrumentation. The canal transportation, centering ability,

Conclusions: The HEDM system outperformed PTG regarding centering ability in the sub-furcation areas and canal transportation 2 mm below the furcation. However, HEDM showed more dentin removal in the middle region than PTG, which was resolved when HEG was used. Therefore, using PathFile with the HEDM system might be suggested.

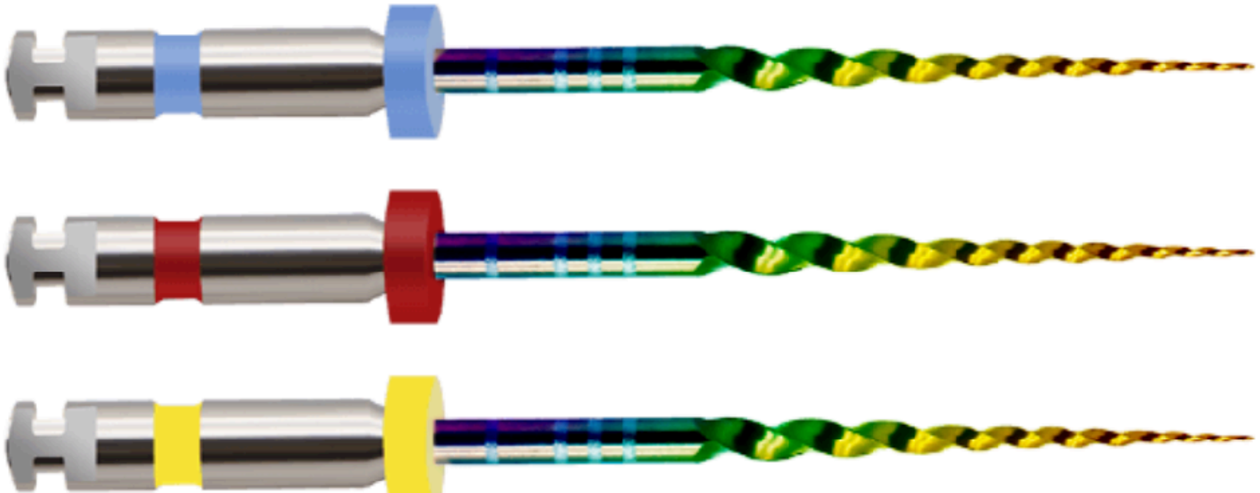
and canal transportation 2 mm below the furcation. However, HEDM showed more dentin removal in the middle region than PTG, which was resolved when HEG was used. Therefore, using PathFile with the HEDM system might be suggested.

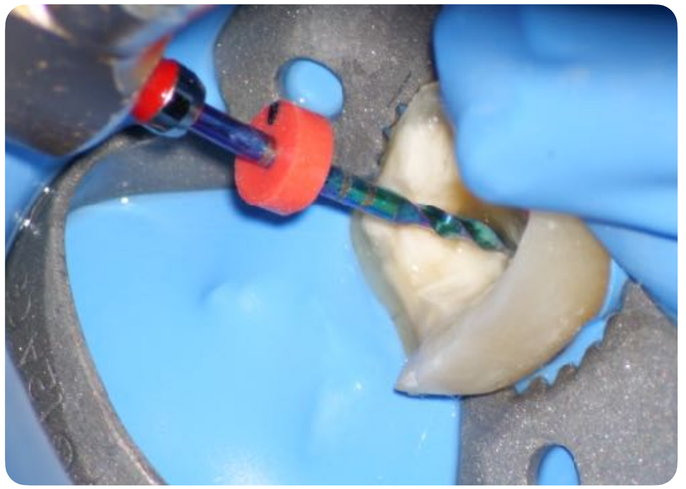
Keywords: Canal transportation, centering ability, glide path, NiTi file, root canal preparation

PRO FLEX NHA

NANO RIVESTITO ATTIVAZIONE TERMICA

SHAPING

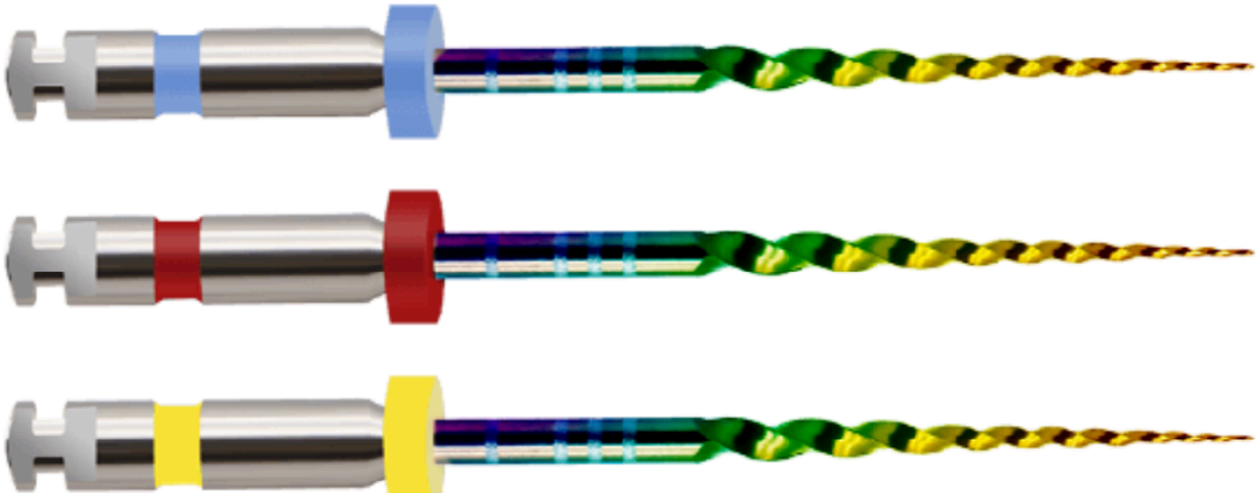


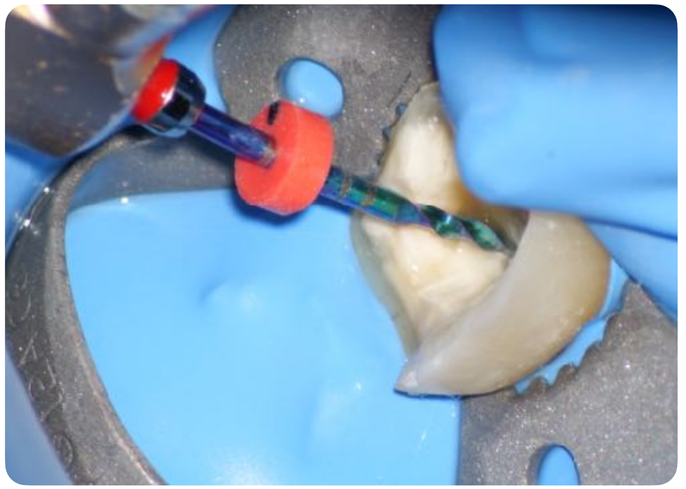


Preparation to size 30 offers minimum requirement for irrigation and obturation

SHAPING

F 30.04





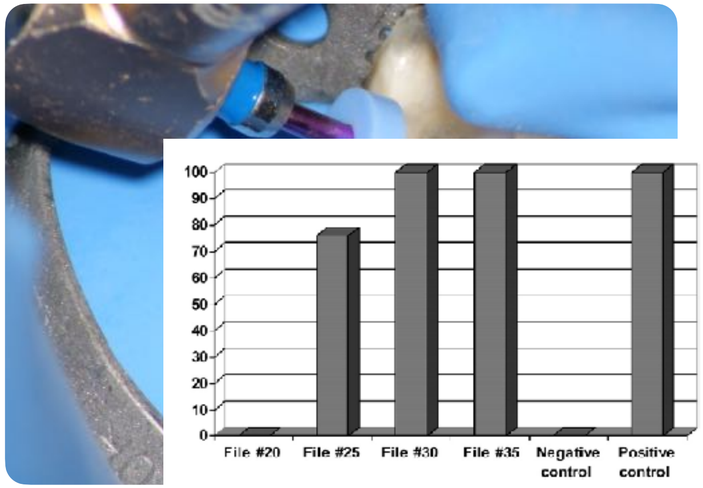


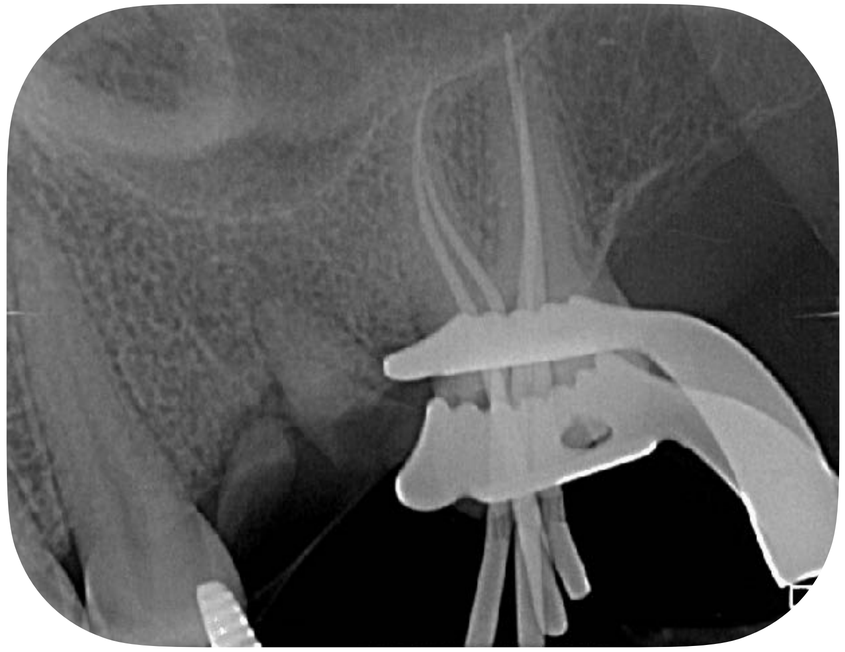
Figure 2. Smear layer removal from the apical third of the canal in six groups (percent).

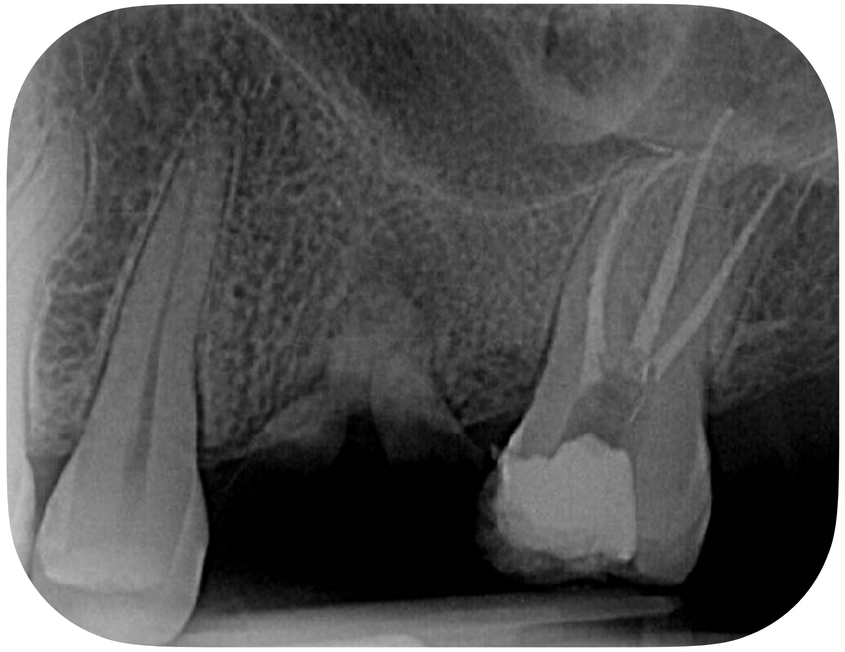
PRO FLEX NHA

NANO RIVESTITO ATTIVAZIONE TERMICA

PRO FLEX NHA

NANO RIVESTITO ATTIVAZIONE TERMICA





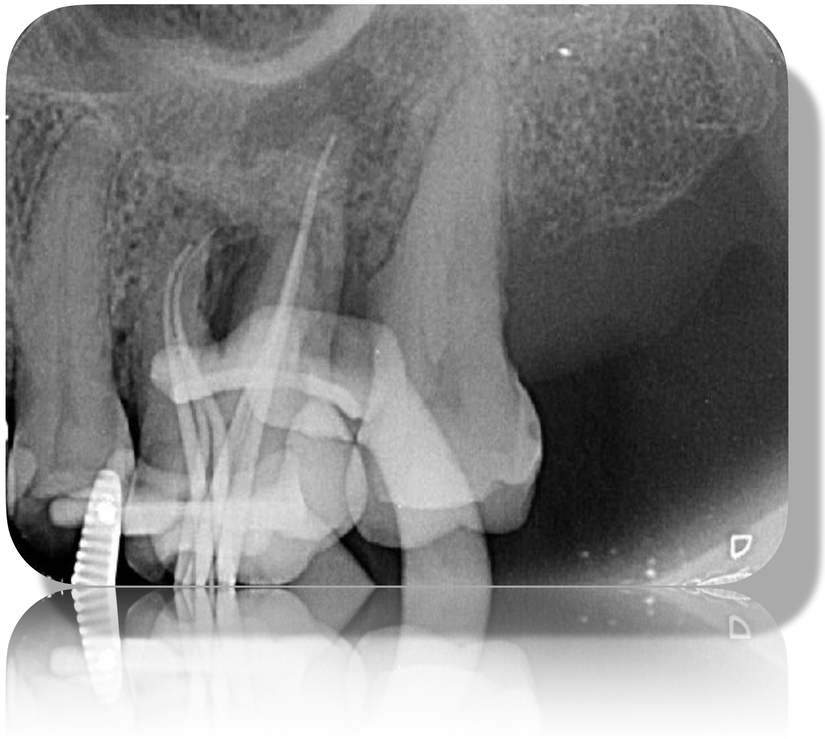

PRO FLEX NHA
NANO RIVESTITO ATTIVAZIONE TERMICA

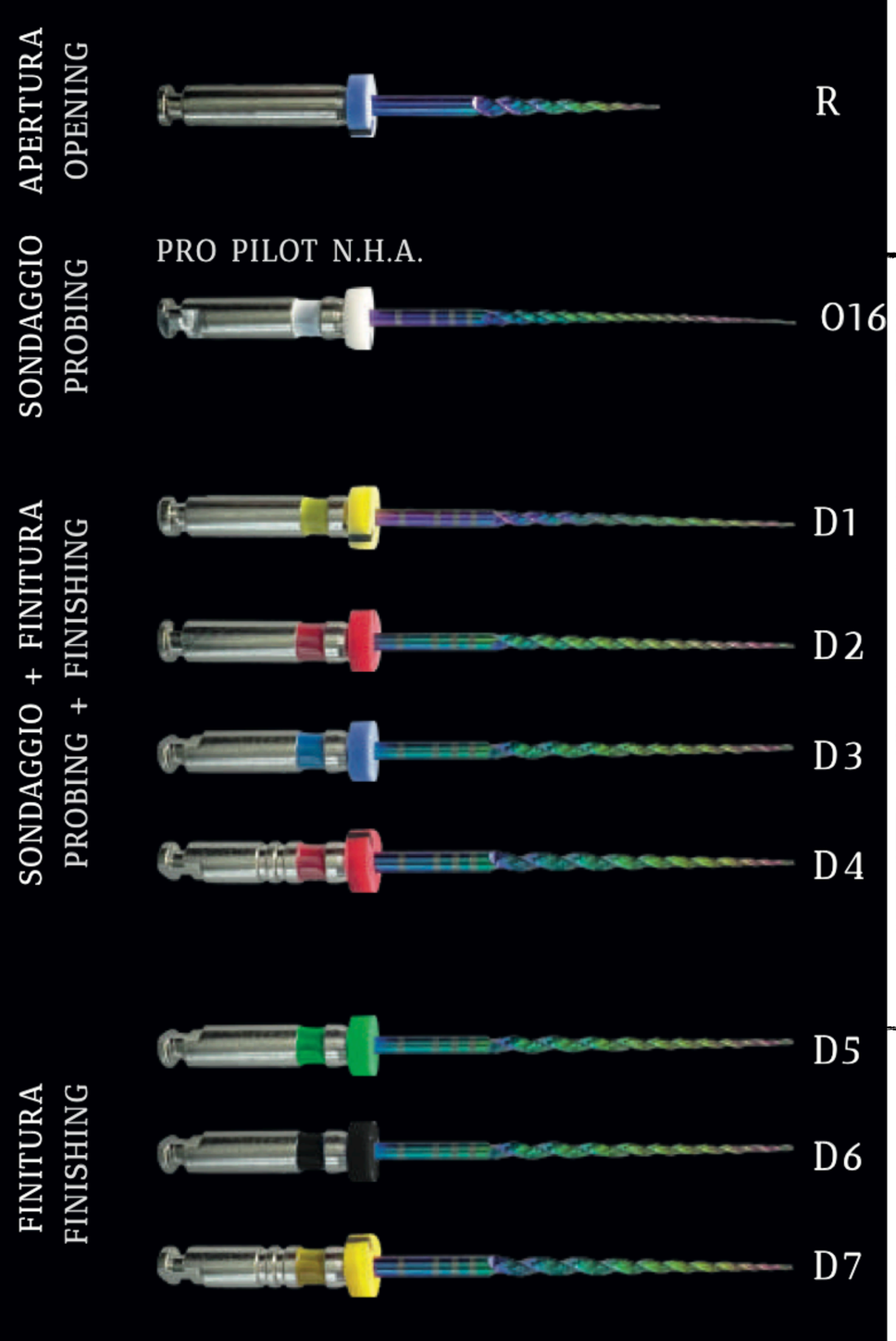
PRO FLEX NHA

NANO RIVESTITO ATTIVAZIONE TERMICA

PRO FLEX NHA

NANO RIVESTITO ATTIVAZIONE TERMICA





ADVANTAGES HT ROTARY FILES

- FLEXIBILITY (CURVATURES)
- CONSERVATIVE APPROACH (0.4 SHAPING)
- MORE RESISTANT
- CUTTING EFFICENCY
- DEEP SHAPE (30.4…)

DENTAL WORLD
BIOCERAMIC SEALER

IDRAULIC CONDENSATION -0,4 TAPER-

ADVANTAGES

High Biocompatibility
Non-toxic
Hydrophilic
Radiopacity
Adhesion to dentin
Dimensionally stable
Bioactive and Osteoinductive
Low inflammatory response
Hydroxyapatite formation
Antibacterial (basic pH)
Easy to use and handle

BIOCERAMIC SEALER: CHEMISTRY

IDRATATION

$$2\,(3CaO.SiO_2) + 6H_2O. \rightarrow 3CaO.2SiO_2 + 3H_2O + 3Ca(OH)_2$$

$$2\,(2CaO.SiO_2) + 4H_2O. \rightarrow 3CaO.2SiO_2 + 3H_2O + Ca(OH)_2$$

PRECIPITATION REACTION

$$7Ca(OH)_2 + 3Ca(H_2PO_4)_2 \rightarrow Ca_{10}(PO_4)_6(OH)_2 + 12H_2O$$

SO MANY COMPOSITION!

Material	Abbreviation	Manufacturer	Ti
Mineral Trioxide Aggregate	MTA	Angelus Dental Solutions, Londrina, PR, Brazil	
Nano-hydroxiapatite	Nano-HA	Sigma-Aldrich, UK	
Biodentine (tricalcium silicate)	BD	Septodont, Saint Maurdes-Fosses, France	
Nex-Cem MTA	Nex MTA	GC, Tokyo, Japan	
Hydroxiapatite-Tricalcium Phosphate	HA-TCP	OSSTEM Implant Co., Ltd., New Zealand Zimmer, Warsaw, IN, USA N/S	1 1 1
ProRoot Mineral Trioxide Aggregate	PR-MTA	Dentsply Tulsa Dental Specialties, Tulsa OK, USA	
Quick-Set2	-	Primus C	
TheraCal LC	TheraCal	Bisco Inc	
iRoot BP Plus	-	Innovati Canada	
Calcium-enriched mixture	CEM	Bionique	
Hydroxyapatite	HA	N/S	
iRoot Fast Set root repair material	FS	Innovati Canada	
MTA Plus	MTAP	Avalon B USA	
MTA Fillapex	MTAF	Angelus	
FillCanal	FC	Technew,	
iRoot BP	iRoot BP	Innovati Canada	

Material	Manufacturer	Composition	Radiopacifier
ProRoot MTA	Dentsply Sirona (New York, USA)	Bismuth oxide, tricalcium silicate, dicalcium silicate, tricalcium aluminate and calcium sulfate	Bismuth oxide
MTA Angelus	Angelus (Londrina, Brazil)	Tricalcium silicate, dicalcium silicate, tricalcium aluminate, calcium oxide, bismuth oxide	Bismuth oxide
MTA Repair HP	Angelus (Londrina, Brazil)	Tricalcium silicate, dicalcium silicate, tricalcium aluminate, calcium oxide, calcium tungstate liquid: water and plasticizer	Calcium tungstate
Generex A	Dentsply Tulsa (Tulsa, USA)	Bismuth oxide, tricalcium silicate, dicalcium silicate, and tricalcium aluminate with a mixing gel containing sodium lauryl sulfate and other undisclosed ingredients	Bi
Ceramicrete-D	Tulsa Dental Specialties, (Argonne, USA)	Phosphosilicate ceramic, hydroxyapatite, cerium oxide, deionized water	Ce
Biodentine	Septodont (Saint-Maur-des-fosses, France)	Tricalcium silicate, dicalcium silicate, calcium carbonate, calcium oxide, iron oxide and zirconium oxide	Zir
EndoSequence Root Repair Material	Brasseler, (Savannah, USA)	Calcium silicate, monobasic calcium phosphate, zirconium oxide, Tantalum oxide, filler agent	Zirc
Endosequence BC Root Repair Material Fast Set Putty	Brasseler, (Savannah, USA)	Zirconium oxide, calcium silicate, monobasic calcium phosphate, calcium hydroxide and thickening agents	Zir
RetroMTA	BioMTA, (Seoul, Korea)	Calcium carbonate, silicon dioxide, aluminium oxide, calcium zirconia complex	Calc
TotalFill BC Root Repair Material (RRM)	FKG (Brasseler, Savannah, USA)	Calcium silicates, calcium phosphate monobasic, zirconium oxide, tantalum oxide and thickening agents	Zirc
NeoMTA Plus	Avalon Biomed (Inc. Bradenton, USA)	Tricalcium silicate, dicalcium silicate, and tantalum oxide liquid: water and proprietary polymers	Tan

TABLE 1. Summary data for calcium silicate and calcium aluminate cements included in this review of bioactive dental materials

Generic Description	Commercial Trade Name	Manufacturer	Product Format	Indications for Use
Calcium silicate—PC-like Contains iron	Grey ProRoot Mineral Trioxide Aggregate (GMTA)	DentsplyTulsa, Dentsply International York, PA, USA	Powder/Liquid	Pulp cap, pulpotomy, root ending, filling, repair of root resorption, repair of root perforations, apexification
Calcium silicate—PC-like iron-free or reduced	White ProRoot Mineral Trioxide Aggregate (WMTA)	DentsplyTulsa Dentsply International	Powder/Liquid	Pulp cap, pulpotomy, root ending, filling, repair of root resorption, repair of root perforations, apexification
Calcium silicate—PC-like	MTA—Angelus	Angelus Industria de Produtos Odontologicos SA, Rua Waldir Lindgren, 781, Londrina—PR—86029-315, Brazil	Powder/Liquid	Pulp cap, pulpotomy, root ending, filling, repair of root resorption, repair of root perforations, apexification
Calcium silicate (aluminum absent)	Bioaggregate	Innovative BioCeramix, Inc 3668 Woodbreeze Mall, Vancouver, BCV6S 2L2, Canada	Powder/Liquid	Repair of root perforations, repair of root resorption, root end filling, apexification, pulp capping
Calcium silicate (aluminum absent)	Endosequence Root Repair Material	Brasseler USA, One Brasseler Boulevard, Savannah, GA 31419 USA	Single component—paste or putty	Repair of root perforations, repair of root resorption, root end filling, apexification, pulp capping
Calcium silicate (aluminum absent)	iRoot BP	Innovative BioCeramix, Inc	Single component—paste or putty	Injectable root repair material
Calcium silicate (aluminum absent)	iRoot SP	Innovative BioCeramix, Inc	Single component—paste or putty	Root canal sealer
Tricalcium silicate	Biocerfill	Septodont, 209 Granite Run Drive, Suite 150, Lancaster	Powder/liquid, encapsulated/trituration	Pulp cap, pulpotomy, root ending, filling, repair of root resorption, repair of root perforations, apexification, liner/base, temporary restorative
			Powder/liquid, encapsulated/trituration	Permanent posterior restorative
			Powder/liquid, encapsulated/trituration	Permanent luting cement

Material	Brand	Abbreviation	Composition	Manufacturer
Bioceramic Sealer	iRoot SP Injectable Root Canal Sealer --- EndoSequence BC Sealer TotalFill BC Sealer	iRoot SP EndoSequence Sealer TotalFill Sealer	Tricalcium silicate, dicalcium silicate, calcium hydroxide, zirconium oxide, phosphate monobasic, filler and thickening agents	Innovative Bioceramix Inc. (IBC) Vancouver, British Colombia, Canada --- Brasseler USA Dental LLC, Savannah, GA
Bioceramic Root Repair Material Paste	iRoot BP Injectable Root Repair Filling Material --- EndoSequence Root Repair Material (RRM) Paste TotalFill BC RRM Paste	iRoot BP EndoSequence Paste TotalFill Paste	Tricalcium silicate, dicalcium silicate, zirconium oxide, tantalum pentoxide. calcium phosphate monobasic and filler agents	Innovative Bioceramix Inc. (IBC) Vancouver, British Colombia, Canada --- Brasseler USA Dental LLC, Savannah, GA
Bioceramic Root Repair Material Putty	iRoot BP Plus Injectable Root Repair Filling Material --- EndoSequence Root Repair Material (RRM) Putty TotalFill BC RRM Putty	iRoot BP Plus EndoSequence Putty TotalFill Putty	Tricalcium silicate, dicalcium silicate, zirconium oxide, tantalum pentoxide, calcium phosphate monobasic and filler agents	Innovative Bioceramix Inc. (IBC) Vancouver, British Colombia, Canada --- Brasseler USA Dental LLC, Savannah, GA

Table 1

Idraulic Condensation

DW DENTAL WORLD
ITALIAN MANUFACTURER

Bioceramic Sealer

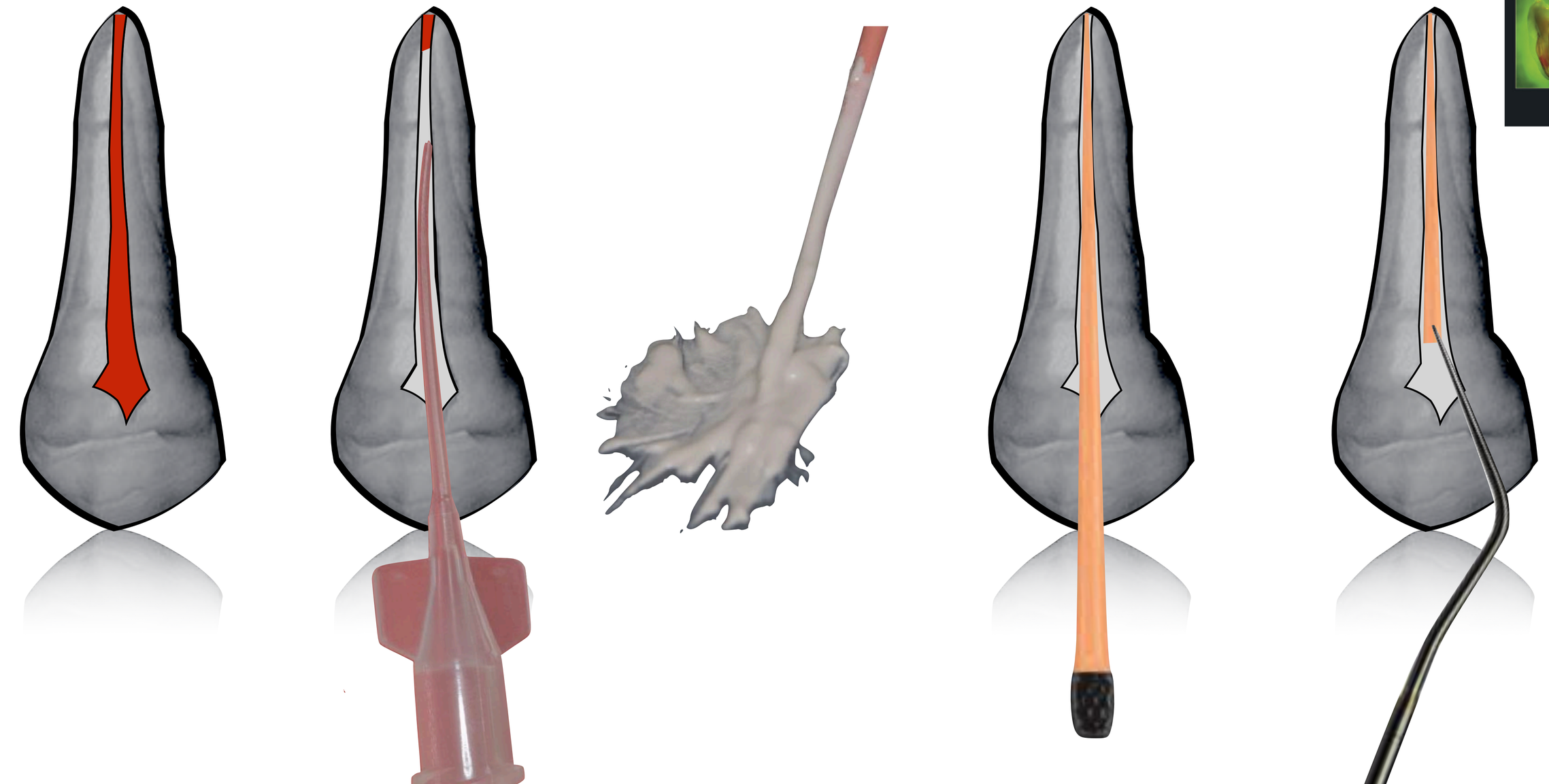
Remake Root HT

Pre-mixed bioceramic sealant.

FLOW hydraulic cement based on calcium aluminosilicate.

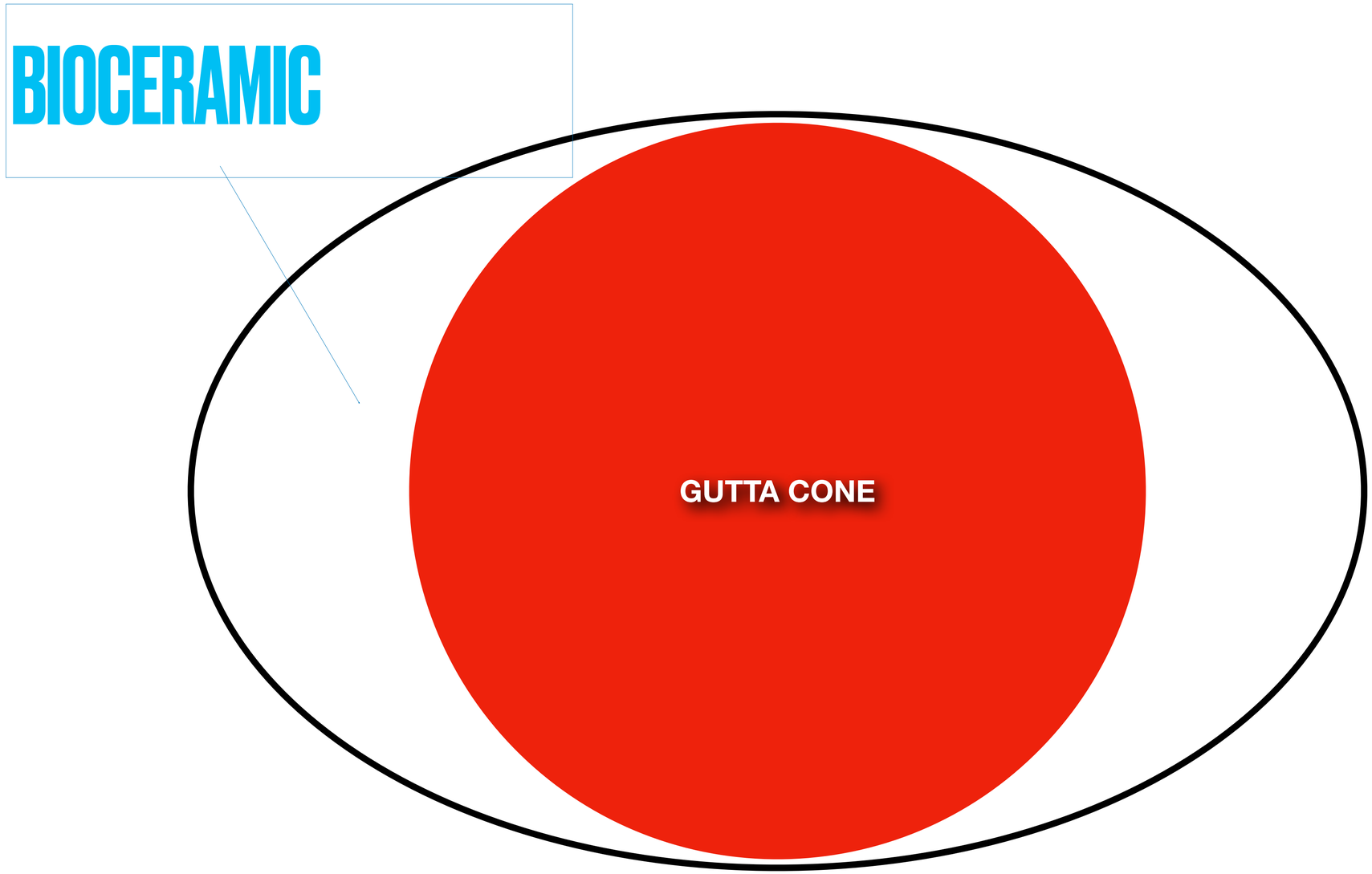
- Generation of calcium hydroxide
- Three-dimensional adherent sealing
- Generation of hydroxyapatite
- Chemical bonding to gutta-percha and dentin
- Setting time: work (25 min.)
- Setting time: total (2.5 hours)
- No contraction
- Wet field activation
- Resistance 100 MPa

- Calcium aluminosilicate with high degree of purity
- Resin-free
- Eugenol-free
- Ready to use
- Pre-mixed injectable one-component paste
- Compatible with Thermafil




ACCADEMIA ITALIANA DI ENDODONZIA
COLLANA DI MONOGRAFIE
OTTURAZIONE DEL SISTEMA CANALARE
MAURO VENTURI, FEDERICA FONZAR
GIANLUCA FUMEI, CARLO PIANA
Coordinamento scientifico
MAURO VENTURI
PICCIN

IDRAULIC CONDENSATION



IDRAULIC CONDENSATION

BIOCERAMIC

FILLER

GUTTA CONE

CARRIER

QUESTA TECNICA DI CHIUSURA NON RICHIEDE CONICITA' IMPORTANTI COME LA CONDENSAZIONE VERTICALE A CALDO

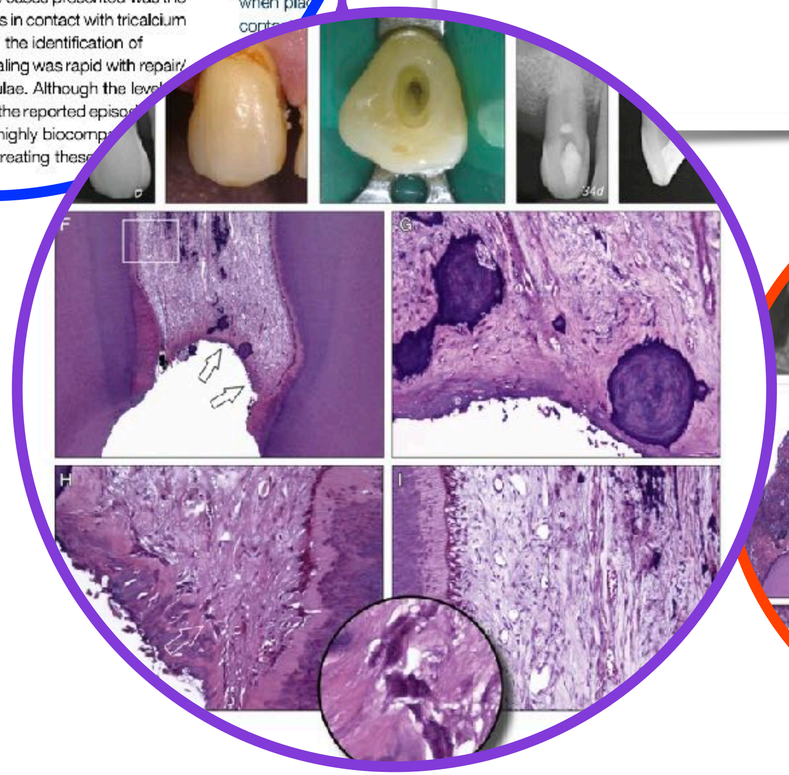
ADVANTAGES BIOCERAMIC SEALER

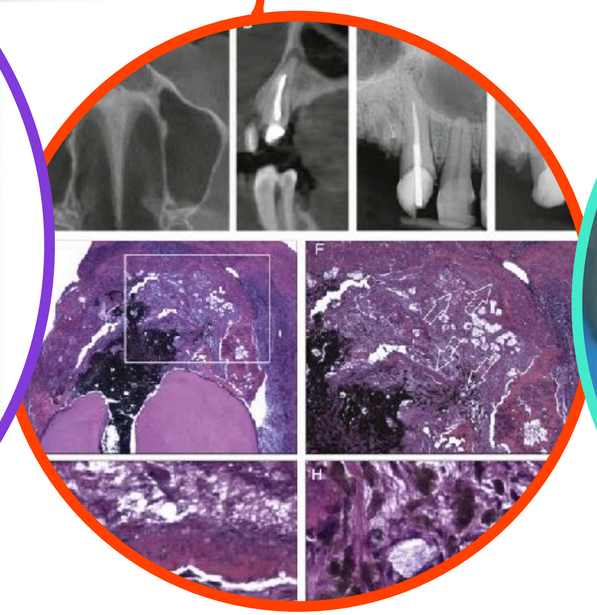
- EASY TO LEARN AND USE
- CONSERVATIVE APPROACH (SHAPING AND FILLING)
- “EASY” RETREATMENT
- BIOCOMPATIBILITY
- LESS POST OP PAIN
- FASTER HEALING TIME

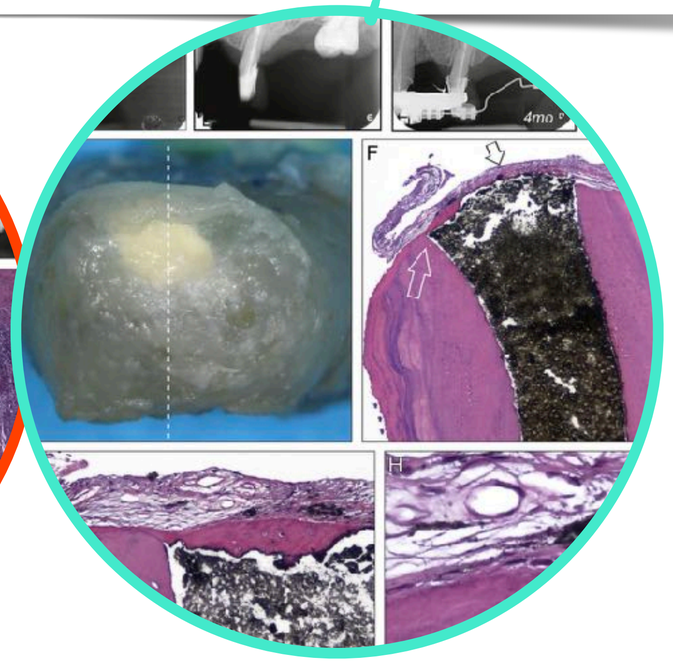
DENTAL WORLD
ITALIAN MANUFACTURER

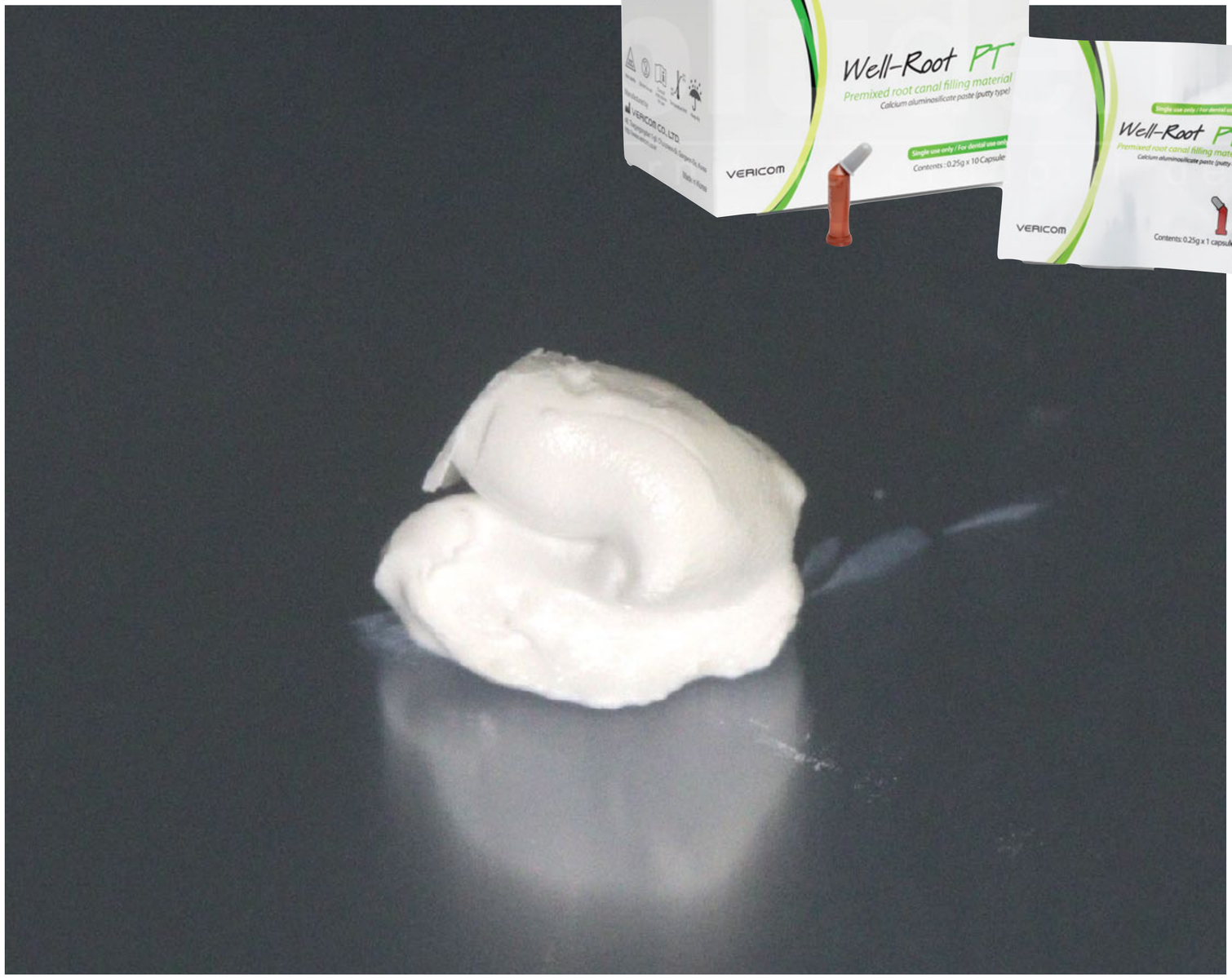
BIOCERAMIC PUTTY

Confirmation of the biocompatibility and bioactivity of the tricalcium Silicate–based materials used in treating the cases reported in this series enables clinicians to use these materials with confidence when placing them in direct contact with pulpal and periapical tissues.





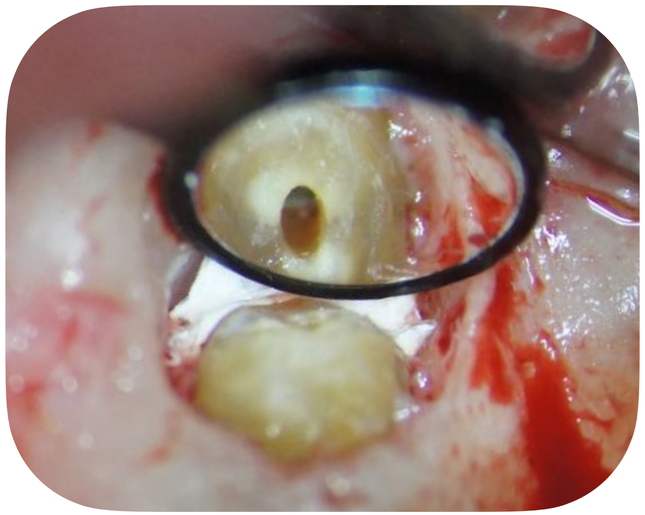


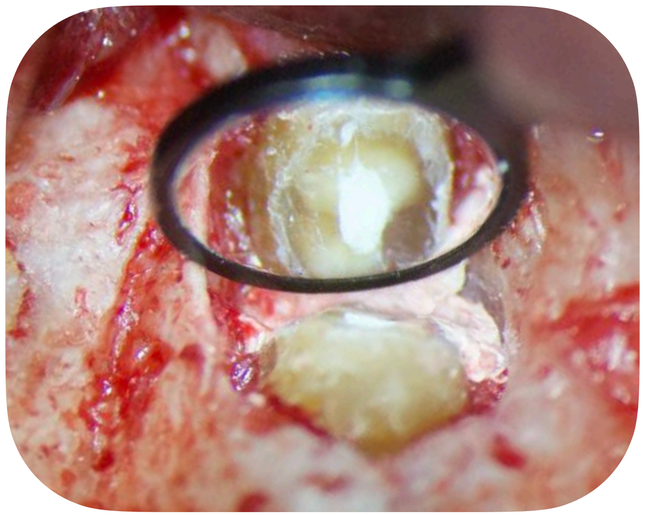


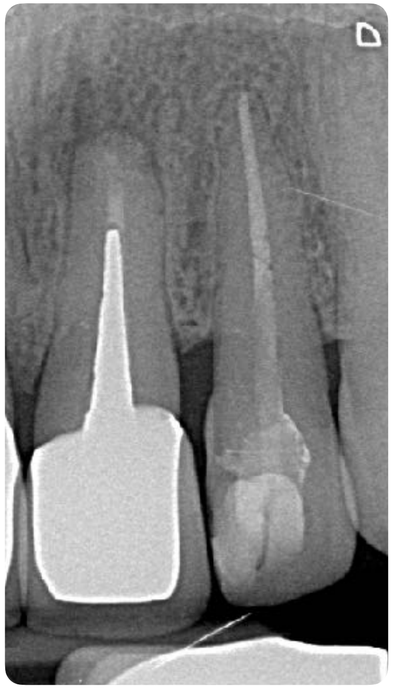
Well-Root PT
Premixed root canal filling material
Calcium aluminosilicate paste (putty type)
VERICOM
Contents : 0.25g x 10 Capsule
Well-Root PT
Premixed root canal filling material
Calcium aluminosilicate paste (putty type)
VERICOM
Contents: 0.25g x 1 capsule

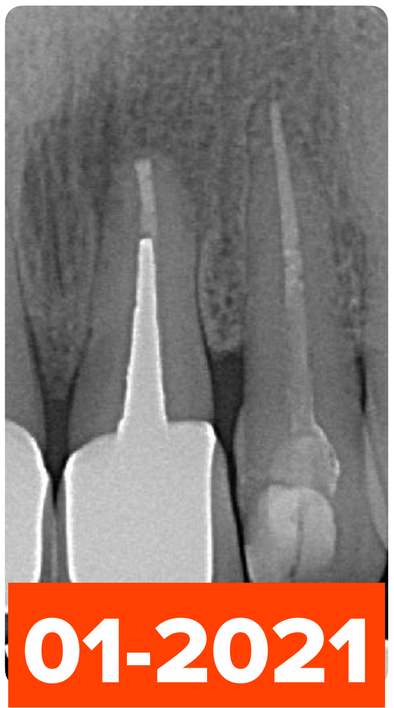
Perforation

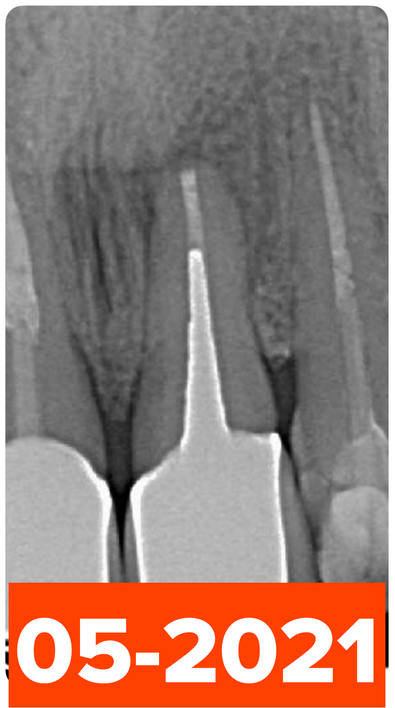
SYRGERY

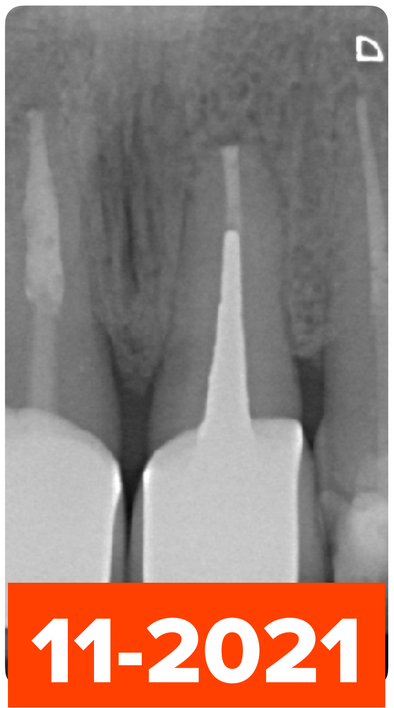


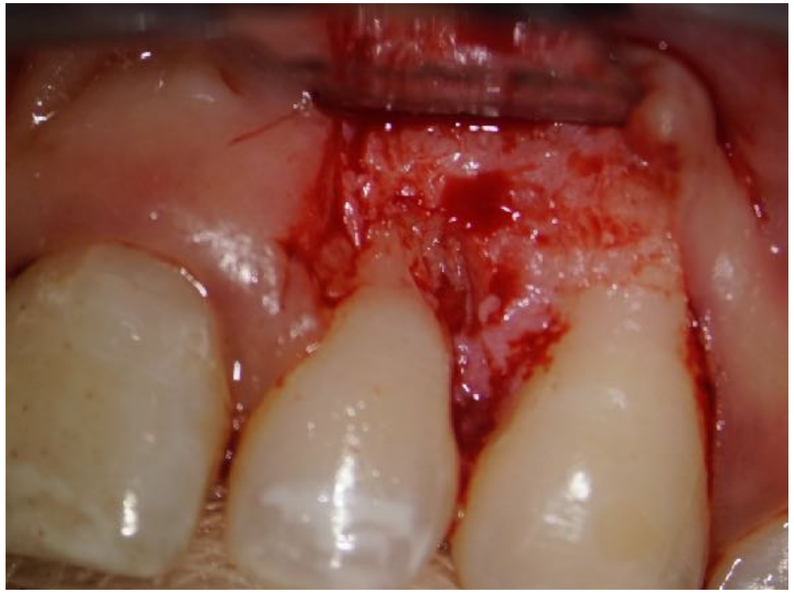
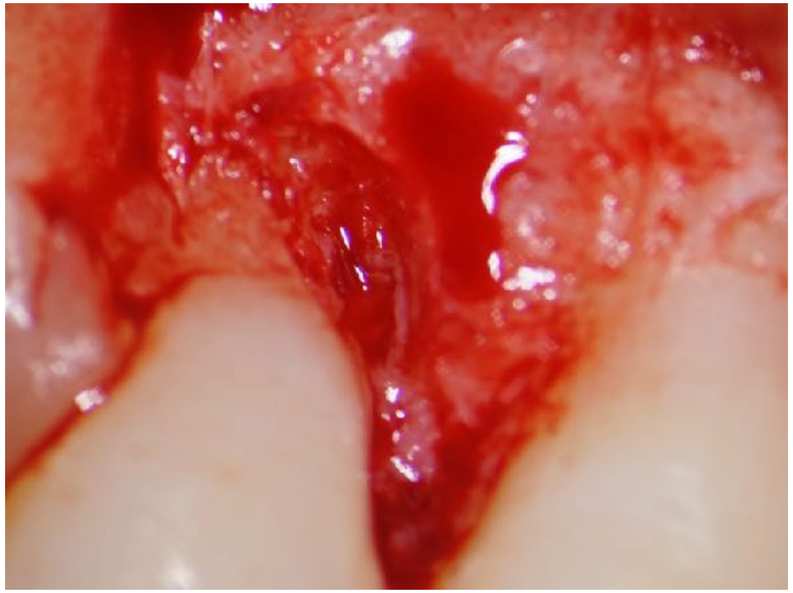






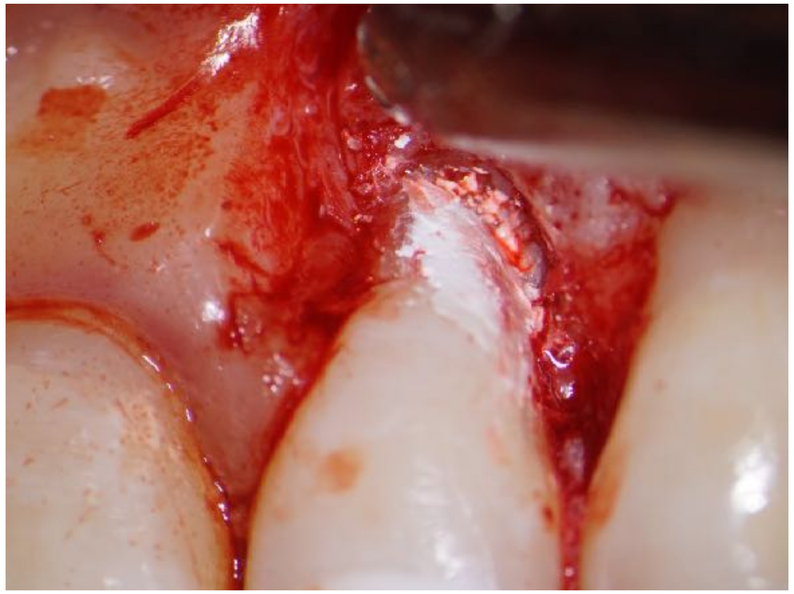




GENNAIO 2021

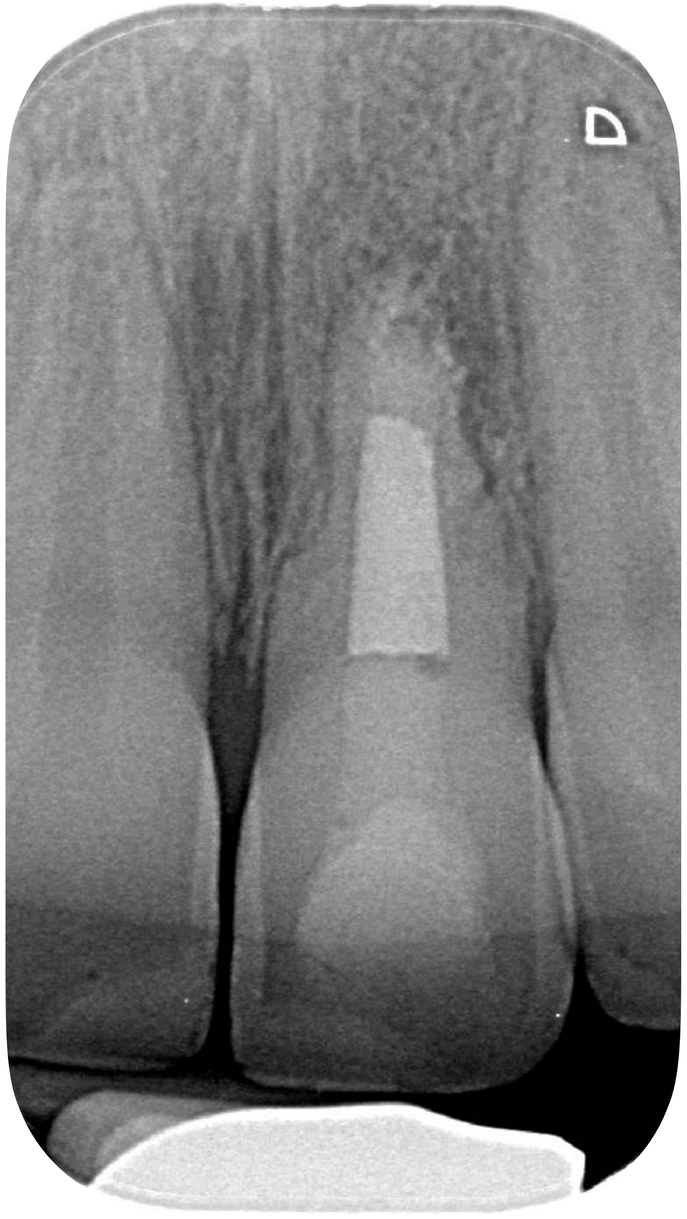
RRM

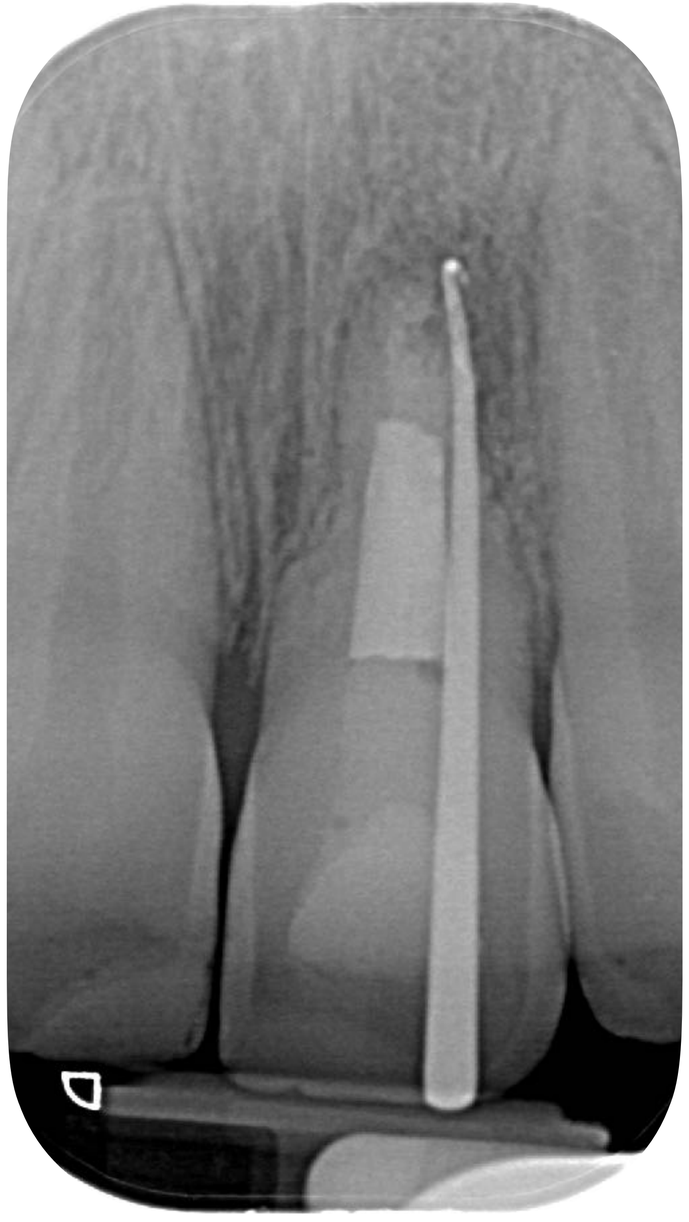

Gennaio 2021

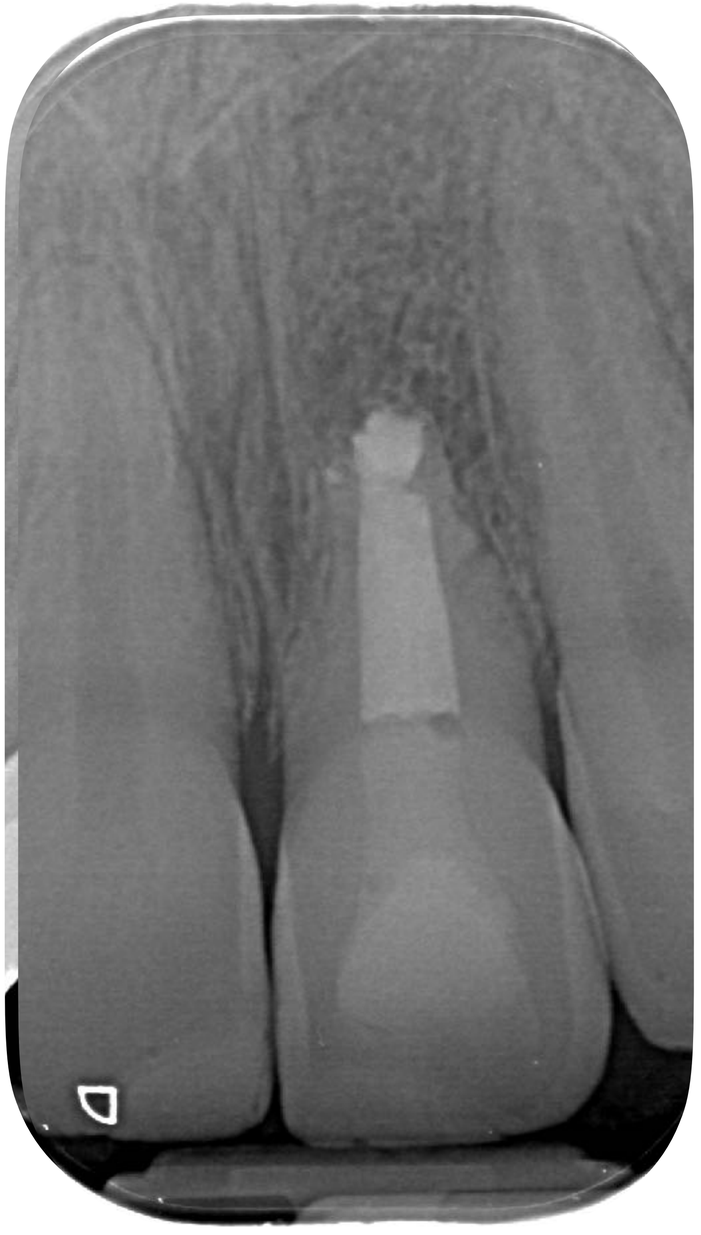
Febbraio 2023

2019

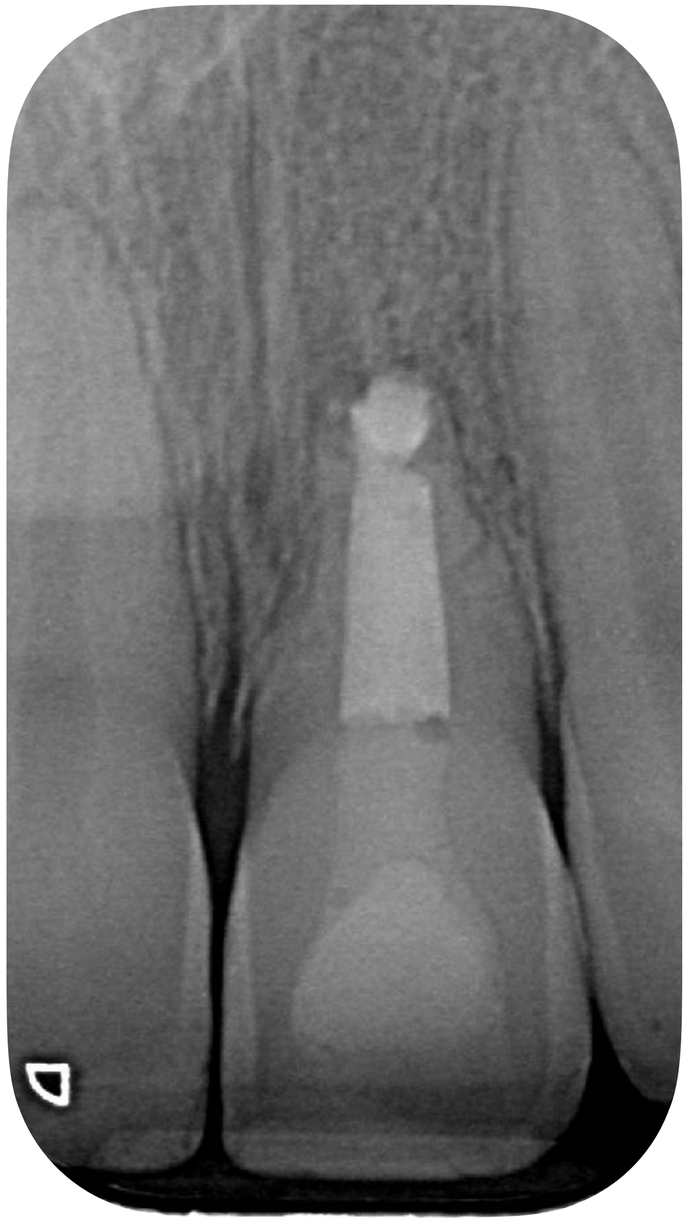


2022

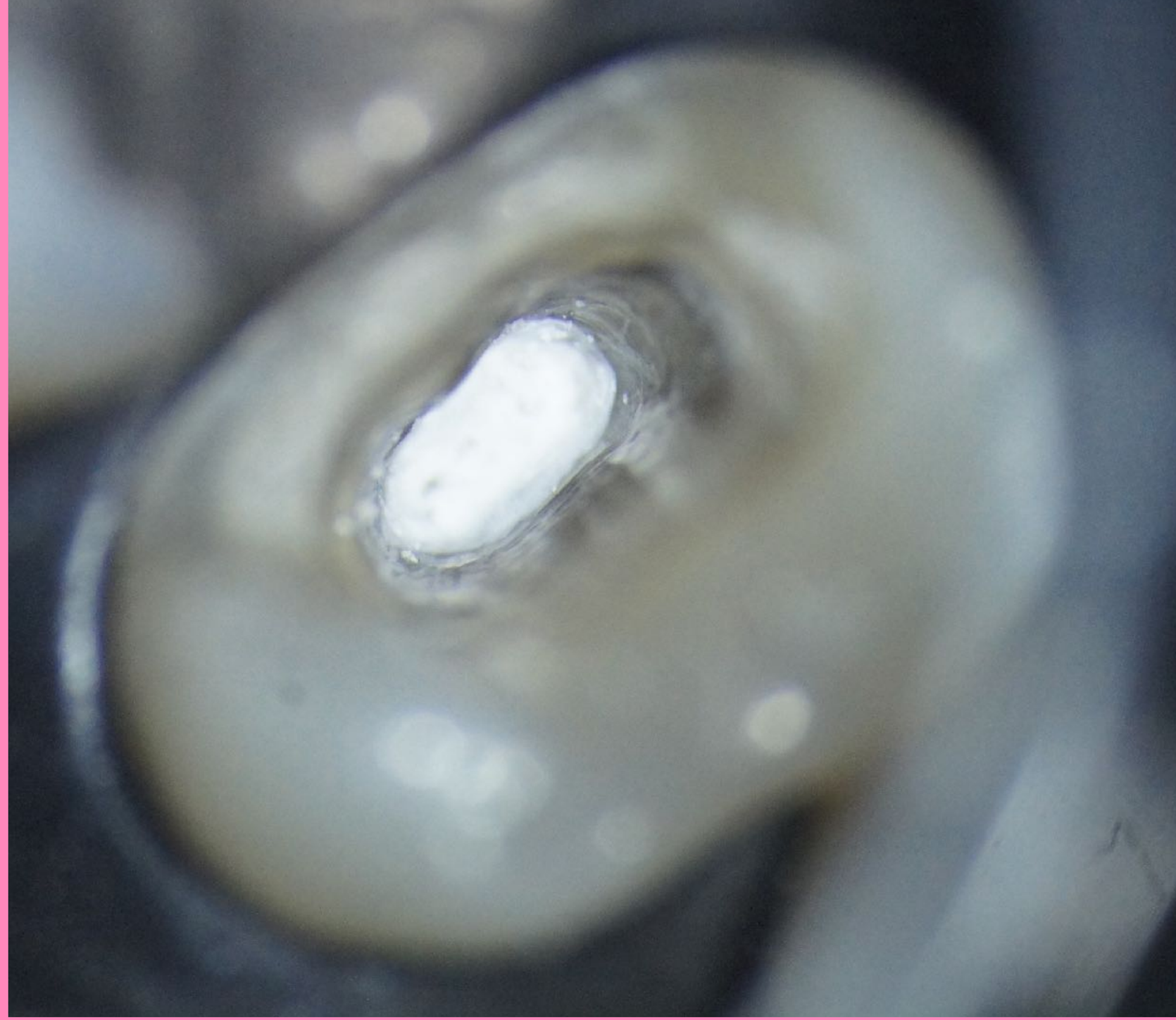




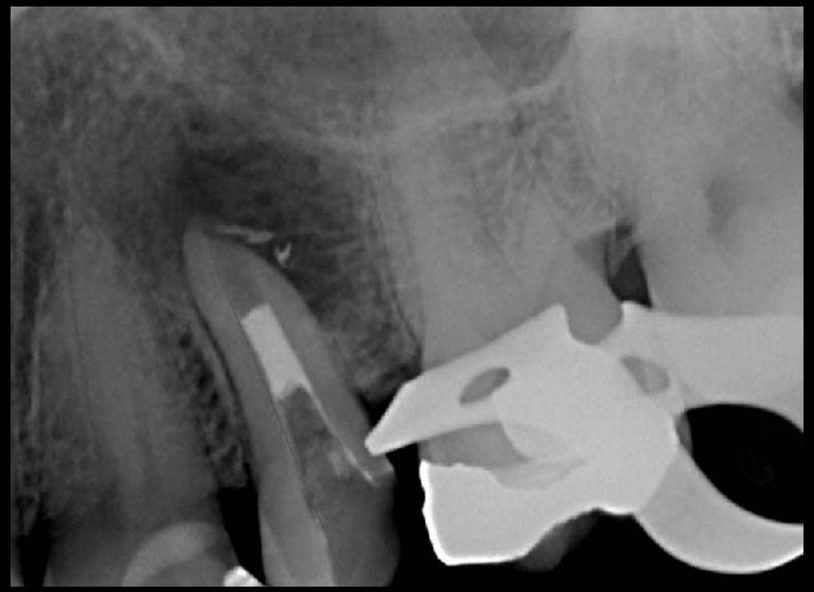
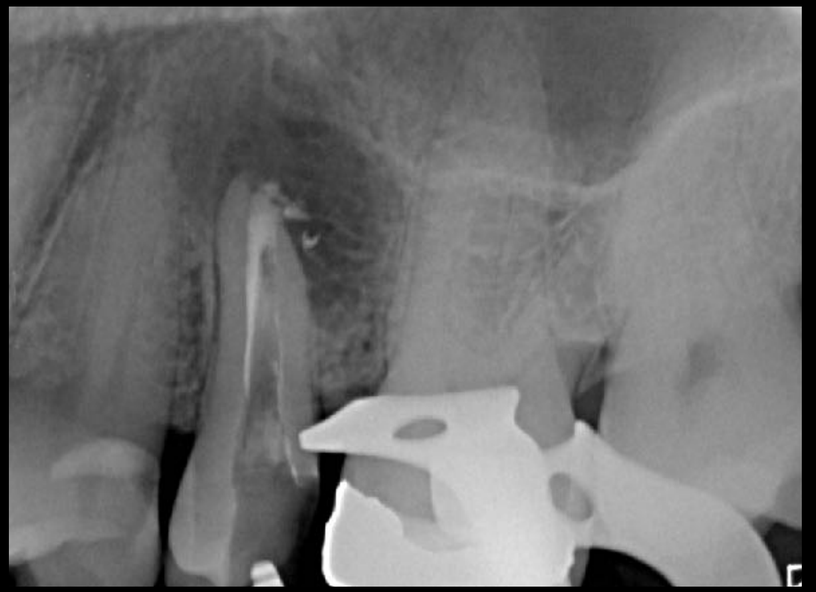
2024



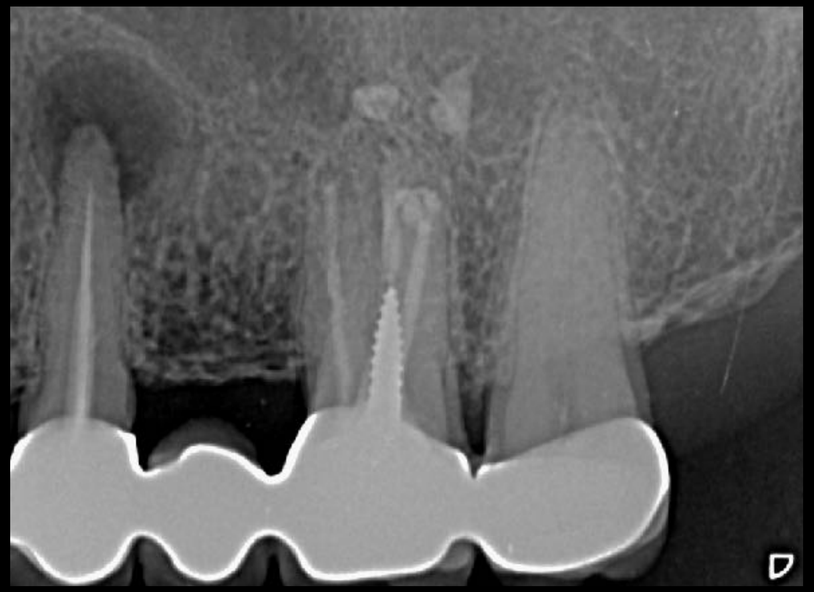
APICAL PLUG

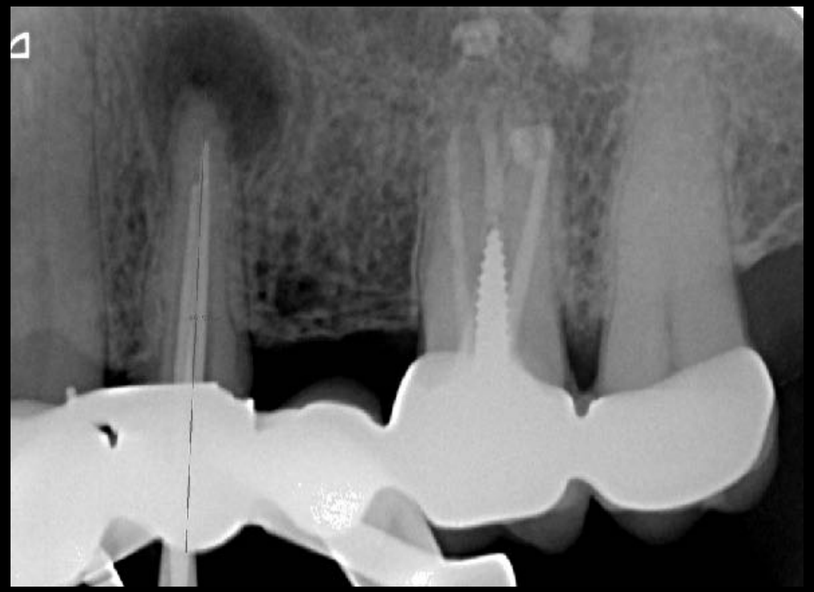


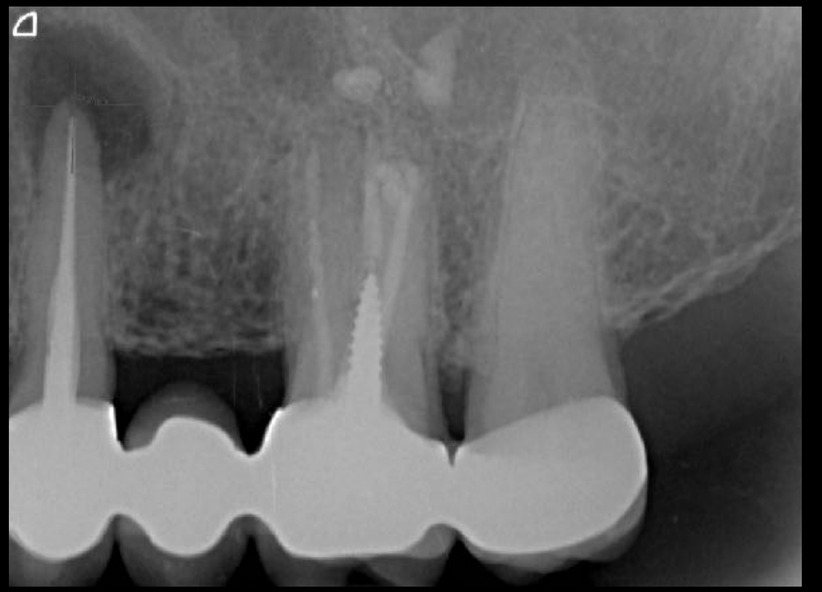
APICAL PLUG: VIDEO

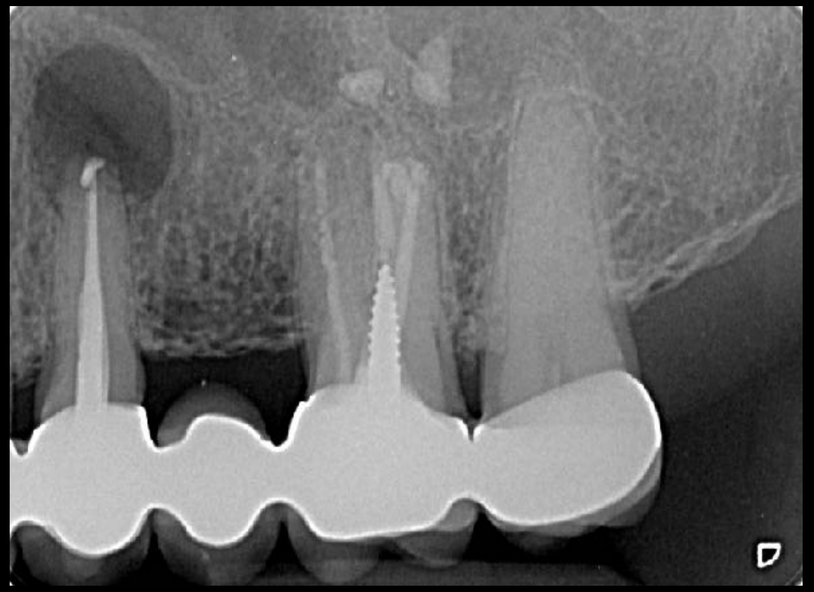




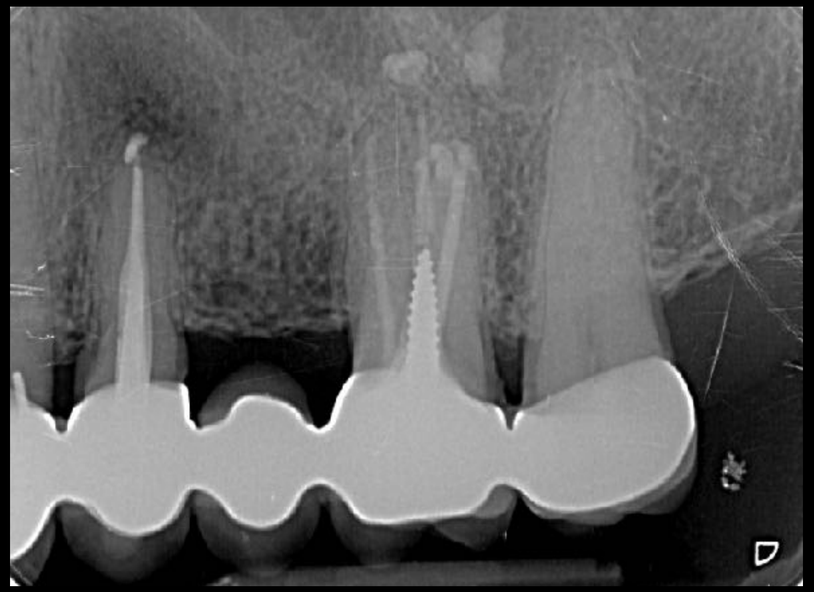

APICAL PLUG

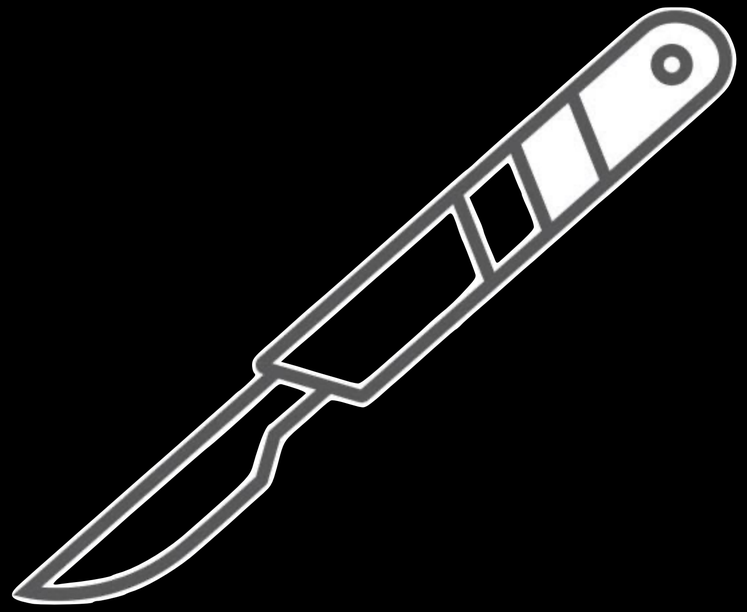


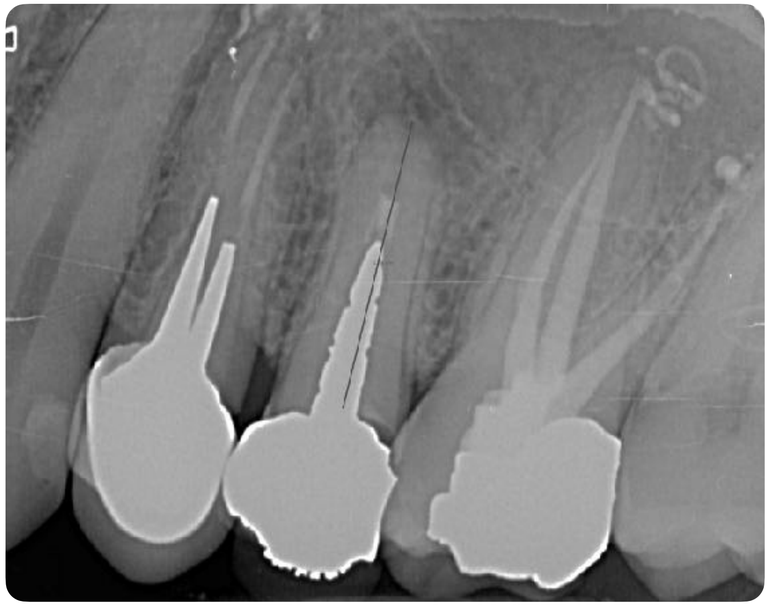


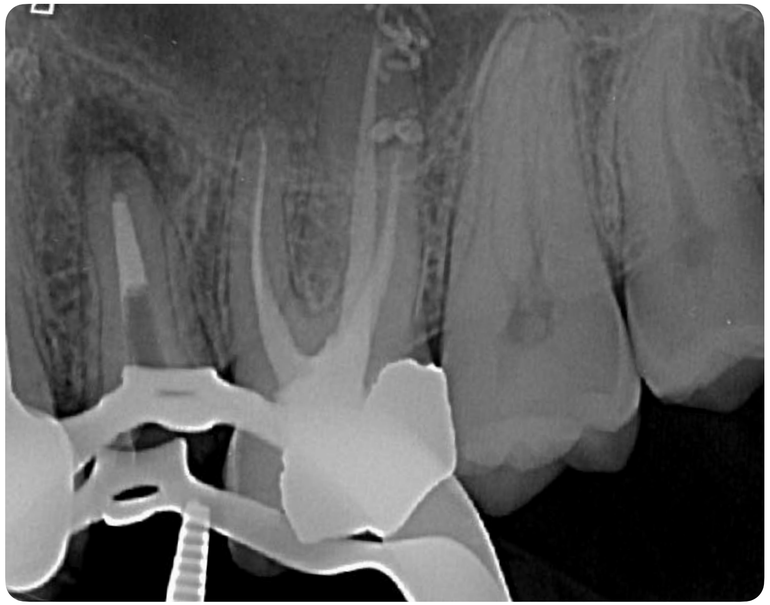












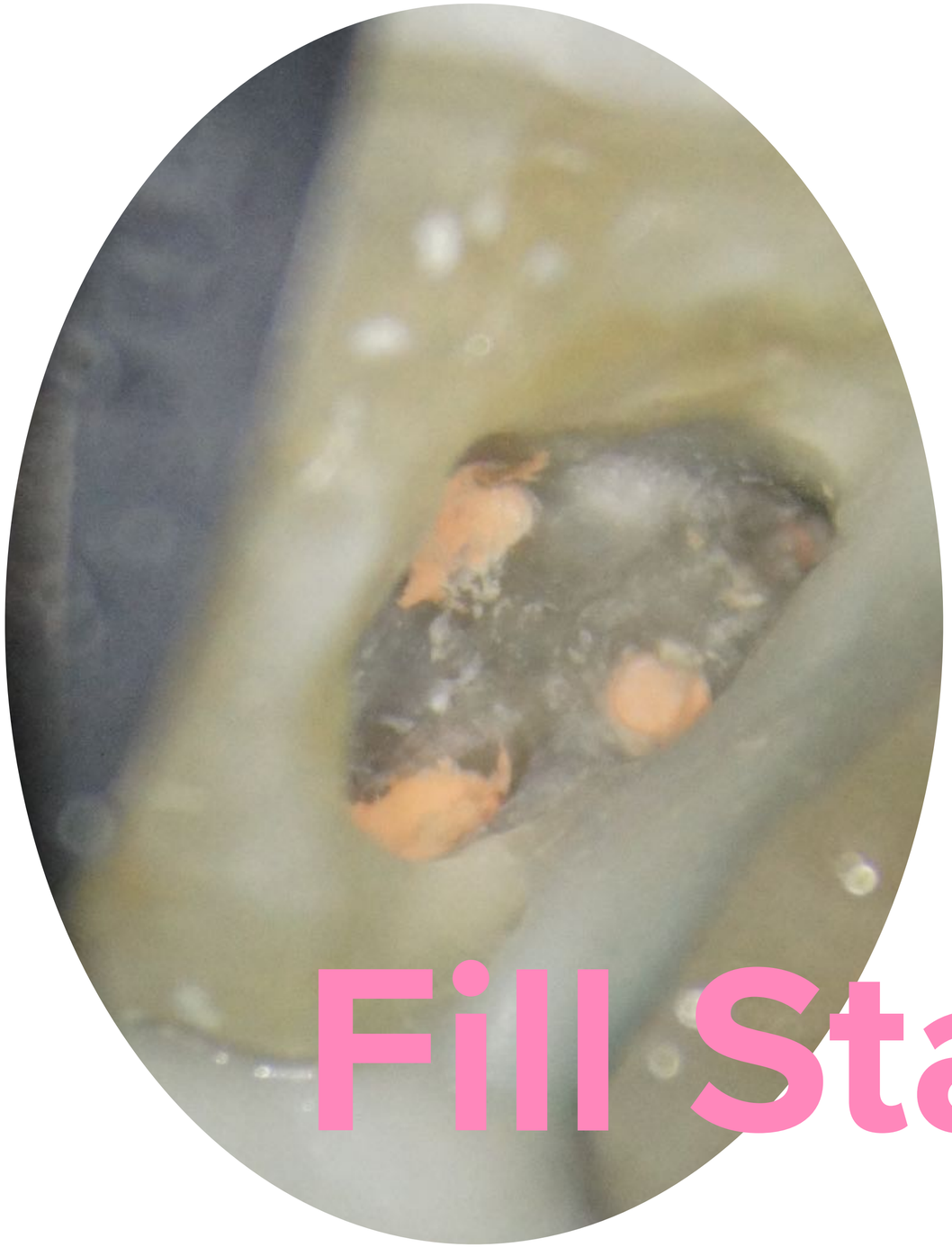
APICAL PLUG

ADVANTAGES BIOCERAMIC PUTTY

- EASY TO USE
- APICAL SURGERY, RESORPTION, APICAL PLUG
- BIOCOMPATIBILITY
- LESS POST OP PAIN
- FASTER HEALING TIME

DW DENTAL WORLD
ITALIAN MANUFACTURER

RESTO



Fill Stains Pink

Dentine Preservation

CAVITY ACCESS

SHAPING

POST-SPACE

RESTORATION

J Prosthet Dent. 2008 Apr;99(4):267-73. doi: 10.1016/S0022-3913(08)60059-1.

Residual dentin thickness in bifurcated maxillary first premolars after root canal and post space preparation with parallel-sided drills.

Pilo R, Shapenco E, Lewinstein I.

Int Endod J. 2009 Dec;42(12):1071-6. doi: 10.1111/j.1365-2591.2009.01632.x.

Micro-computed tomography of tooth tissue volume changes following endodontic procedures and post space preparation.

Ikram OH, Patel S, Sauro S, Mannocci F.

J Endod. 2006 Mar;32(3):202-5.

Residual dentin thickness in bifurcated maxillary premolars after root canal and dowel space preparation.

Katz A, Wasenstein-Kohn S, Tamse A, Zuckerman O.

Kirkevang
IEJ 2001

"Inadequate root canal and coronal restorations were associated with an increased incidence of AP."

Periapical status and quality of root fillings and coronal restorations in a Danish population

Hommez
IEJ 2002

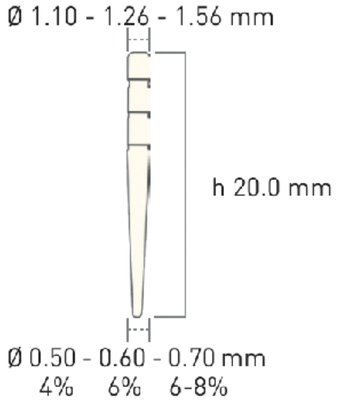
The importance of a good coronal restoration, as well as of a good root filling should be emphasized as the technical quality of both infuencing the periapical status.

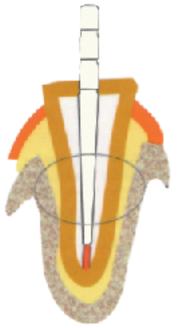
Periapical health related to the quality of coronal restorations and root fillings

ADHESIVE

5th generation one component nano filled light-cured bonding system; acetone-based

It allows direct and indirect restoration procedures, with minimum and uniform thicknesses; dental desensitizer





Variable taper endodontic posts made of radiopaque fiberglass and carbon fiber, with retention notches and micro-sandblasted and pre-silanized surface

Recommended for narrow roots and for the preparation with endodontic Ni-Ti instruments

POST

Dual cured cement (auto – photo) recommended for the cementation of bridges, crowns, posts, inlay, onlay and ceramic, metal, composite and zirconia screws.

Uniform cementation

Multiple cementation

Continuous fluoride ions release

Easy application and removal

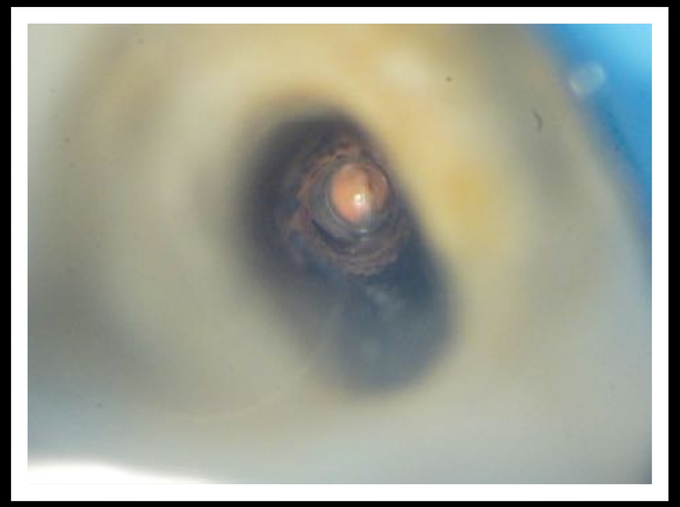
Minimum thickness

CEMENT

COMPOSITE


CE 0425
CreaFILL flow
2g
CreaFILL NHC
(IT) Composito nano-ibrido

Endo-resto



ricostruzione premolare

KEY POINT

MINIMALLY INVASIVE ENDODONTIC

ACHIEVEMENT OF BIOLOGICAL AND MECHANICAL GOALS

NANO COATED HEAT TREATED ROTARY FILES

BIOCERAMIC SEALERS

GFUMEI@TISCALI.IT

DRGFUMEIENDODONTICS

WWW.SHAPE-IT-ENDO.SOCIALACADEMY.COM

ShapeIT

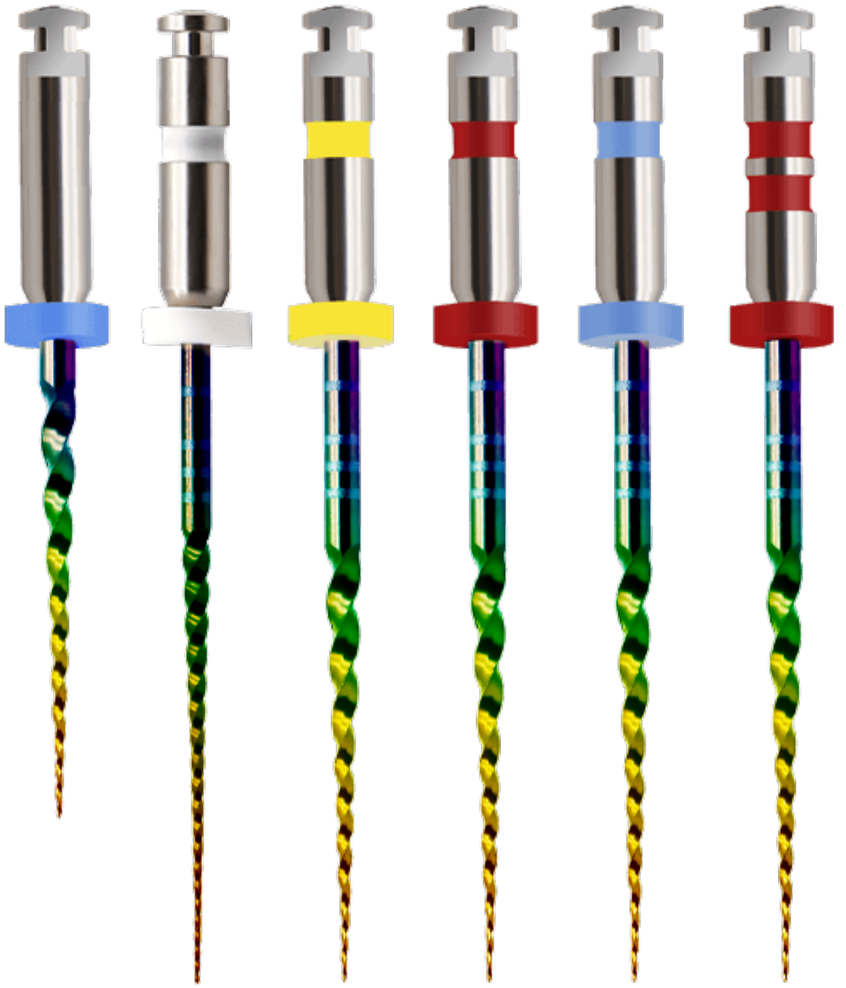
Shape IT endo

Shape IT

ShapeITendo

Shape IT


HANDS
ON!



I STEP

Working lenght

II STEP

Opener Preflaring 20-10

400 rpm

T 2,5 Ncm

III STEP

GLYDER Glide path 15/2-6

300 rpm

T 1,8 Ncm

IV STEP

Shaping

20.4

25.4

30.4

25.6

400 rpm

T 2,5 Ncm