06-02-2025

DR GIANLUCA FUMEI

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Il *recupero dell'elemento dentario*

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Obbiettivi del Trattamento

Meccanici

Biologici

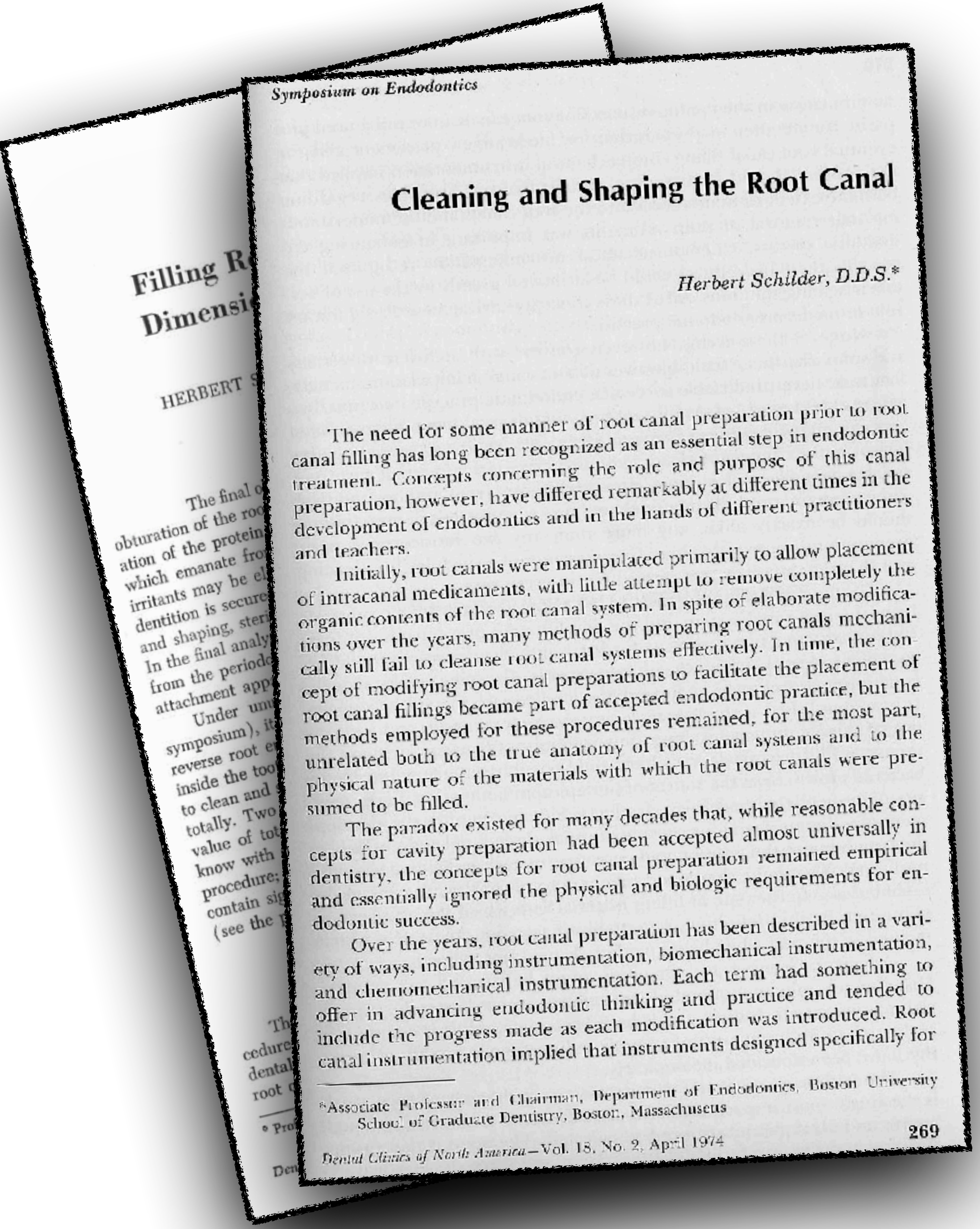
Obbiettivi del Trattamento

Meccanici

* Conicità continua da corona ad apice
* Preservare le curvature del canale
* Preservare il diametro apicale

Biologici

* Rimuovere la polpa malata
* Ridurre la carica batterica



Symposium on Endodontics

Cleaning and Shaping the Root Canal

*Herbert Schilder, D.D.S.**

The need for some manner of root canal preparation prior to root canal filling has long been recognized as an essential step in endodontic treatment. Concepts concerning the role and purpose of this canal preparation, however, have differed remarkably at different times in the development of endodontics and in the hands of different practitioners and teachers.

Initially, root canals were manipulated primarily to allow placement of intracanal medicaments, with little attempt to remove completely the organic contents of the root canal system. In spite of elaborate modifications over the years, many methods of preparing root canals mechanically still fail to cleanse root canal systems effectively. In time, the concept of modifying root canal preparations to facilitate the placement of root canal fillings became part of accepted endodontic practice, but the methods employed for these procedures remained, for the most part, unrelated both to the true anatomy of root canal systems and to the physical nature of the materials with which the root canals were presumed to be filled.

The paradox existed for many decades that, while reasonable concepts for cavity preparation had been accepted almost universally in dentistry, the concepts for root canal preparation remained empirical and essentially ignored the physical and biologic requirements for endodontic success.

Over the years, root canal preparation has been described in a variety of ways, including instrumentation, biomechanical instrumentation, and chemomechanical instrumentation. Each term had something to offer in advancing endodontic thinking and practice and tended to include the progress made as each modification was introduced. Root canal instrumentation implied that instruments designed specifically for

*Associate Professor and Chairman, Department of Endodontics, Boston University School of Graduate Dentistry, Boston, Massachusetts

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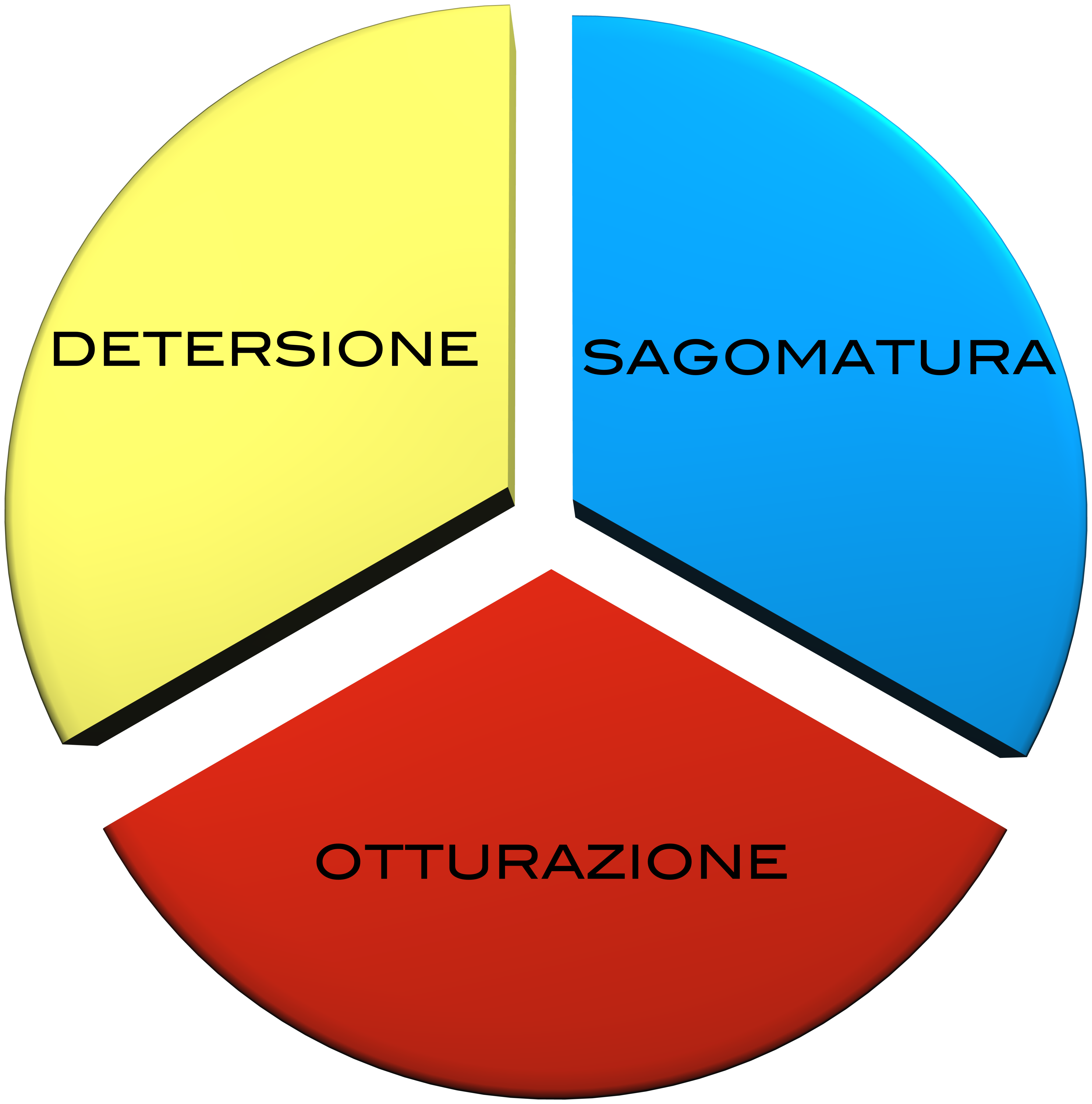
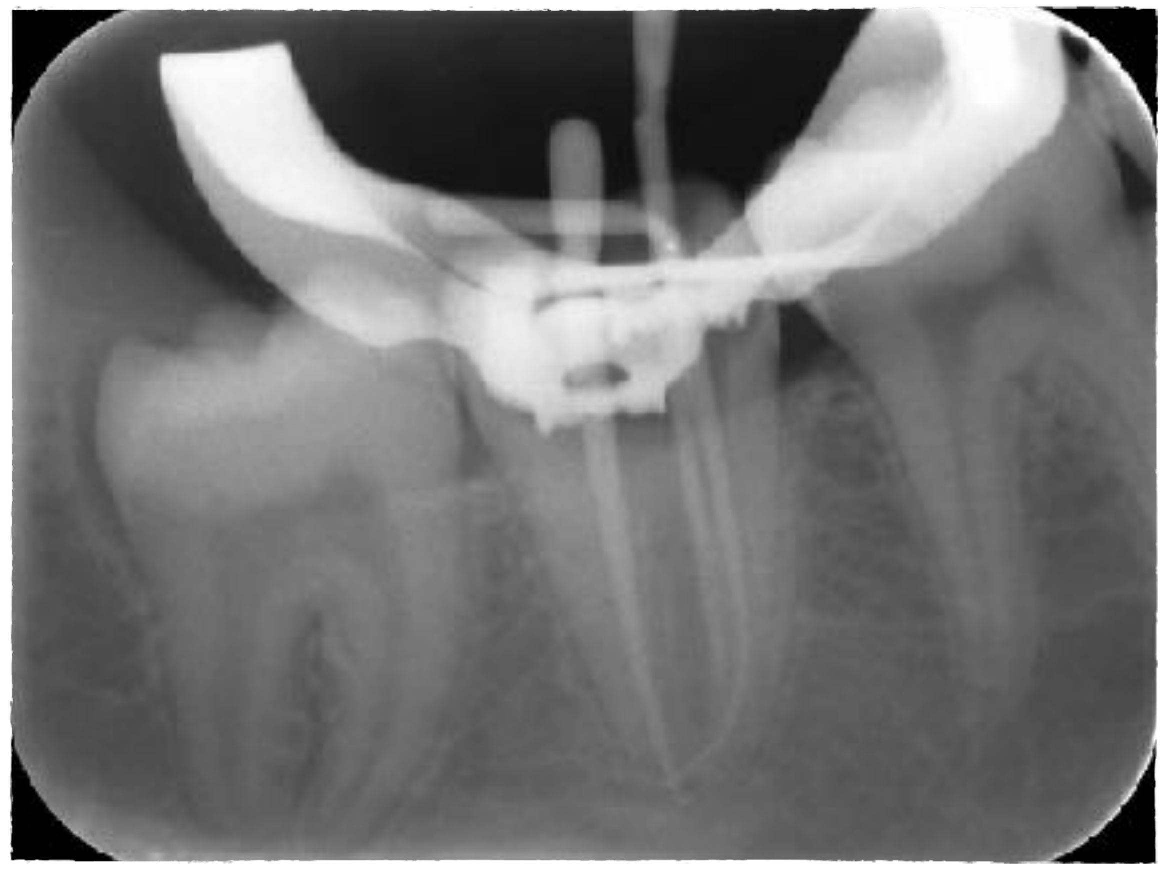
Dental Clinics of North America—Vol. 18, No. 2, April 1974



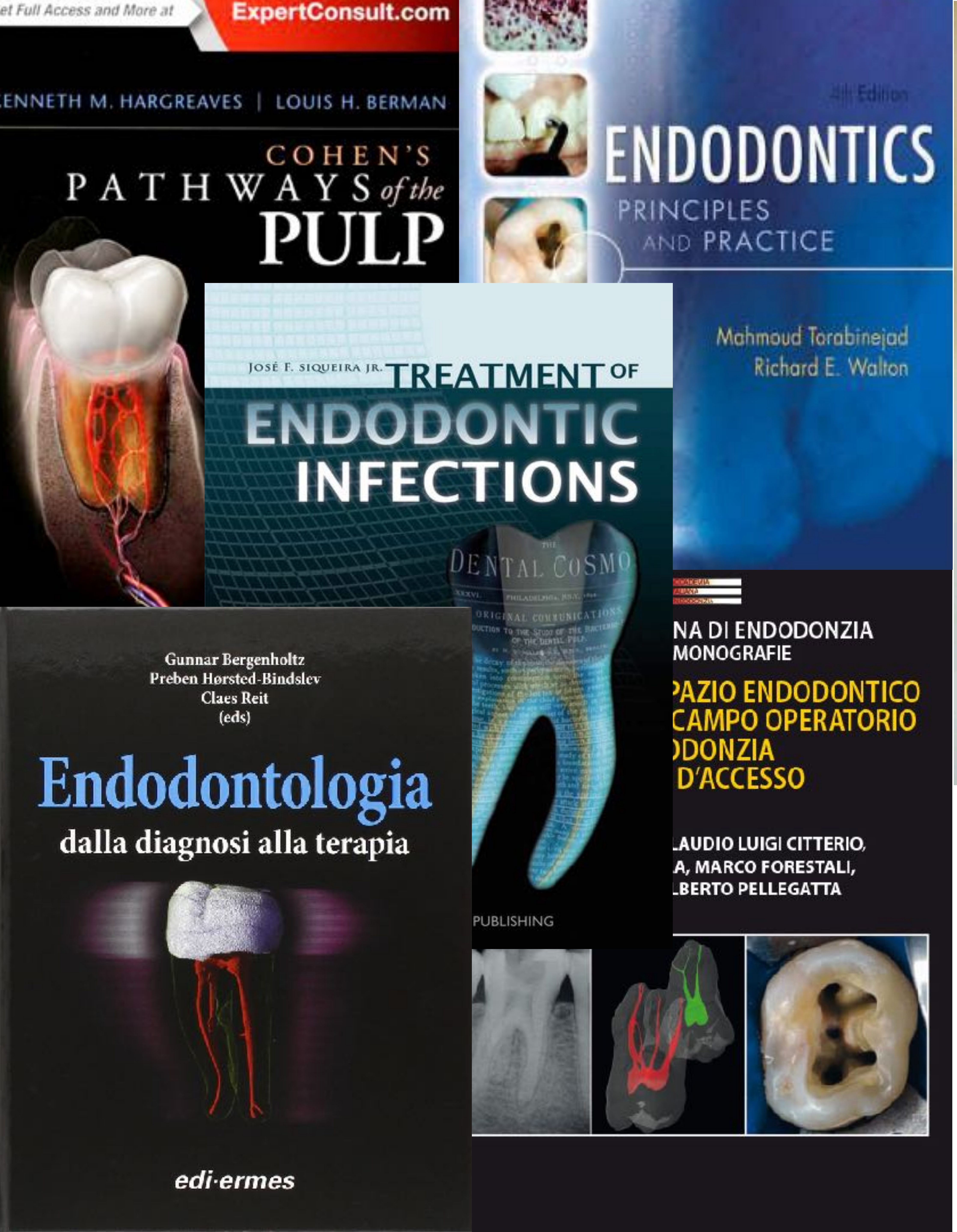
Sagomatura

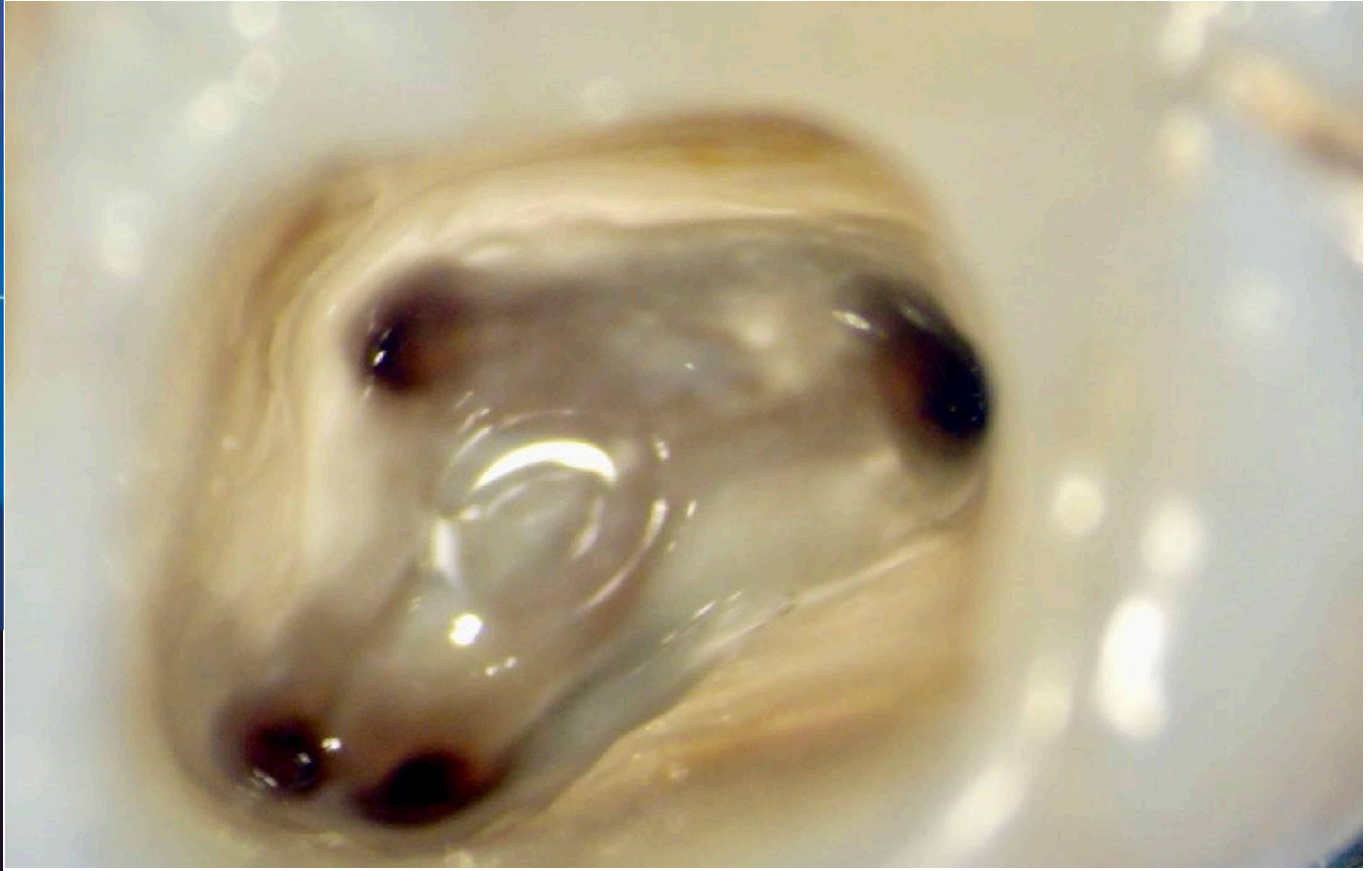
Detersione

Otturazione



APERTURA DI CAMERA





ENDODONTICALLY, ACCESS OBJECTIVES ARE CONFIRMED WHEN ALL THE ORIFICES OF A FURCATED TOOTH CAN BE VISUALIZED WITHOUT MOVING THE MOUTH MIRROR"

C.J.Ruddle (2007)
Endodontic access preparation the tools for sucess,
Dental Products Report

La Preparazione di una corretta cavità d'accesso influenza il risultato del trattamento canalare Dal 20 al 30%

APERTURA DI CAMERA

RIMUOVERE TX CARIATO

RIMUOVERE TETTO CAMERALE

VISIONE DIRETTA IMBOCCHI CANALARI

ACCESSO RETTILINEO AL III APICALE

CONTENERE IRRIGANTI

PRESERVARE STRUTTURA DENTALE

RITENERE OTT PROVVISORIA

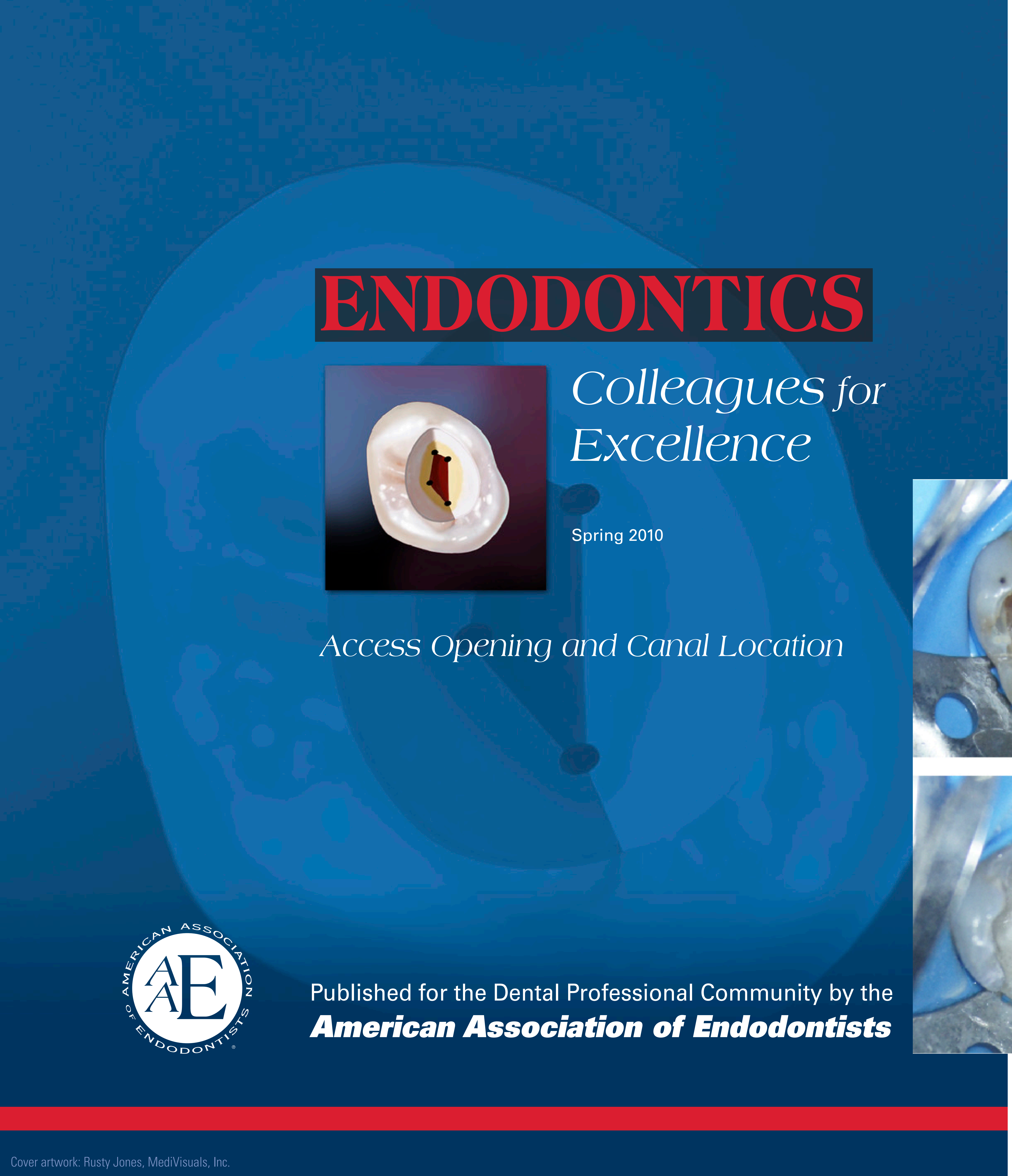
"Errors accumulate during procedures.

That's the reason botching the access at the start of an RCT is so much more devastating than problems that come just before finishing the case."

"Cutting endodontic access cavities for long-term outcomes"
Oral Health - may 1, 2018

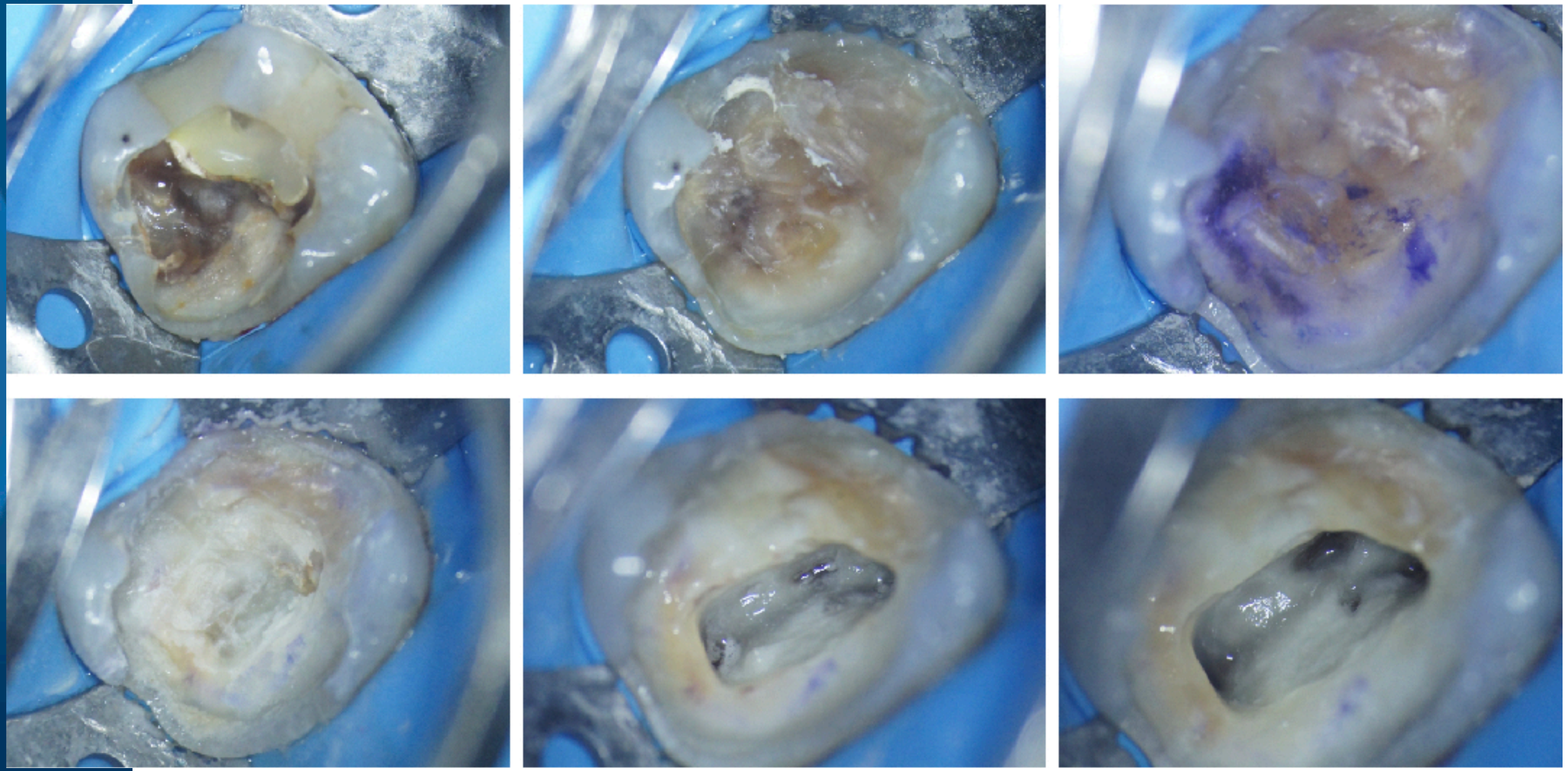
SONDAGGIO GAC

DR.ssa Rapetti & Dr Aiuto



LA INCOMPLETA RIMOZIONE DI TESSUTO CARIATO AUMENTA NOTEVOLMENTE IL RISCHIO DI CONTAMINAZIONE DELL'ENDODONTO DURANTE LE FASI DEL TRATTAMENTO.

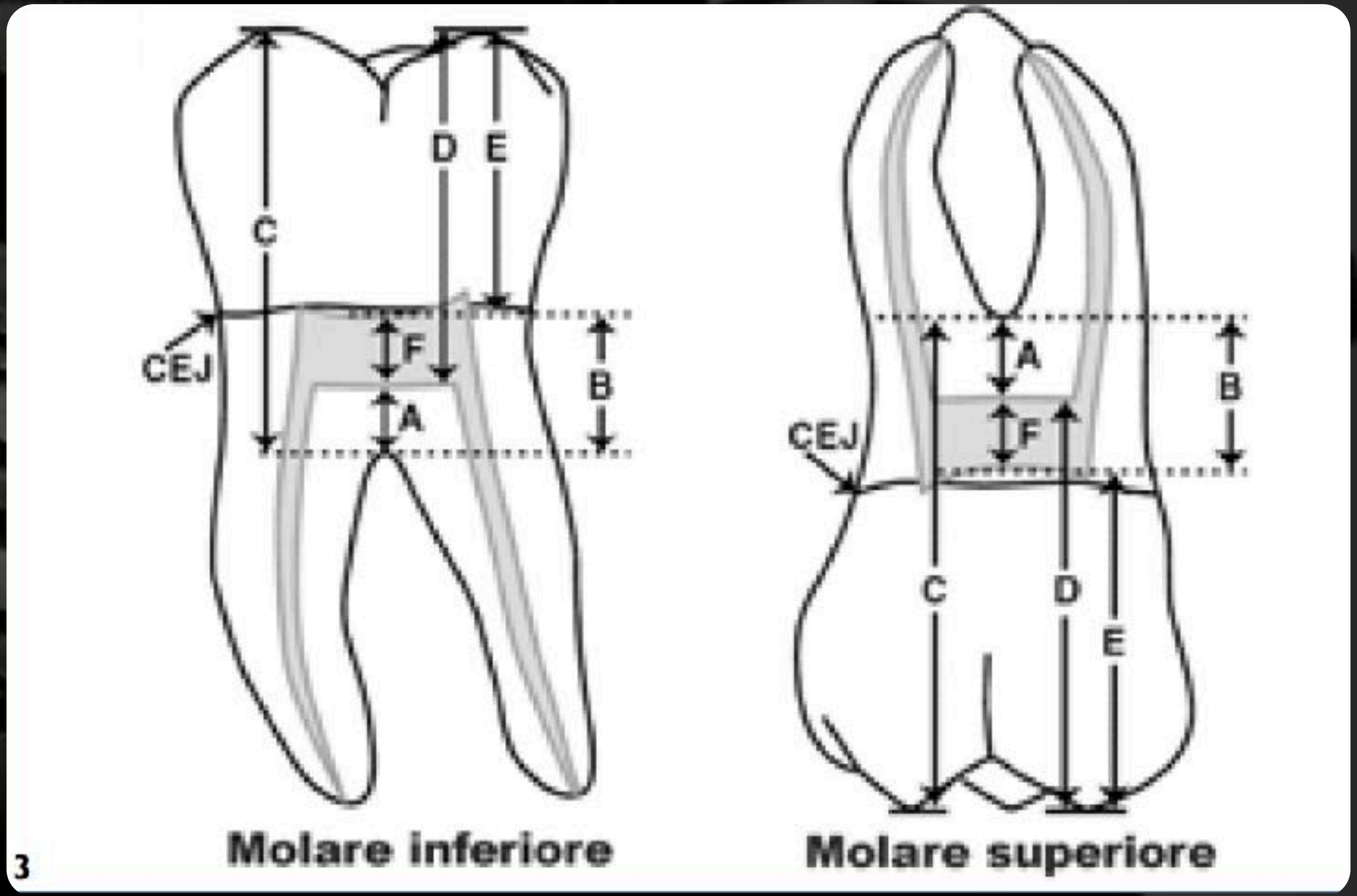
L'AAE CONSIDERA LA RIMOZIONE DI RESTAURI INCONGRUI E DEL TESSUTO CARIATO, CONDIZIONI IMPRESCINDIBILI PER UNA PROGNOSI FAVOREVOLE DELLA TERAPIA.



lettuRe consigliate:

MORFOLOGIA DELLA CAMERA PULPARE
DALLA RICERCA DI BASE ALLA METODOLOGIA CLINICA

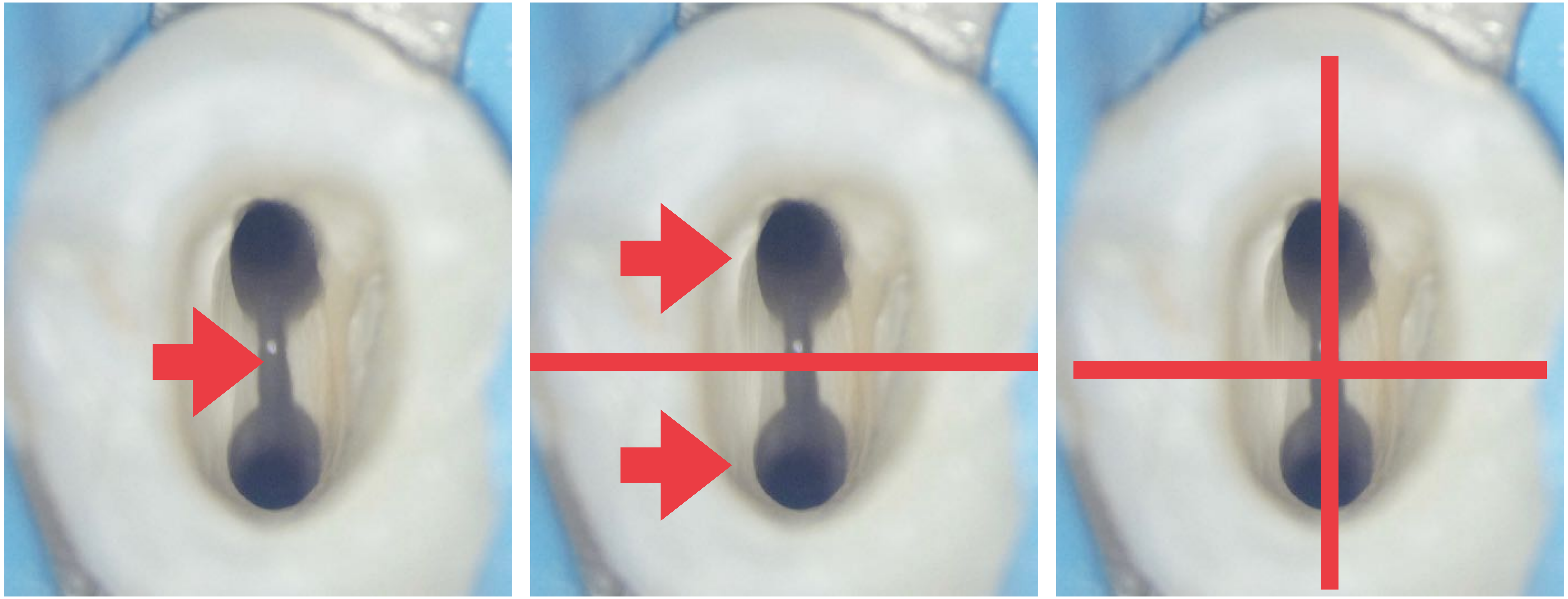
ALLAN S. DEUTSCH



MISURE MEDIE IN MM PER I MOLARI MASCELLARI E MANDIBOLARI

N=100	A	B	C	D=(C-A)	E=(C-B)	F=(B-A)
Media (max)	3,05	4,91	11,15	8,08	6,24	1,88
(mand)	2,96	4,57	10,90	7,95	6,36	1,57
SD (max)	0,79	1,06	1,21	0,88	0,88	0,69
(mand)	0,78	0,91	1,21	0,79	0,93	0,68
Variazione %	25,80	21,60	10,90	10,9	14,11	36,50
(mand)	26,00	20,00	11,10	9,94	14,60	43,00

*INFORMATORE ENDODONTICO. VOL 8
NUMERO 1 2005



LEGGE VARIAZIONE DEL COLORE

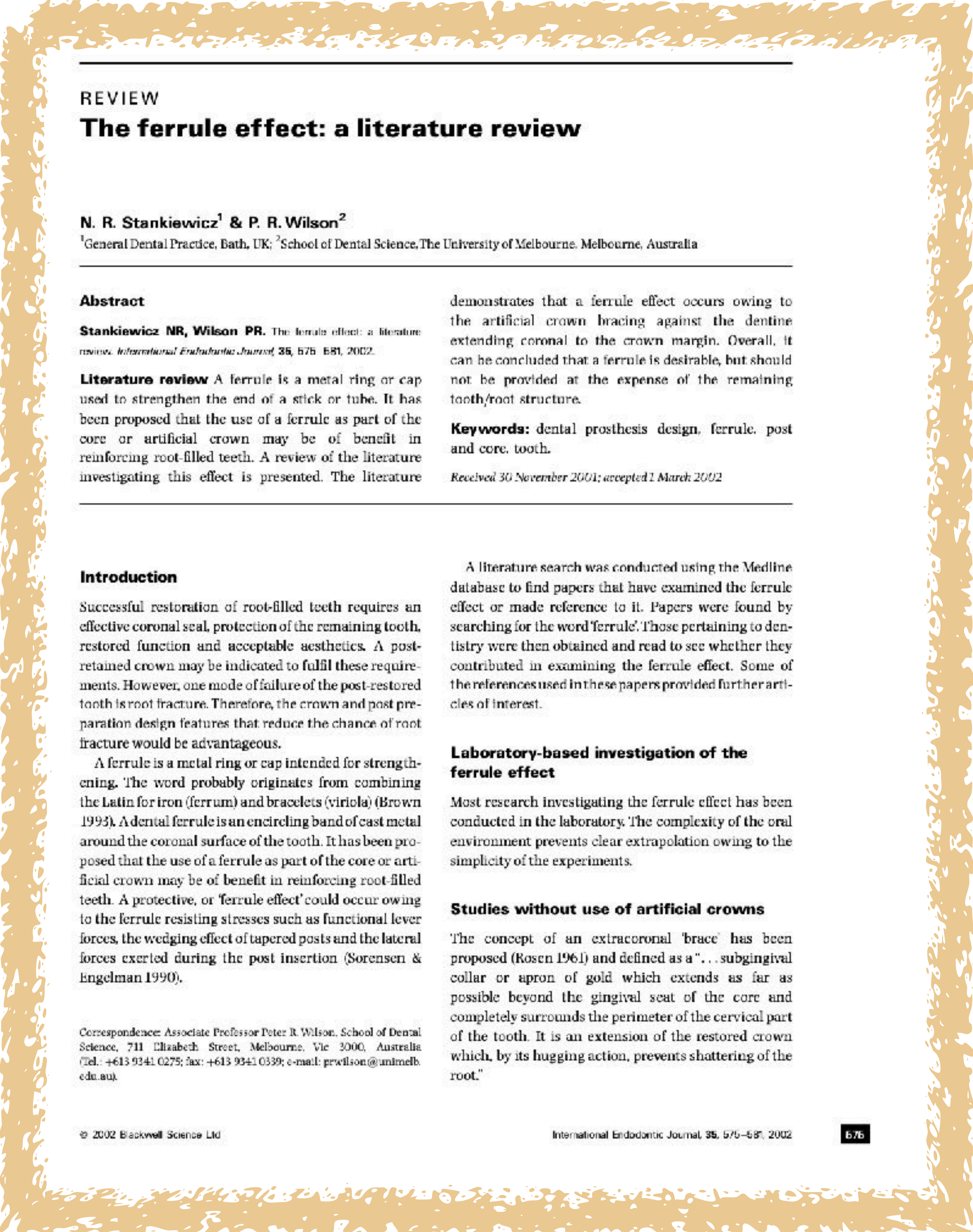
LEGGE 1: IMBOCCHI TRA PARETE E PAVIMENTO

LEGGE 2: IMBOCCHI AGLI ANGOLI TRA PARETE E PAVIMENTO

LEGGE 3: IMBOCCHI AL TERMINE LINEE DI SVILUPPO RADICOLARI

LEGGE DELLA SIMMETRIA 1(ECC MOL MASC) IMBOCCHI EQUIDISTANTI DA LINEA MEDIANA MEDIO-DISTALE

LEGGE DELLA SIMMETRIA 2 (ECC MOL MASC) IMBOCCHI PERPENDICOLARI A LINEA MEDIO-DISTALE CENTRALE



REVIEW

The ferrule effect: a literature review

N. R. Stankiewicz[1] & P. R. Wilson[2]

[1]General Dental Practice, Bath, UK; [2]School of Dental Science, The University of Melbourne, Melbourne, Australia

Abstract

Stankiewicz NR, Wilson PR. The ferrule effect: a literature review. *International Endodontic Journal*, **35**, 575–581, 2002.

Literature review A ferrule is a metal ring or cap used to strengthen the end of a stick or tube. It has been proposed that the use of a ferrule as part of the core or artificial crown may be of benefit in reinforcing root-filled teeth. A review of the literature investigating this effect is presented. The literature demonstrates that a ferrule effect occurs owing to the artificial crown bracing against the dentine extending coronal to the crown margin. Overall, it can be concluded that a ferrule is desirable, but should not be provided at the expense of the remaining tooth/root structure.

Keywords: dental prosthesis design, ferrule, post and core, tooth.

Received 30 November 2001; accepted 1 March 2002

Introduction

Successful restoration of root-filled teeth requires an effective coronal seal, protection of the remaining tooth, restored function and acceptable aesthetics. A post-retained crown may be indicated to fulfil these requirements. However, one mode of failure of the post-restored tooth is root fracture. Therefore, the crown and post preparation design features that reduce the chance of root fracture would be advantageous.

A ferrule is a metal ring or cap intended for strengthening. The word probably originates from combining the Latin for iron (ferrum) and bracelets (viriola) (Brown 1993). A dental ferrule is an encircling band of cast metal around the coronal surface of the tooth. It has been proposed that the use of a ferrule as part of the core or artificial crown may be of benefit in reinforcing root-filled teeth. A protective, or 'ferrule effect' could occur owing to the ferrule resisting stresses such as functional lever forces, the wedging effect of tapered posts and the lateral forces exerted during the post insertion (Sorensen & Engelman 1990).

Correspondence: Associate Professor Peter R. Wilson, School of Dental Science, 711 Elizabeth Street, Melbourne, Vic 3000, Australia (Tel.: +613 9341 0275; fax: +613 9341 0339; e-mail: prwilson@unimelb.edu.au).

A literature search was conducted using the Medline database to find papers that have examined the ferrule effect or made reference to it. Papers were found by searching for the word 'ferrule'. Those pertaining to dentistry were then obtained and read to see whether they contributed in examining the ferrule effect. Some of the references used in these papers provided further articles of interest.

Laboratory-based investigation of the ferrule effect

Most research investigating the ferrule effect has been conducted in the laboratory. The complexity of the oral environment prevents clear extrapolation owing to the simplicity of the experiments.

Studies without use of artificial crowns

The concept of an extracoronal 'brace' has been proposed (Rosen 1961) and defined as a "... subgingival collar or apron of gold which extends as far as possible beyond the gingival seat of the core and completely surrounds the perimeter of the cervical part of the tooth. It is an extension of the restored crown which, by its hugging action, prevents shattering of the root."

Ferula

Conclusions

Laboratory evidence shows in some circumstances that a ferrule effect occurs owing to the crown bracing against the dentine extending coronal to the crown margin. Furthermore, a significant increase in resistance to failure in single rooted teeth is observed where this dentine extends at least 1.5 mm. However, the cost of getting this support in teeth with no coronal dentine is loss of tooth tissue. When assessing a tooth prior to root treatment and subsequent restoration with a crown (if needed), a ferrule would be desirable but not at the expense of the remaining tooth/root structure.

Stankiewicz & P. R. Wilson. 2002

Minimally Invasive Endodontics

Preservare la **massima** quantità di tessuto dentale durante la terapia endodontica

“Evitare” la **frattura** degli strumenti rotanti

Preservare la dentina

- ACCESSO CAMERALE
- STRUMENTAZIONE CANALARE
- PREPARAZIONE POST-SPACE
- REALIZZAZIONE RESTAURO

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.

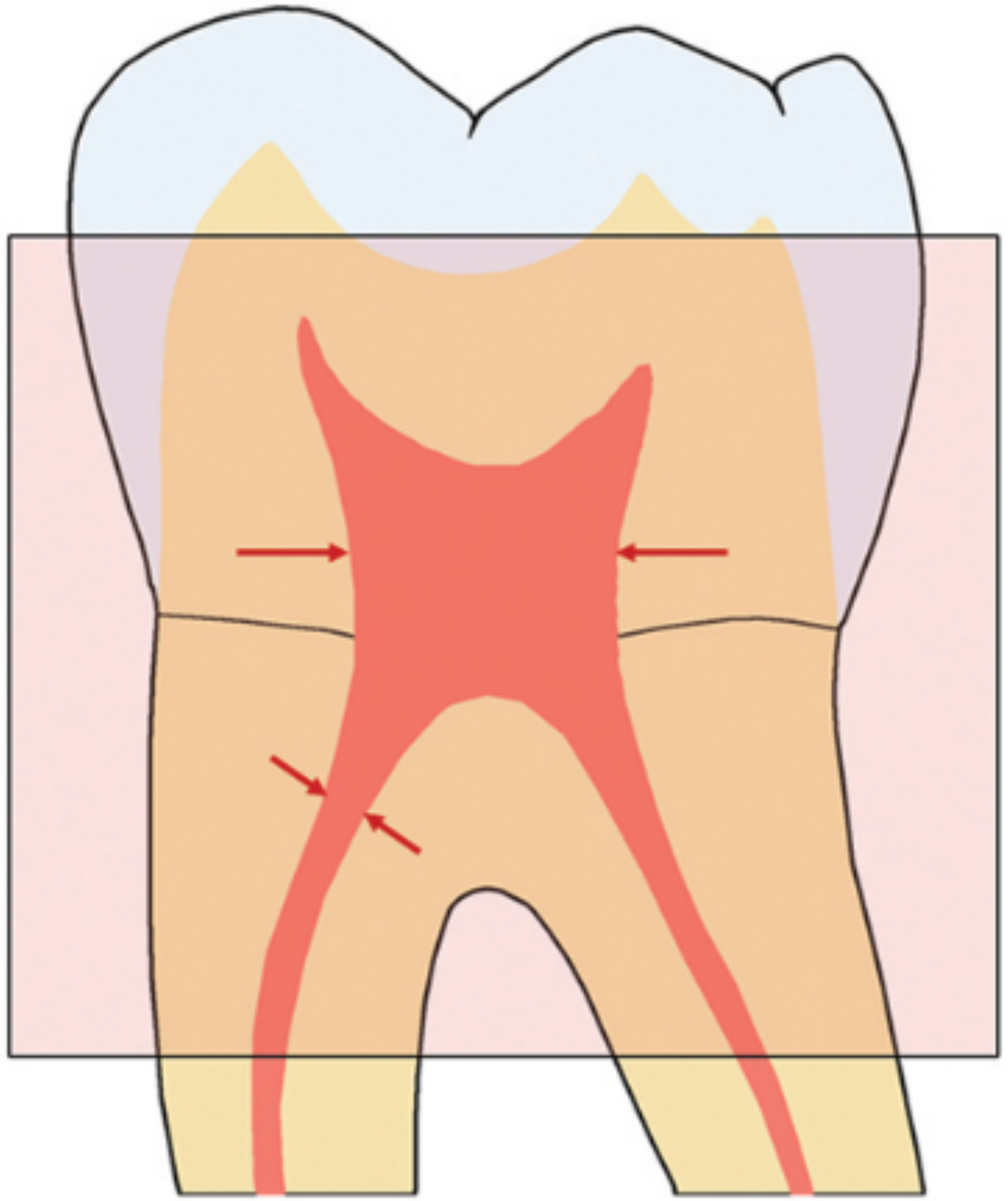
Ikram OH, Patel S, Sauro S, Mannocci F.

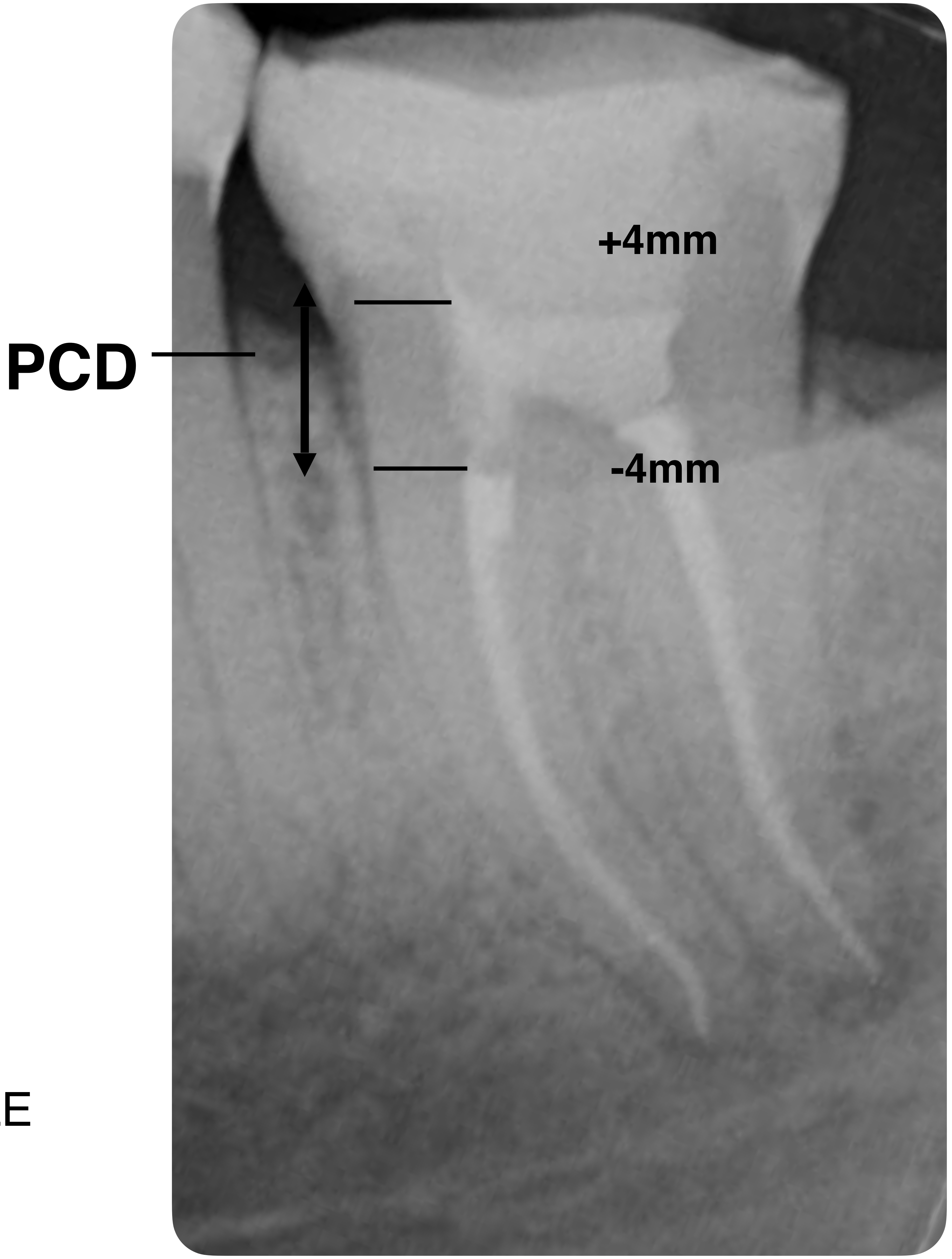
J Endod. 2006 Mar;32(3):202-5.

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

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

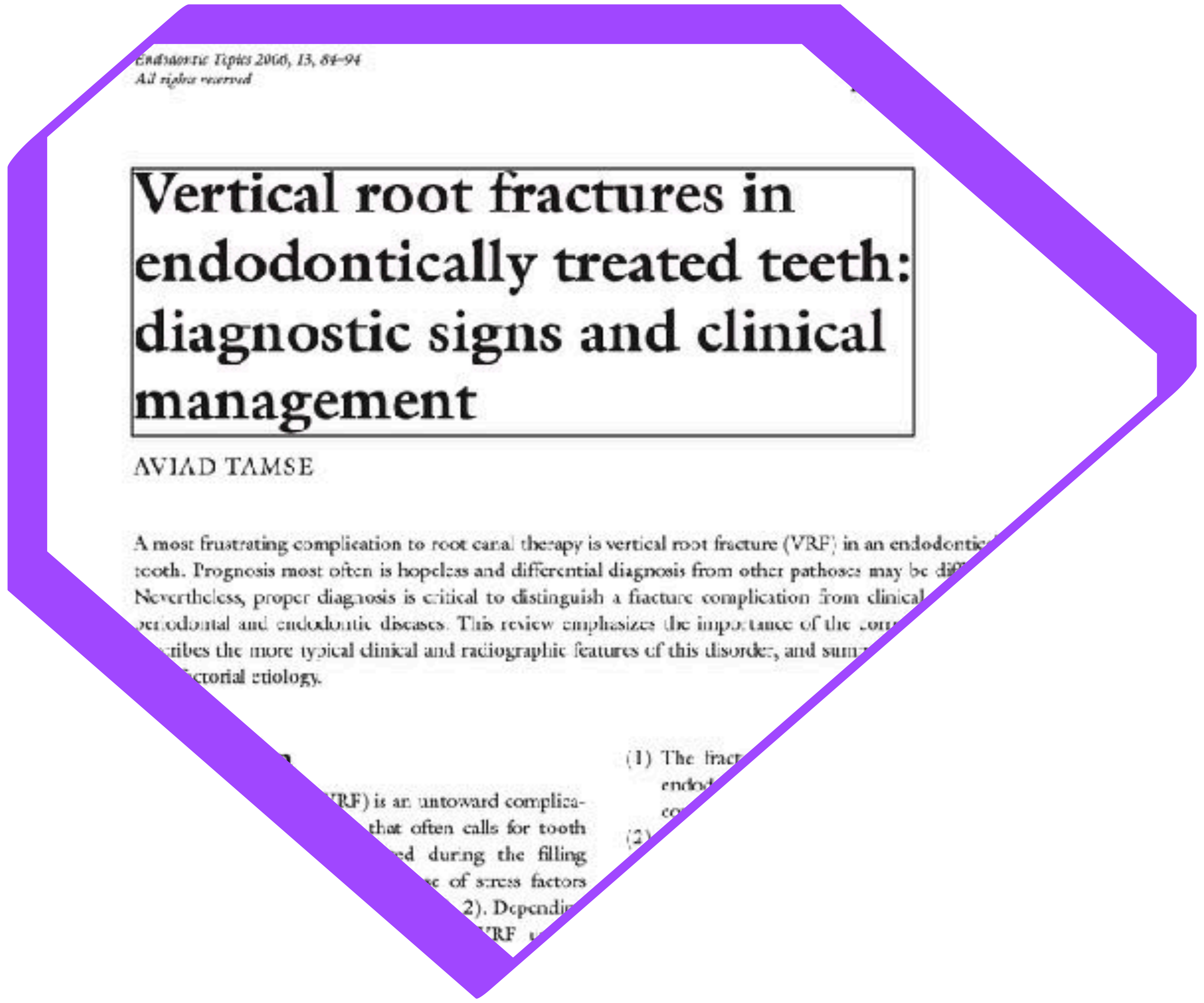
CONSERVAZIONE DELLA
DENTINA PERICERVICALE





1. LA DENTINA PERICERVICALE È LOCALIZZATA GENERALMENTE A 4MM CORONALMENTE E APICALMENTE ALLA CRESTA ALVEOLARE
2. LA DENTINA PERICERVICALE È INSOSTITUIBILE

TAMSE 2006


Endodontic Topics 2006, 13, 84–94
All rights reserved

Vertical root fractures in endodontically treated teeth: diagnostic signs and clinical management

AVIAD TAMSE

“Predisposing factors include loss of healthy tooth substance, … which increases the risk for cracks in the body of dentin that can later propagate to fracture “

“…cutting dentin to straight lines at curvatures weakens the root structure …
In the infected root canals especially, a balance between the need to remove infected dentin and maintaining sufficient root thickness to withstand the forces of mastication should therefore be sought. “

“Special attention to securing sufficient remaining dentin should be given to the teeth and roots most susceptible to fracture, i.e., the maxillary and mandibular premolars and the mesial roots of the mandibular molars”

APPROCCIO CONSERVATIVO

Preservare la **massima** quantità di tessuto dentale durante la terapia endodontica

“Evitare” la **frattura** degli strumenti rotanti


Treatment
Plan
ANATOMY
diagnosis
knowledge
skills
Tips &tricks
Structure
Preservation
tools
longevity
new technologies
research

EXPECTING THE UNESPECTED Partnoy 2005

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.

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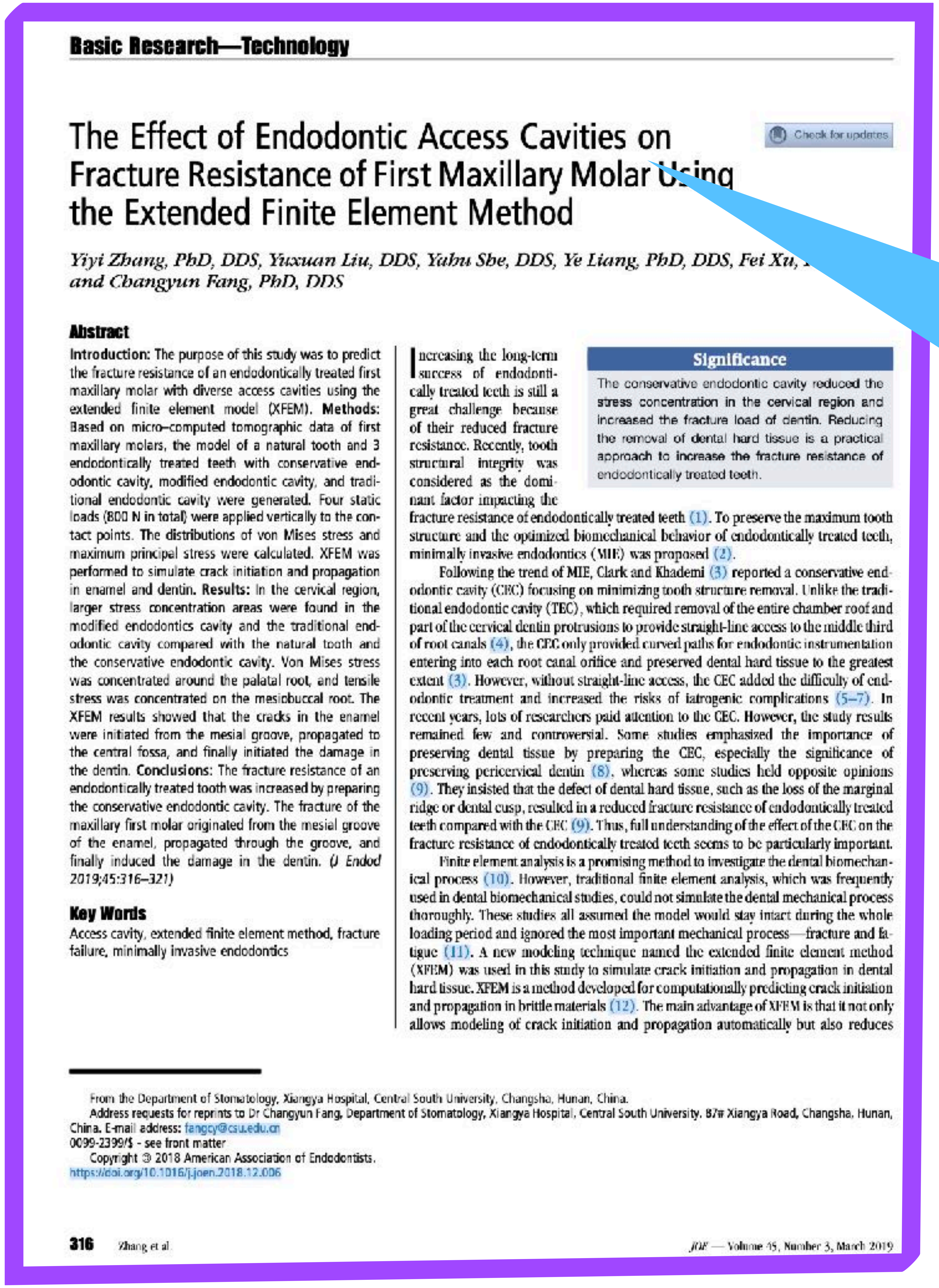
1163 roots examined:
980 (84%) curved

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



The Effect of Endodontic Access Cavities on Fracture Resistance of First Maxillary Molar Using the Extended Finite Element Method

Check for updates

Yiyi Zhang, PhD, DDS, Yuxuan Liu, DDS, Yahu She, DDS, Ye Liang, PhD, DDS, Fei Xu, and Changyun Fang, PhD, DDS

Abstract

Introduction: The purpose of this study was to predict the fracture resistance of an endodontically treated first maxillary molar with diverse access cavities using the extended finite element model (XFEM). **Methods:** Based on micro–computed tomographic data of first maxillary molars, the model of a natural tooth and 3 endodontically treated teeth with conservative endodontic cavity, modified endodontic cavity, and traditional endodontic cavity were generated. Four static loads (800 N in total) were applied vertically to the contact points. The distributions of von Mises stress and maximum principal stress were calculated. XFEM was performed to simulate crack initiation and propagation in enamel and dentin. **Results:** In the cervical region, larger stress concentration areas were found in the modified endodontics cavity and the traditional endodontic cavity compared with the natural tooth and the conservative endodontic cavity. Von Mises stress was concentrated around the palatal root, and tensile stress was concentrated on the mesiobuccal root. The XFEM results showed that the cracks in the enamel were initiated from the mesial groove, propagated to the central fossa, and finally initiated the damage in the dentin. **Conclusions:** The fracture resistance of an endodontically treated tooth was increased by preparing the conservative endodontic cavity. The fracture of the maxillary first molar originated from the mesial groove of the enamel, propagated through the groove, and finally induced the damage in the dentin. *(J Endod 2019;45:316–321)*

Key Words

Access cavity, extended finite element method, fracture failure, minimally invasive endodontics

Significance

The conservative endodontic cavity reduced the stress concentration in the cervical region and increased the fracture load of dentin. Reducing the removal of dental hard tissue is a practical approach to increase the fracture resistance of endodontically treated teeth.

Increasing the long-term success of endodontically treated teeth is still a great challenge because of their reduced fracture resistance. Recently, tooth structural integrity was considered as the dominant factor impacting the fracture resistance of endodontically treated teeth (1). To preserve the maximum tooth structure and the optimized biomechanical behavior of endodontically treated teeth, minimally invasive endodontics (MIE) was proposed (2).

Following the trend of MIE, Clark and Khademi (3) reported a conservative endodontic cavity (CEC) focusing on minimizing tooth structure removal. Unlike the traditional endodontic cavity (TEC), which required removal of the entire chamber roof and part of the cervical dentin protrusions to provide straight-line access to the middle third of root canals (4), the CEC only provided curved paths for endodontic instrumentation entering into each root canal orifice and preserved dental hard tissue to the greatest extent (3). However, without straight-line access, the CEC added the difficulty of endodontic treatment and increased the risks of iatrogenic complications (5–7). In recent years, lots of researchers paid attention to the CEC. However, the study results remained few and controversial. Some studies emphasized the importance of preserving dental tissue by preparing the CEC, especially the significance of preserving pericervical dentin (8), whereas some studies held opposite opinions (9). They insisted that the defect of dental hard tissue, such as the loss of the marginal ridge or dental cusp, resulted in a reduced fracture resistance of endodontically treated teeth compared with the CEC (9). Thus, full understanding of the effect of the CEC on the fracture resistance of endodontically treated teeth seems to be particularly important.

Finite element analysis is a promising method to investigate the dental biomechanical process (10). However, traditional finite element analysis, which was frequently used in dental biomechanical studies, could not simulate the dental mechanical process thoroughly. These studies all assumed the model would stay intact during the whole loading period and ignored the most important mechanical process—fracture and fatigue (11). A new modeling technique named the extended finite element method (XFEM) was used in this study to simulate crack initiation and propagation in dental hard tissue. XFEM is a method developed for computationally predicting crack initiation and propagation in brittle materials (12). The main advantage of XFEM is that it not only allows modeling of crack initiation and propagation automatically but also reduces

From the Department of Stomatology, Xiangya Hospital, Central South University, Changsha, Hunan, China.
Address requests for reprints to Dr Changyun Fang, Department of Stomatology, Xiangya Hospital, Central South University, 87# Xiangya Road, Changsha, Hunan, China. E-mail address: fangcy@csu.edu.cn
0099-2399/$ - see front matter

https://doi.org/10.1016/j.joen.2018.12.006

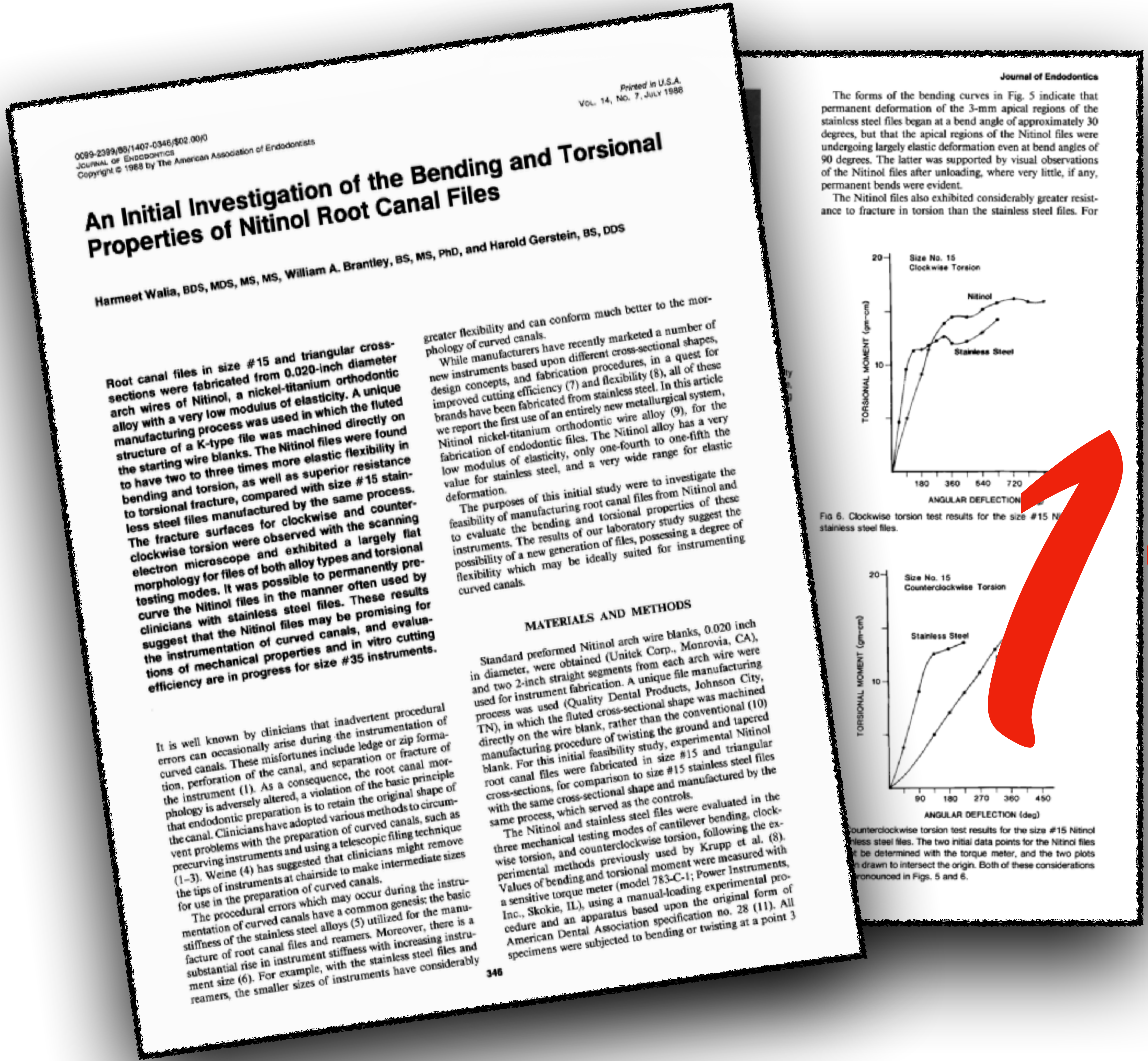
Approximately 43.52% and 34.39% additional coronal tissue was preserved by the CEC and MEC compared with the TEC. On the other hand, the CEC increased the curvature of the endodontic instrument. The CEC is a double-edged sword. It preserved dental hard tissue at the expense of increasing the curvature of the end-odontic instruments. When the angles of the root canals are large, the CEC should be reconsidered.

DAILY PRACTICE

Strumentazione Endodontica

FILE MANUALI

FILE ROTANTI



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JOURNAL OF ENDODONTICS
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Printed in U.S.A.
VOL. 14, NO. 7, JULY 1988

An Initial Investigation of the Bending and Torsional Properties of Nitinol Root Canal Files

Harmeet Walia, BDS, MDS, MS, MS, William A. Brantley, BS, MS, PhD, and Harold Gerstein, BS, DDS

Root canal files in size #15 and triangular cross-sections were fabricated from 0.020-inch diameter arch wires of Nitinol, a nickel-titanium orthodontic alloy with a very low modulus of elasticity. A unique manufacturing process was used in which the fluted structure of a K-type file was machined directly on the starting wire blanks. The Nitinol files were found to have two to three times more elastic flexibility in bending and torsion, as well as superior resistance to torsional fracture, compared with size #15 stainless steel files manufactured by the same process. The fracture surfaces for clockwise and counterclockwise torsion were observed with the scanning electron microscope and exhibited a largely flat morphology for files of both alloy types and torsional testing modes. It was possible to permanently precurve the Nitinol files in the manner often used by clinicians with stainless steel files. These results suggest that the Nitinol files may be promising for the instrumentation of curved canals, and evaluations of mechanical properties and in vitro cutting efficiency are in progress for size #35 instruments.

It is well known by clinicians that inadvertent procedural errors can occasionally arise during the instrumentation of curved canals. These misfortunes include ledge or zip formation, perforation of the canal, and separation or fracture of the instrument (1). As a consequence, the root canal morphology is adversely altered, a violation of the basic principle that endodontic preparation is to retain the original shape of the canal. Clinicians have adopted various methods to circumvent problems with the preparation of curved canals, such as precurving instruments and using a telescopic filing technique (1–3). Weine (4) has suggested that clinicians might remove the tips of instruments at chairside to make intermediate sizes for use in the preparation of curved canals.

The procedural errors which may occur during the instrumentation of curved canals have a common genesis: the basic stiffness of the stainless steel alloys (5) utilized for the manufacture of root canal files and reamers. Moreover, there is a substantial rise in instrument stiffness with increasing instrument size (6). For example, with the stainless steel files and reamers, the smaller sizes of instruments have considerably greater flexibility and can conform much better to the morphology of curved canals.

While manufacturers have recently marketed a number of new instruments based upon different cross-sectional shapes, design concepts, and fabrication procedures, in a quest for improved cutting efficiency (7) and flexibility (8), all of these brands have been fabricated from stainless steel. In this article we report the first use of an entirely new metallurgical system, Nitinol nickel-titanium orthodontic wire alloy (9), for the fabrication of endodontic files. The Nitinol alloy has a very low modulus of elasticity, only one-fourth to one-fifth the value for stainless steel, and a very wide range for elastic deformation.

The purposes of this initial study were to investigate the feasibility of manufacturing root canal files from Nitinol and to evaluate the bending and torsional properties of these instruments. The results of our laboratory study suggest the possibility of a new generation of files, possessing a degree of flexibility which may be ideally suited for instrumenting curved canals.

MATERIALS AND METHODS

Standard preformed Nitinol arch wire blanks, 0.020 inch in diameter, were obtained (Unitek Corp., Monrovia, CA), and two 2-inch straight segments from each arch wire were used for instrument fabrication. A unique file manufacturing process was used (Quality Dental Products, Johnson City, TN), in which the fluted cross-sectional shape was machined directly on the wire blank, rather than the conventional (10) manufacturing procedure of twisting the ground and tapered blank. For this initial feasibility study, experimental Nitinol root canal files were fabricated in size #15 and triangular cross-sections, for comparison to size #15 stainless steel files with the same cross-sectional shape and manufactured by the same process, which served as the controls.

The Nitinol and stainless steel files were evaluated in the three mechanical testing modes of cantilever bending, clockwise torsion, and counterclockwise torsion, following the experimental methods previously used by Krupp et al. (8). Values of bending and torsional moment were measured with a sensitive torque meter (model 783-C-1; Power Instruments, Inc., Skokie, IL), using a manual-loading experimental procedure and an apparatus based upon the original form of American Dental Association specification no. 28 (11). All specimens were subjected to bending or twisting at a point 3

346

Journal of Endodontics

The forms of the bending curves in Fig. 5 indicate that permanent deformation of the 3-mm apical regions of the stainless steel files began at a bend angle of approximately 30 degrees, but that the apical regions of the Nitinol files were undergoing largely elastic deformation even at bend angles of 90 degrees. The latter was supported by visual observations of the Nitinol files after unloading, where very little, if any, permanent bends were evident.

The Nitinol files also exhibited considerably greater resistance to fracture in torsion than the stainless steel files. For

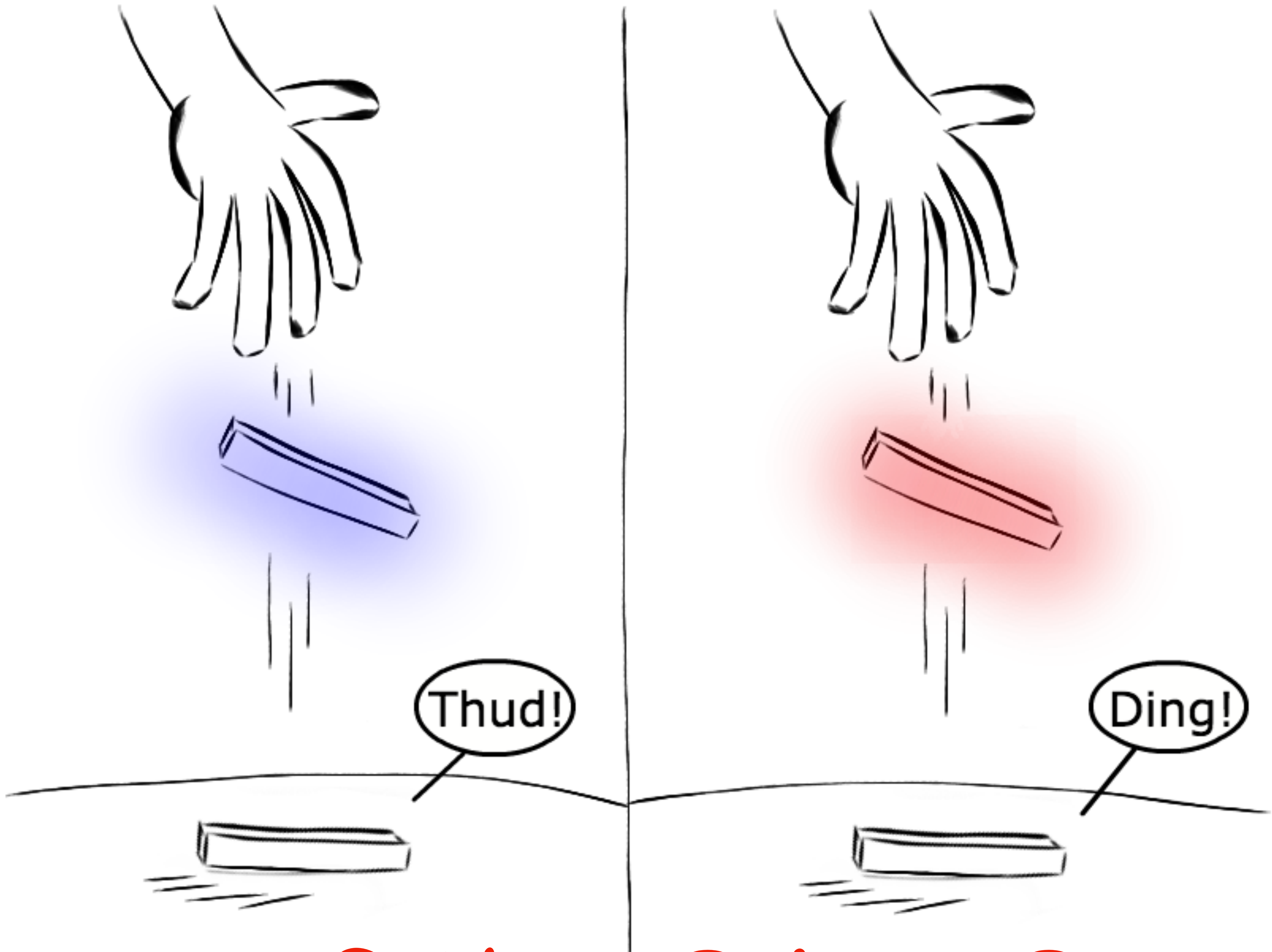
FIG 6. Clockwise torsion test results for the size #15 N... stainless steel files.

...ounterclockwise torsion test results for the size #15 Nitinol ...nless steel files. The two initial data points for the Nitinol files ...t be determined with the torque meter, and the two plots ...n drawn to intersect the origin. Both of these considerations ...ronounced in Figs. 5 and 6.

1988

WALIA et AL JOE

Nickel Titanium Naval Ordnance Laboratory

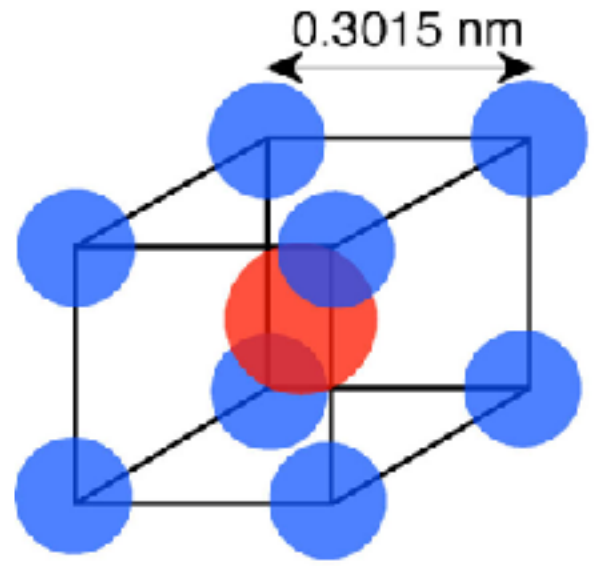


William J Buehler -1963- US Navy Polaris Project

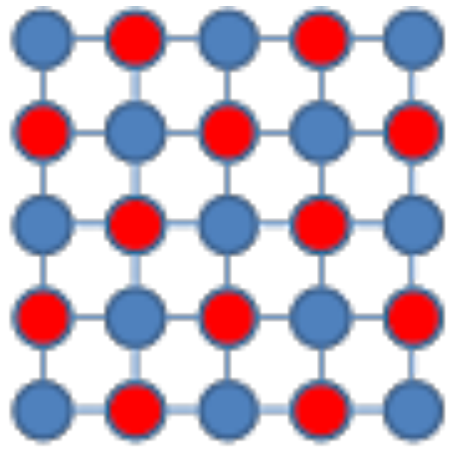
LEGA NI-TI

- Composto binario intermetallico ed equiatomico

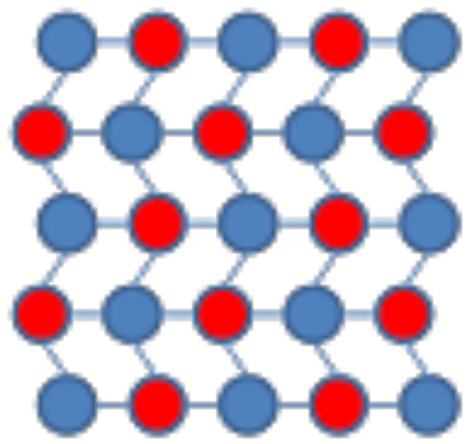
55-45



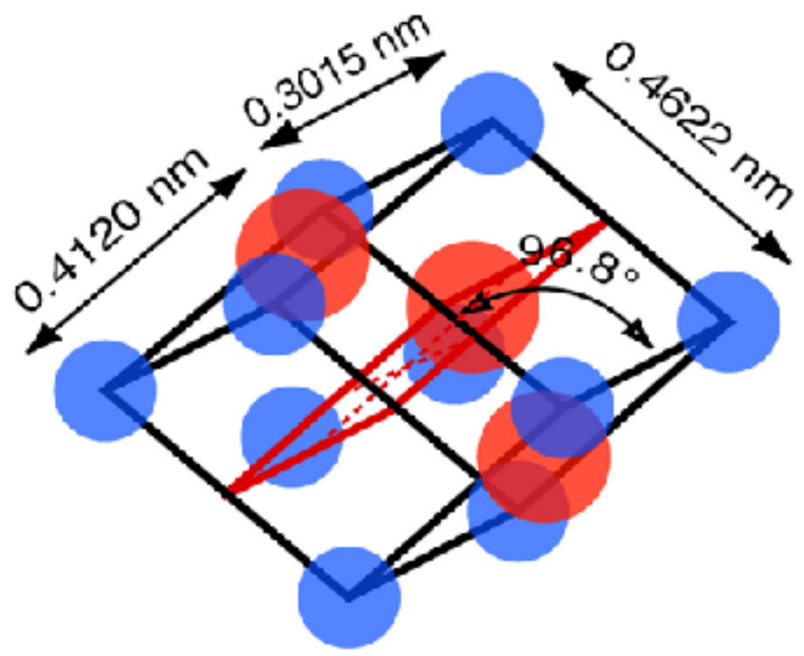
Austenite



La lega può avere due conformazioni atomiche : l'Austenite è la forma più "Rigida e Stabile "a reticolo cubico. La Martensite è la forma meno stabile e più plastica a reticolo esagonale compatto.

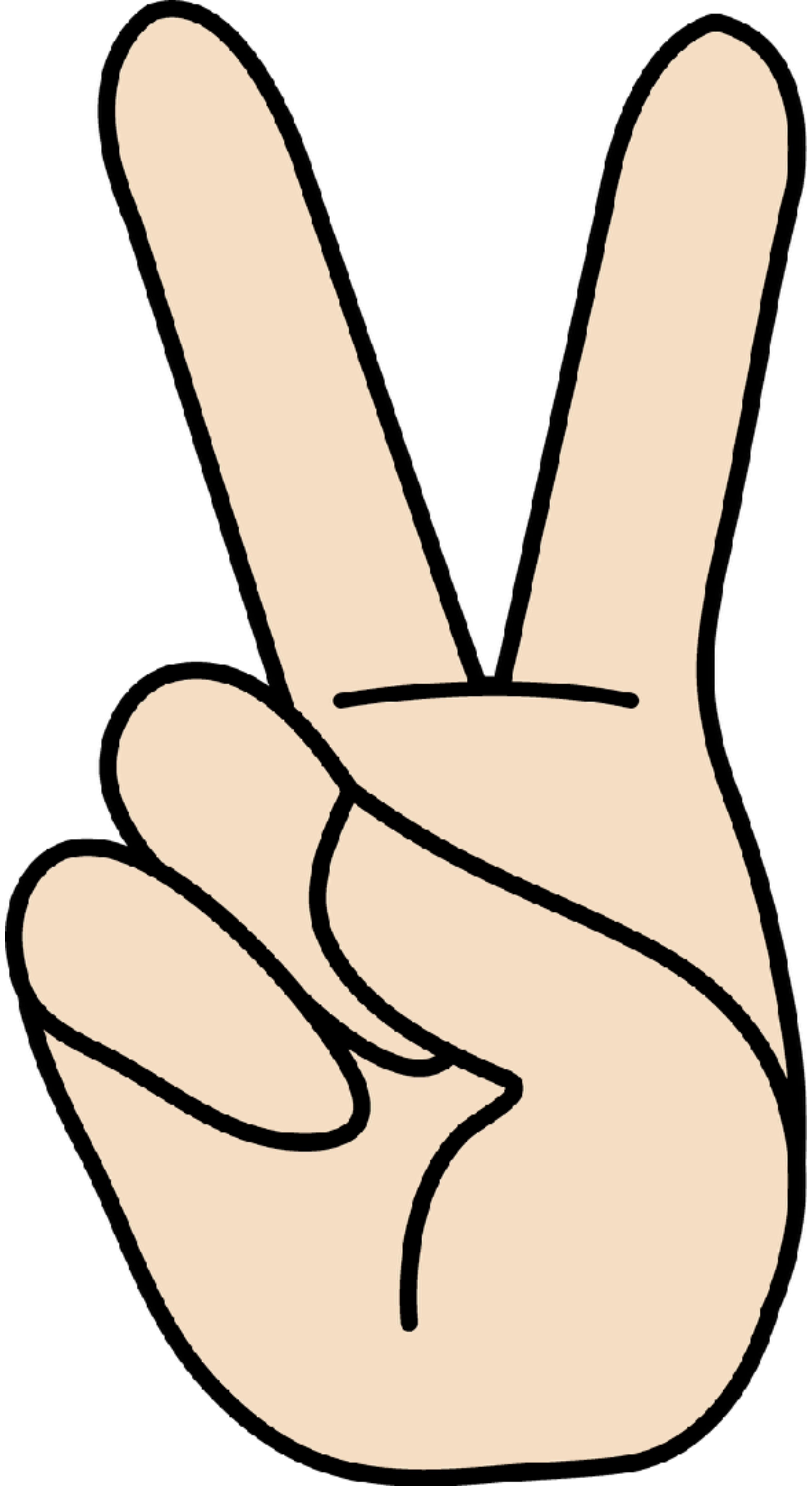


Martensite

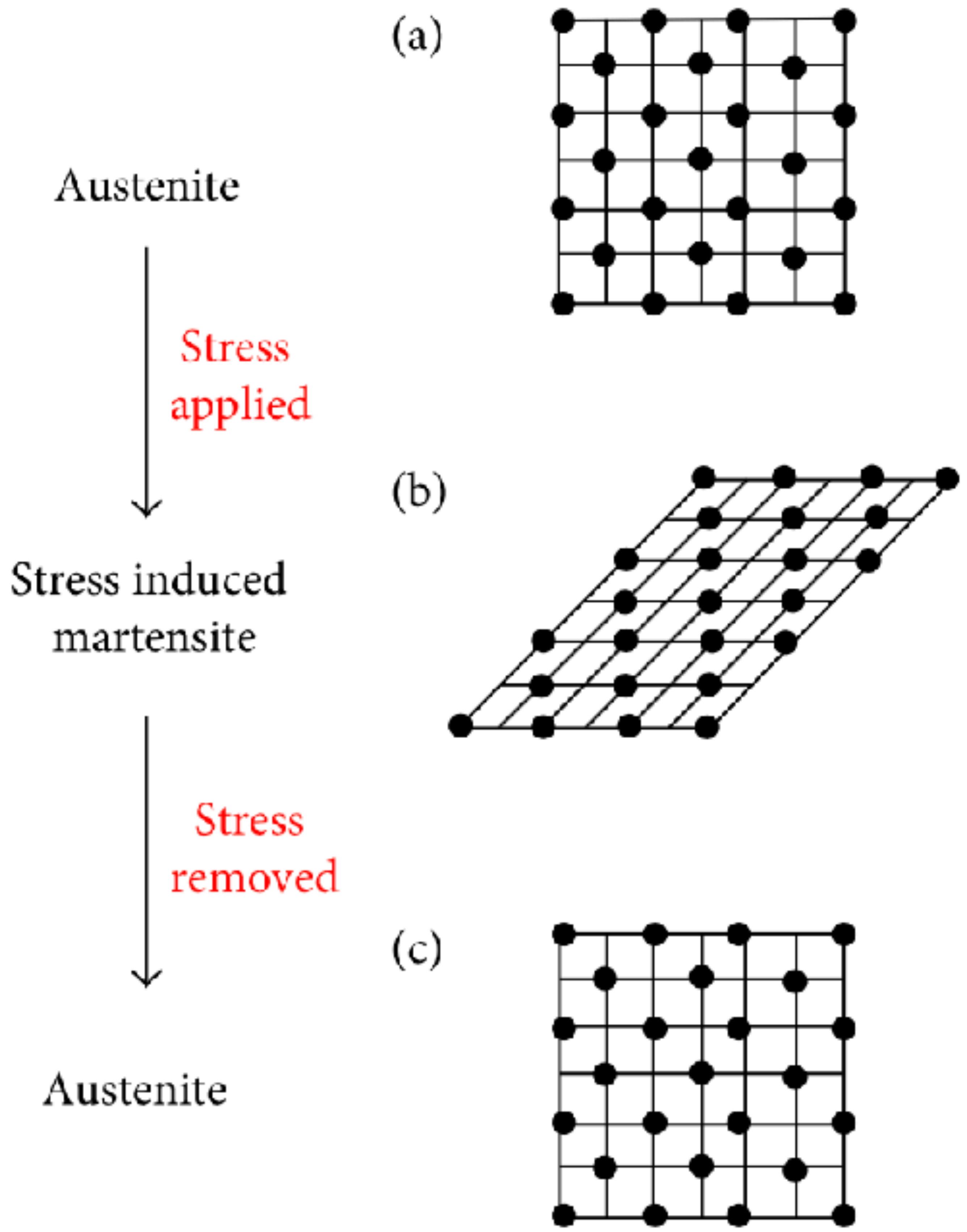


NITINOL

- Pseudoelasticità o Superelasticità
- Memoria di forma



TRANSIZIONE AUSTENITE-MARTENSITE INDOTTA DA STRESS (SIM)
TEMPERATURA >AF



SUPERELASTICITÀ' O PSEUDOELASTICITA'

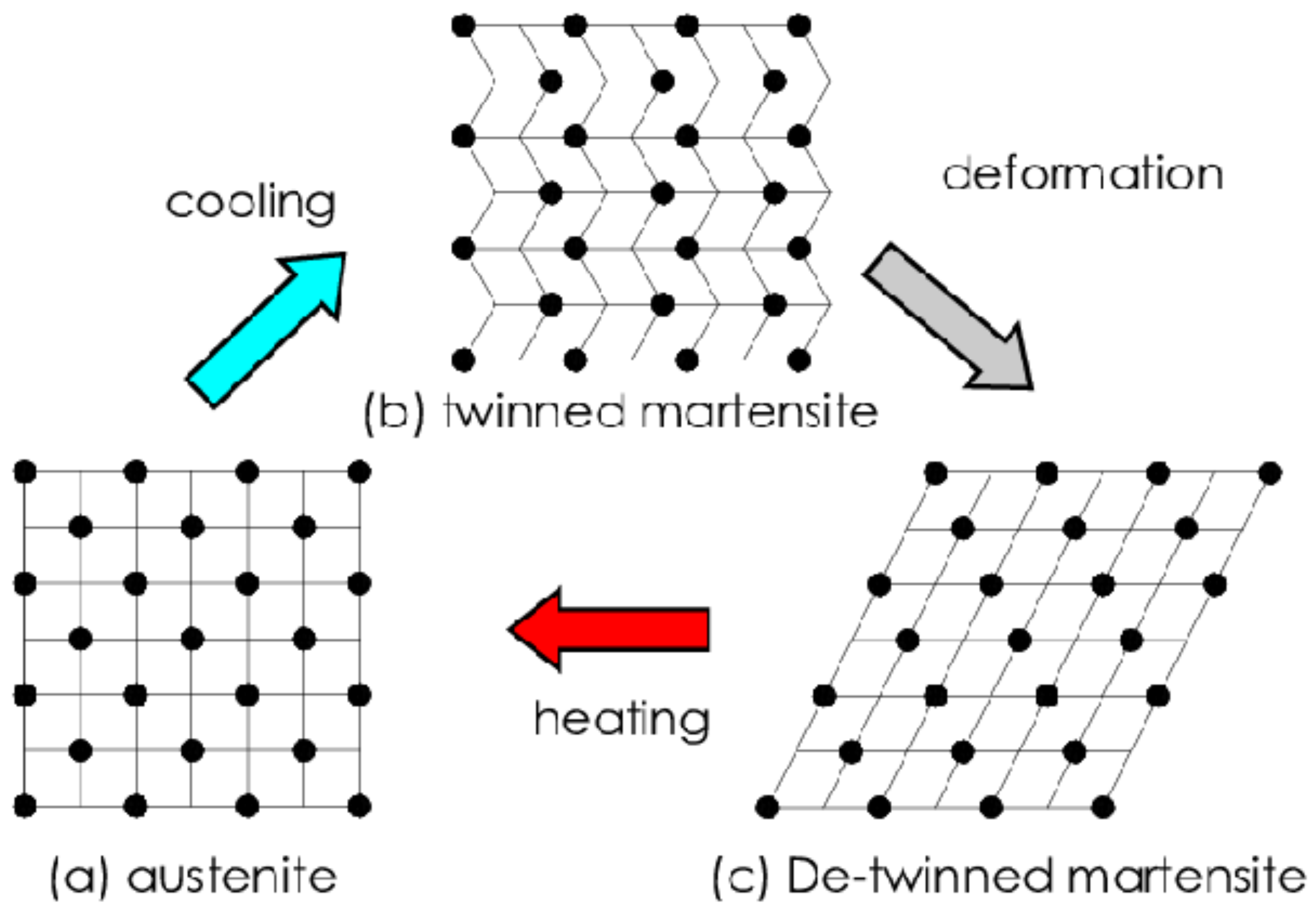
- La lega può subire ampie deformazioni reversibili in campo elastico, sotto carico costante, per un cambiamento della struttura cristallina (8%)
- La temperatura alla quale avviene la transizione è maggiore della Af (lega completamente in fase autentica)
- Il Carico determina una transizione da Austenite a martenite indotta da stress (SIM)
- Alla rimozione dello stress la martensite, instabile ad una temperatura ambientale superiore ad Af, ritorna alla fase autentica rilasciando energia con un movimento rapidissimo (restoring force/spring back)

MEMORIA DI FORMA

- Quando la lega Ni-ti vine portata a bassa temperatura, assume una configurazione di tipo martensitico
- La lega in fase martensitica ha un basso limite di snervamento, ossia è facilmente deformabile
- Con il riscaldamento, la lega riarrangia la sua struttura cristallina, ritorna in una configurazione autentica riassumendo la forma iniziale
- La temperatura alla quale la lega ricorda la sua forma primitiva può essere modificata attraverso appropriati trattamenti termici

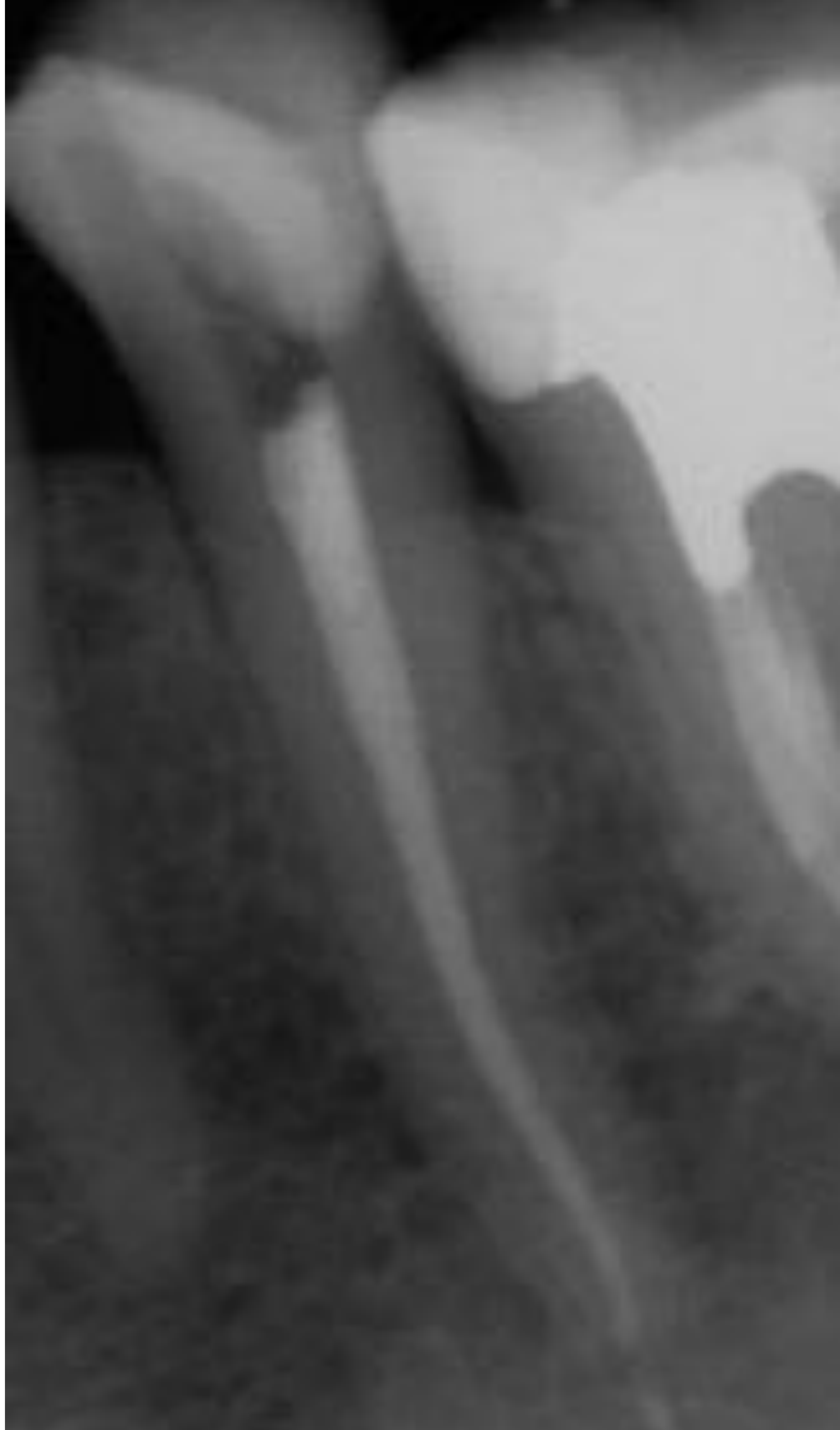
TRANSIZIONE AUSTENITE-MARTENSITE INDOTTA DALLA TEMPERATURA (TIM)

TEMPERATURA < AF



la lega austenitica sarà dura, rigida e con maggiori proprietà di esercitare la Superelasticità.

La lega martensitica d'altra parte sarà morbida, duttile e facilmente deformabile e con proprietà di *Memoria* di Forma.



NEL DENTE?

Nitinol

More Flexibile

More Resistant

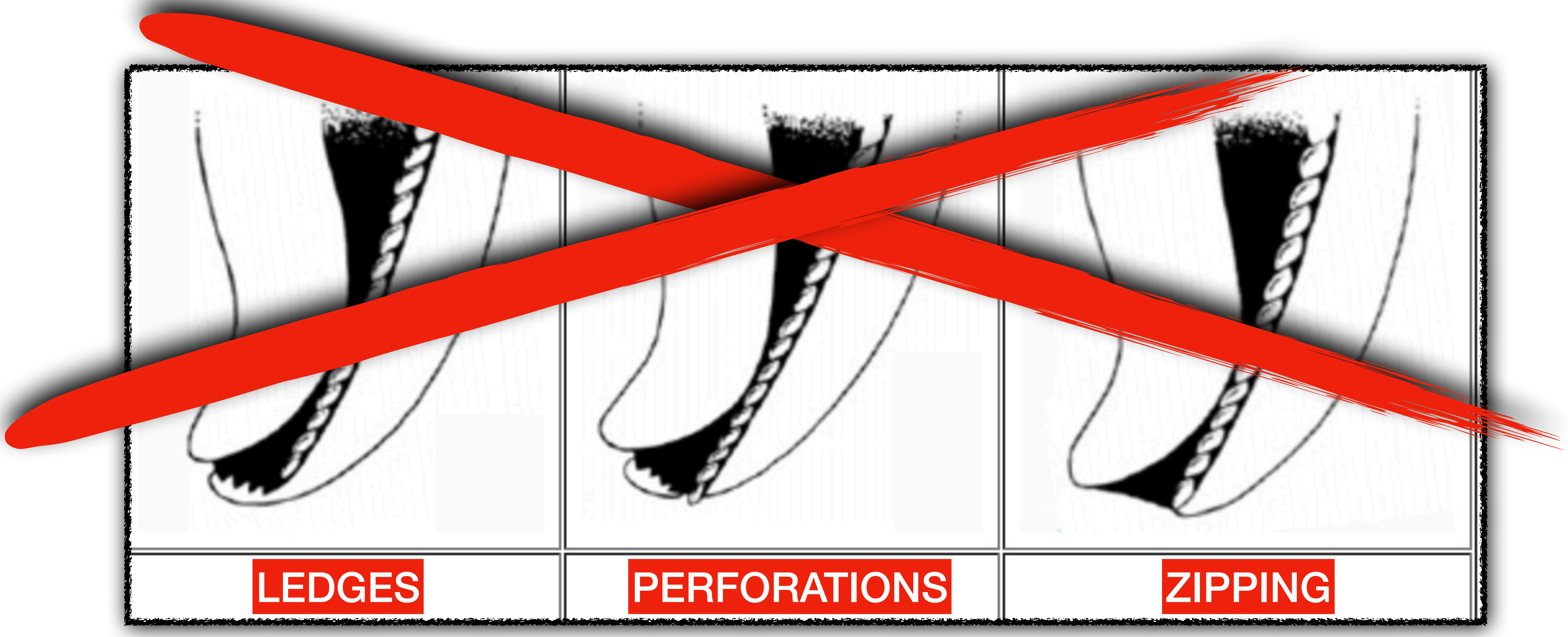
VS

Stainless Steels

NI-TI ROTARY FILE

* Preservare l'anatomia
* Rimanere centrato nel canale
* Efficienza di taglio
* Numero ridotto di passaggi / Sequenza breve
* Resistente

Less Errors Than Stainless Steel



ROTAZIONE

I FILE POSSONO FRATTURARSI

Meccanismi di frattura

Torsione ↔ Fatica ciclica

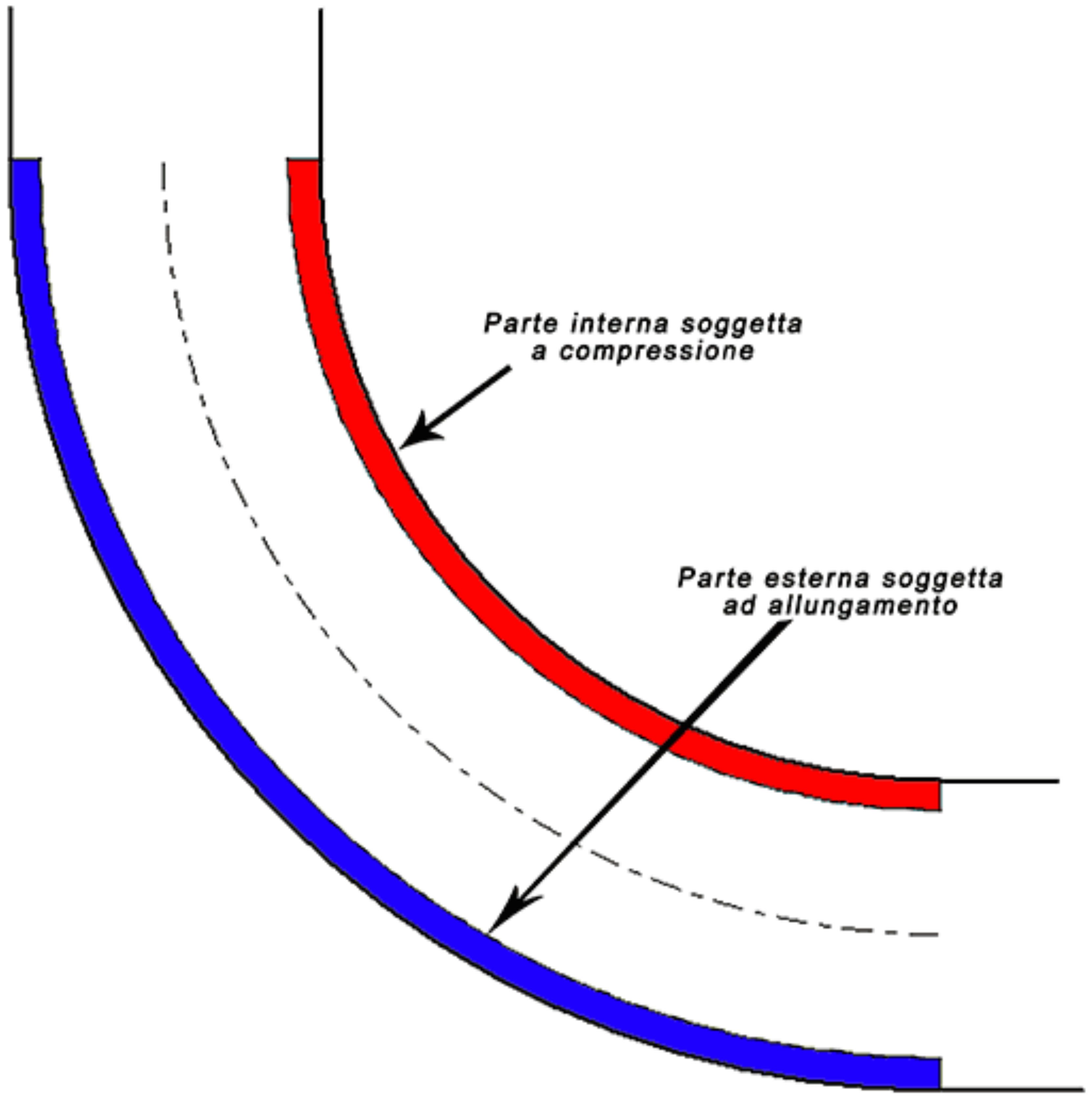
FRATTURA TORSIONALE

FRATTURA DA FATICA CICLICA

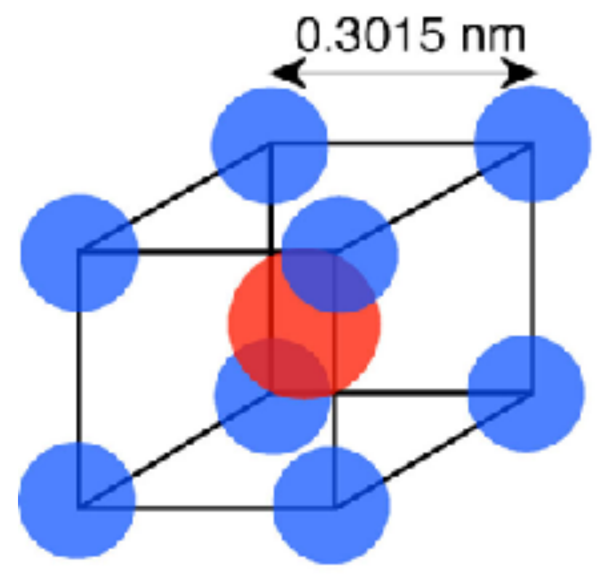
FRATTURA DA TORSIONE

- Si realizza quando una parte dello strumento rotante (solitamente la punta) si blocca e la restante parte continua a ruotare alla velocità preimpostata per azione del torque del

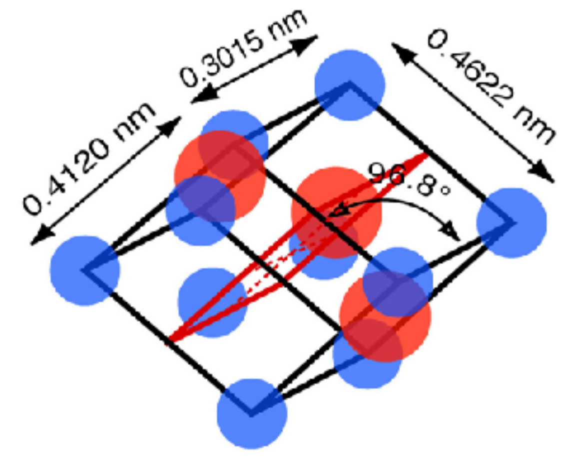
FRATTURA DA FATICA CICLICA



l'Austenite in virtù della sua maggiore rigidità avrà una maggiore resistenza allo sforzo torsionale.



La Martensite avendo una disposizione atomica con atomi orientati diversamente rispetto all'Austenite presenta una maggiore resistenza alla fatica ciclica.



FRATTURA DA FATICA CICLICA: FATTORI INFLUENZANTI

- Diametro, conicità e sezione del file
- Tipo di rotazione e Movimento dell’operatore
- Numero di utilizzi
- Disinfezione e sterilizzazione
- Anatomia Canalare

Preflaring and Apical Diameter

Preflaring of the cervical and middle thirds of the root canal improves the determination of the anatomical diameter

Influence of cervical preflaring on apical file size determination

J. D. Pecora[1], A. Capelli[1], D. M. Z. Guerisoli[1], J. C. E. Spanó[1] & C. Estrela[2]
[1]Ribeirão Preto Dental School, University of São Paulo, Ribeirão Preto, SP, Brazil; and [2]Department of Endodontics, Federal University of Goias, Goiânia, GO, Brazil

Abstract

Pecora JD, Capelli A, Guerisoli DMZ, Spanó JCE, Estrela C. Influence of cervical preflaring on apical file size determination. *International Endodontic Journal*, **38**, 430–435, 2005.

Aim To investigate the influence of cervical preflaring with different instruments (Gates-Glidden drills, Quantec Flare series instruments and LA Axxess burs) on the first file that binds at working length (WL) in maxillary central incisors.

Methodology Forty human maxillary central incisors with complete root formation were used. After standard access cavities, a size 06 K-file was inserted into each canal until the apical foramen was reached. The WL was set 1 mm short of the apical foramen. Group 1 received the initial apical instrument without previous preflaring of the cervical and middle thirds of the root canal. Group 2 had the cervical and middle portion of the root canals enlarged with Gates-Glidden drills sizes 90, 110 and 130. Group 3 had the cervical and middle thirds of the root canals enlarged with nickel-titanium Quantec Flare series instruments. Titanium-nitrite treated, stainless steel LA Axxess burs were used for preflaring the cervical and middle portions of root canals from group 4. Each canal was sized using manual K-files, starting with size 08 files with passive movements until the WL was reached. File sizes were increased until a binding sensation was felt at the WL, and the instrument size was recorded for each tooth. The apical region was then observed under a stereoscopic magnifier, images were recorded digitally and the differences between root canal and maximum file diameters were evaluated for each sample.

Results Significant differences were found between experimental groups regarding anatomical diameter at the WL and the first file to bind in the canal ($P < 0.01$, 95% confidence interval). The major discrepancy was found when no preflaring was performed (0.151 mm average). The LA Axxess burs produced the smallest differences between anatomical diameter and first file to bind (0.016 mm average). Gates-Glidden drills and Flare instruments were ranked in an intermediary position, with no statistically significant differences between them (0.093 mm average).

Conclusions The instrument binding technique for determining anatomical diameter at WL is not precise. Preflaring of the cervical and middle thirds of the root canal improved anatomical diameter determination; the instrument used for preflaring played a major role in determining the anatomical diameter at the WL. Canals preflared with LA Axxess burs created a more accurate relationship between file size and anatomical diameter.

Keywords: apical file size determination, coronal flaring, instrument type.

Received 21 May 2003; accepted 10 January 2005

Correspondence: Prof. Dr Jesus D. Pécora, Departamento de Odontologia Restauradora, Faculdade de Odontologia de Ribeirão Preto, Universidade de Sao Paulo, 14040-904, Ribeirão Preto, SP, Brazil (Tel.: +55 16 602 3982; fax: +55 16 633 0999; e-mail: pecora@forp.usp.br).

Introduction

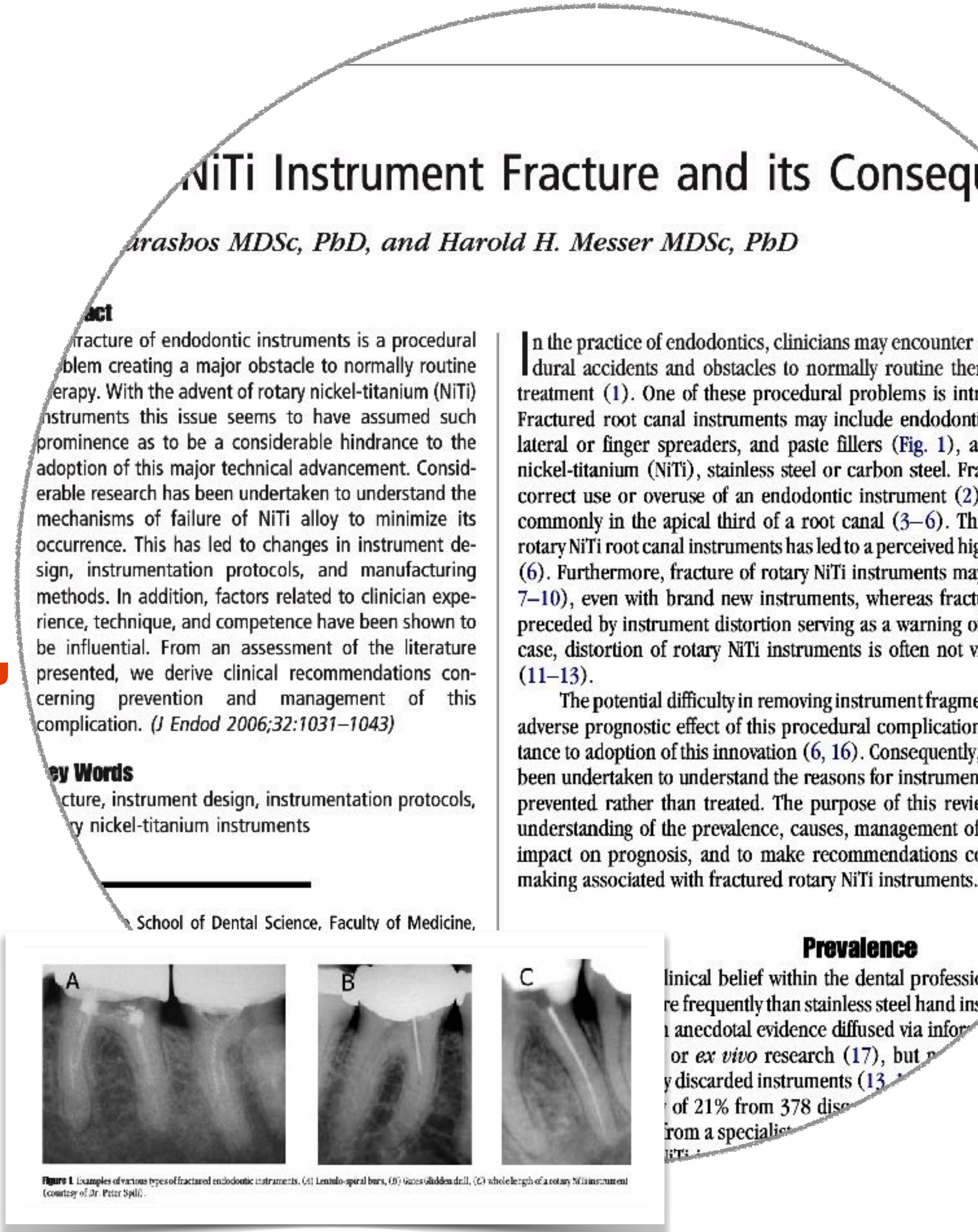
Current standards in root canal treatment are based on cleaning and shaping the root canal prior to filling (West & Roane 1998). Some authors suggest that the amount of apical enlargement to be achieved during shaping of the canal should be based on the estimation of initial apical diameter and by three file sizes greater

MOTORI ENDODONTICI

- MANTENERE LA VELOCITA’ DI ROTAZIONE COSTANTE
- GESTIONE DEL TORQUE DI AVANZAMENTO DEL FILE
- OTTENERE UN CARICO COSTANTE SUL FILE

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


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

School of Dental Science, Faculty of Medicine,

In the practice of endodontics, clinicians may encounter dural accidents and obstacles to normally routine the 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).

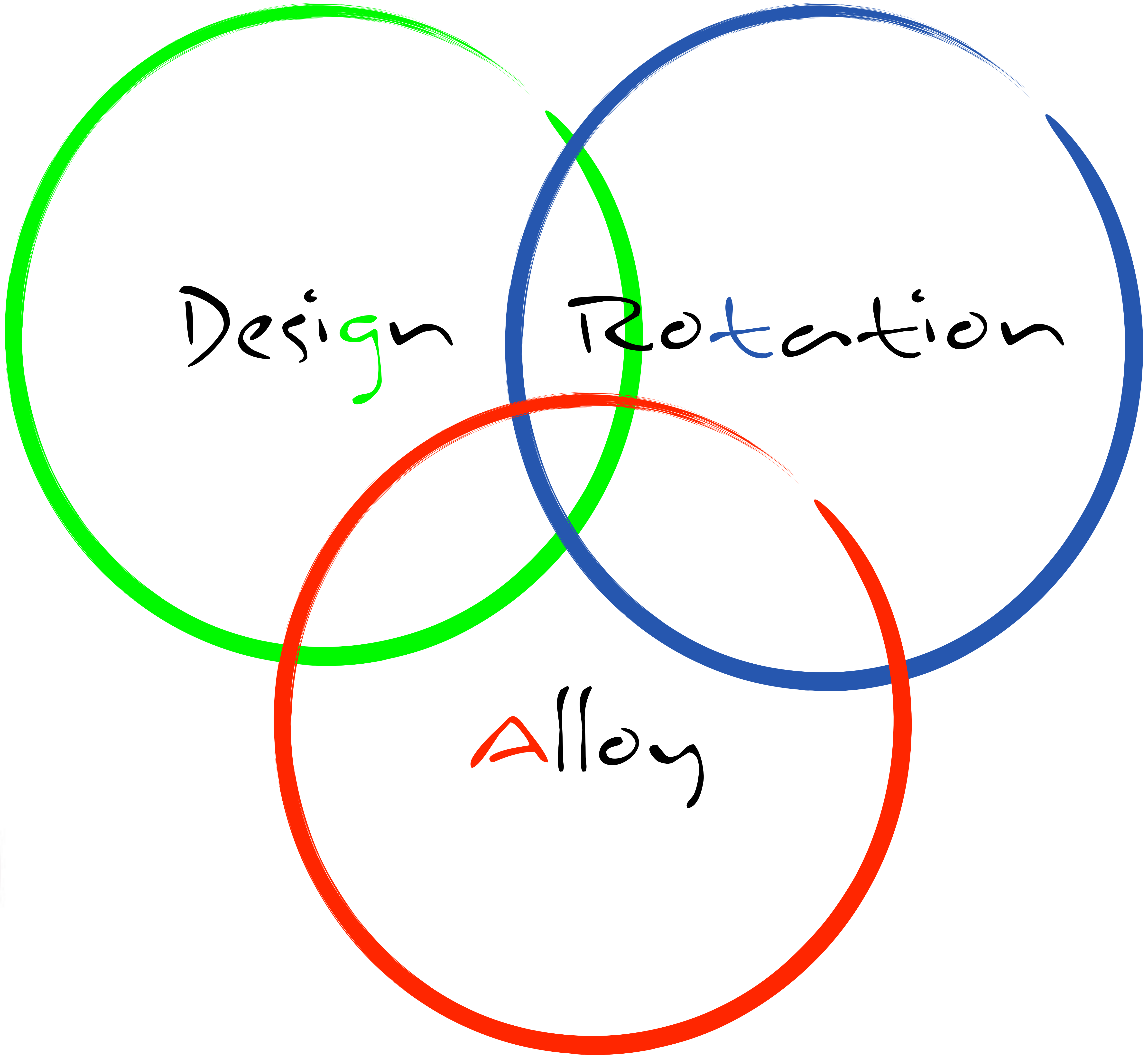
The potential difficulty in removing instrument fragme adverse prognostic effect of this procedural complication tance to adoption of this innovation (6, 16). Consequently been undertaken to understand the reasons for instrumen prevented rather than treated. The purpose of this revie understanding of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

Prevalence

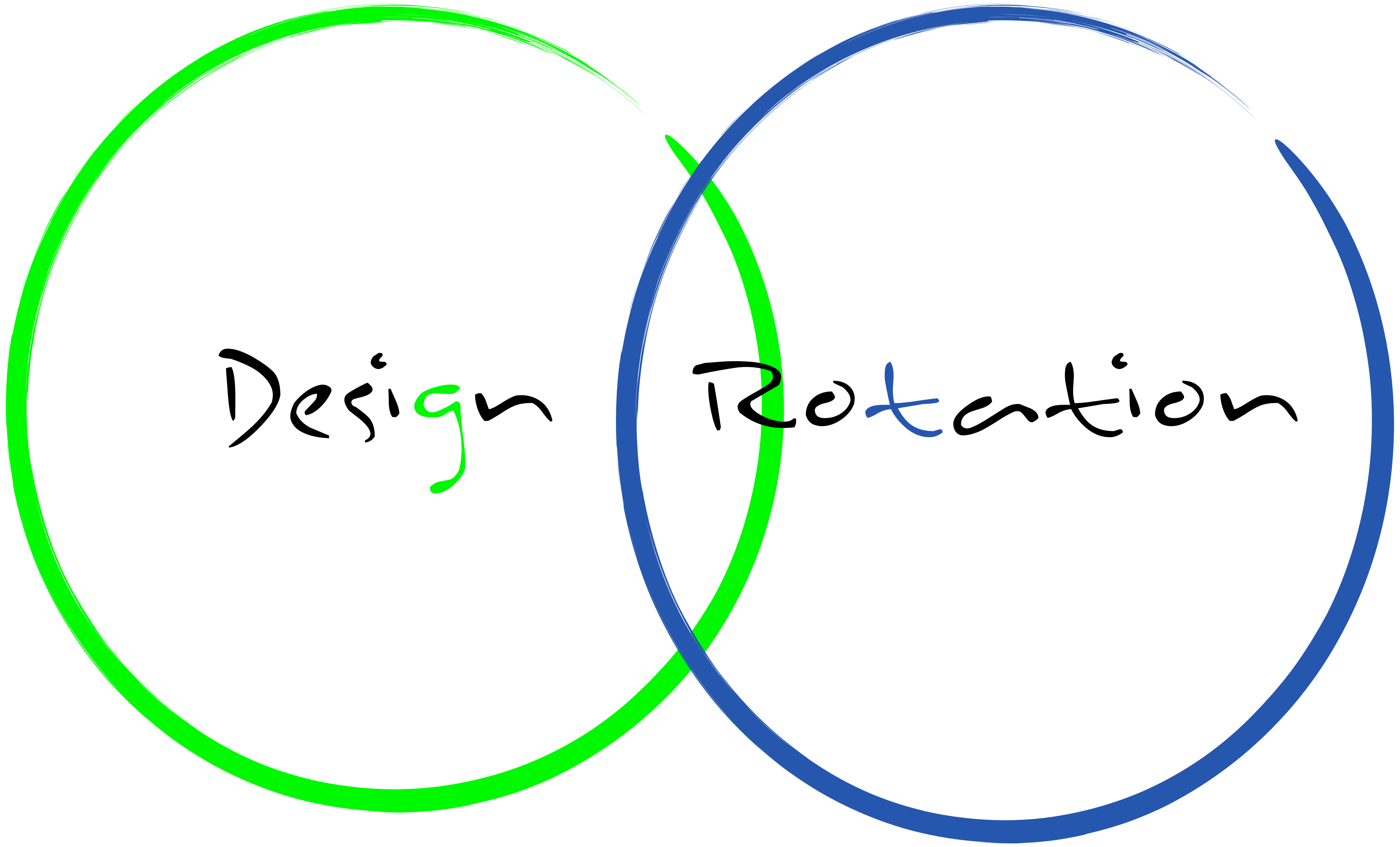
Figure 1 Examples of various types of fractured endodontic instruments. (A) Lentulo-spiral burs, (B) Gates Glidden drill, (C) whole length of a rotary NiTi instrument (courtesy of Dr. Peter Spili).

Peter Parashos and Harold H. Messer 2006

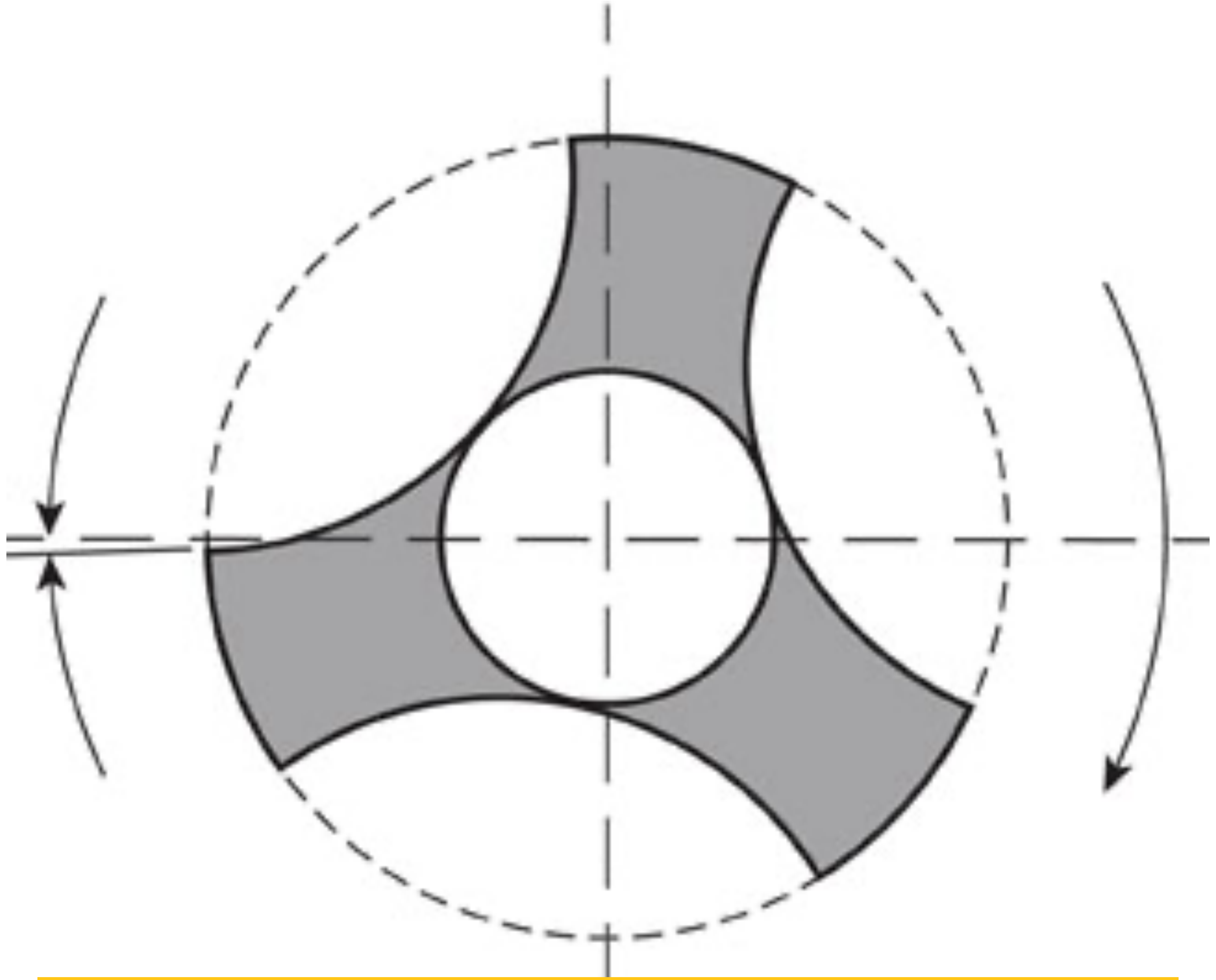
MAXIMIZE EFFICENCY & AVOID BREAKAGE



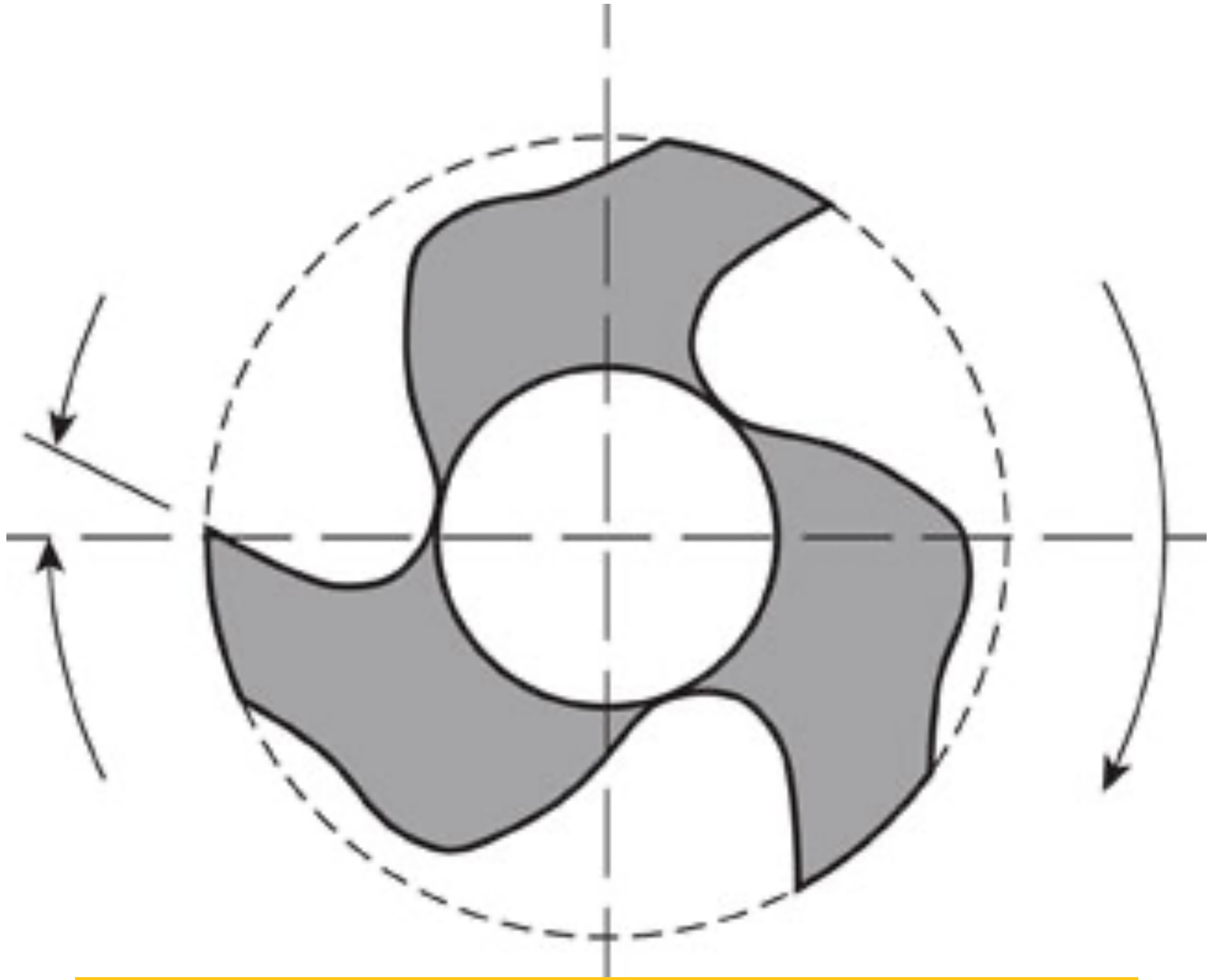
MAXIMIZE EFFICENCY & AVOID BREAKAGE



EVOLUZIONE DEL DESIGN: DISEGNO DELLE LAME

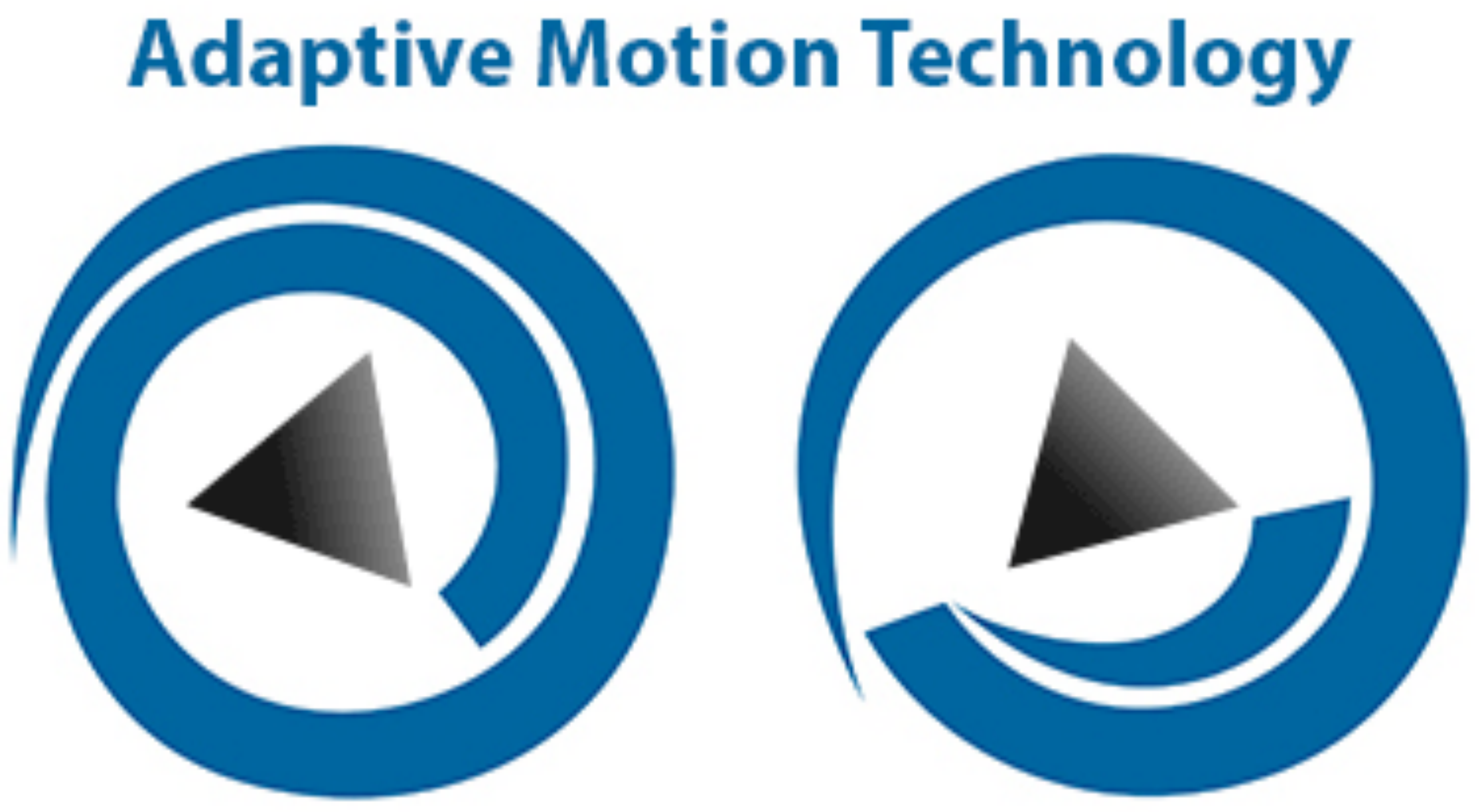


PROFILE CROSS SECTION,
NEGATIVE RAKE ANGLE



K3 FILE CROSS SECTION
POSITIVE RAKE ANGLE

EVOLUZIONE DEI MOVIMENTI- MOTORI ENDODONTICI



Rotary: 600°clockwise and 0° counterclockwise file motion when no load is applied.

Reciprocation: 370°clockwise and up to 50° counterclockwise file motion when load is applied.

2011

Changing the DNA of NI-ti

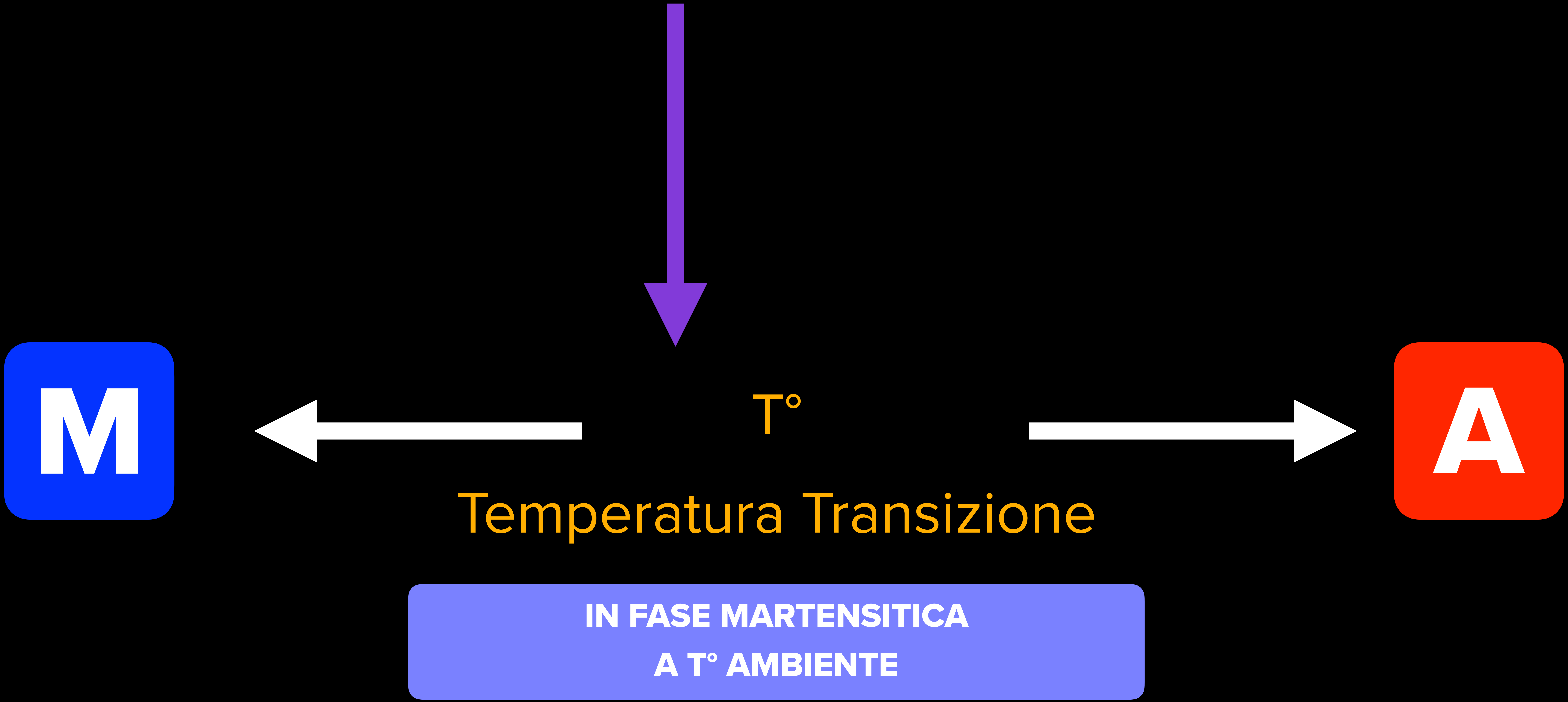
3

Alloy

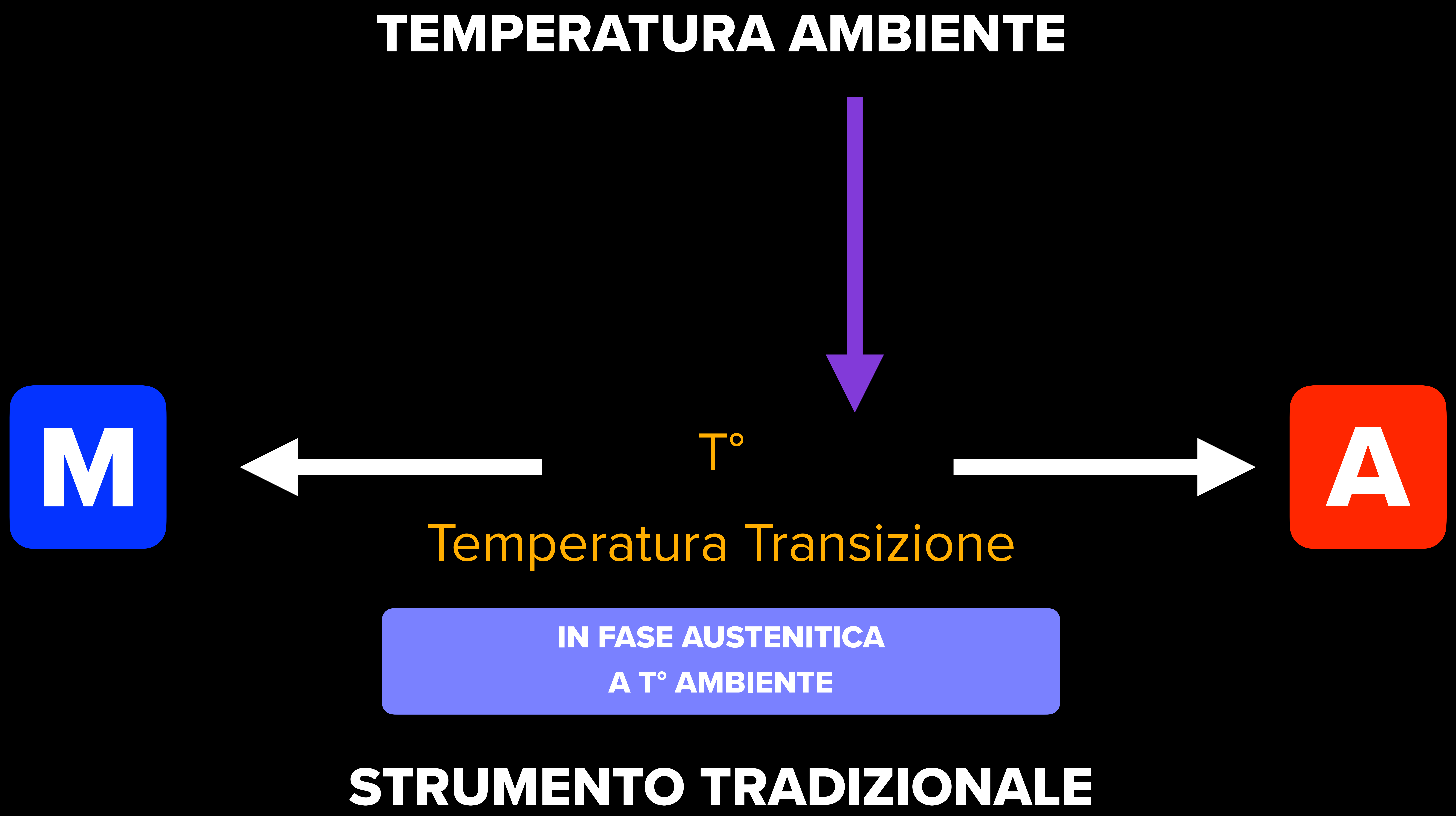
HEAT TREATMENT

- VARIAZIONE DELLA TEMPERATURA DI TRANSIZIONE FRA LE DUE FASI
- LA TEMPERATURA DI TRANSIZIONE DETERMINA LE CARATTERICTICHE DEL FILE A TEMPERATURA AMBIENTE

TEMPERATURA AMBIENTE



STRUMENTO TRATTATO TERMICAMENTE


TEMPERATURA AMBIENTE
M
T°
Temperatura Transizione
A
IN FASE AUSTENITICA
A T° AMBIENTE
STRUMENTO TRADIZIONALE

DENTAL OFFICE

I FILE TRATTATI TERMICAMENTE A T° AMBIENTE SONO IN FASE MARTENSITICA

Niti Trattato termicamente

- Ridotto ritorno elastico (restoring force)
- Memoria di forma attivata dal calore
- Fase Martensitica stabile a t°ambiente

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 differen[...] NiTi raw materials and their impact on instrumen[...] performance because many new instruments are intr[...] duced on a regular basis. **Results:** This review summ[...] rizes the metallurgical properties of next-genera[...] NiTi instruments, the impact of thermomecha[...] treatment on instrument flexibility, and the resis[...] to cyclic fatigue and torsion. **Conclusions:** Th[...] of this review was to provide clinicians with the[...] edge necessary for evidence-based practice[...] mizing the benefits from the selection and ap[...] of NiTi rotary instruments for root canal t[...] (J Endod 2013;39:163–172)

Key Words: Controlled ... nickel-titan...

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. 2A–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 NEYY 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 = 315, 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*).

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2013

YA SHEN et AL JOE

2011

YA SHEN et AL

TABLE 1. The Number of Revolutions to Fracture (N_f), the Maximum Surface Strain Amplitude (ϵ_a), and the Dimple Area/Total Cross-section Area on the Fractured Instrument (%) for Each Brand at the Curvature of 35° and 45° in Dry Condition

	45°			35°		
Size 25/.04	N_f	ϵ_a	Dimple area (%)	N_f	ϵ_a	Dimple area (%)
ProFile	486 ± 163	8.3 ± 1.2	71 ± 6	640 ± 180	6.2 ± 0.4	67 ± 8
TYP	376 ± 124	8.4 ± 0.5	75 ± 1	645 ± 231	6.0 ± 0.9	72 ± 5
TYP CM	1340 ± 160	4.2 ± 1.1	43 ± 17	2422 ± 1806	3.9 ± 0.7	28 ± 6
NEYY	329 ± 92	6.4 ± 0.3	79 ± 3	1213 ± 430	3.6 ± 0.6	71 ± 4
NEYY CM	2629 ± 125	3.4 ± 0.7	43 ± 9	3491 ± 1,782	2.2 ± 0.9	39 ± 6

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

Endodontic Heat Treated Ni-Ti Rotary Files

- Reduced Elastic memory
- Shape Memory Heat Activated

Endodontic Heat Treated Ni-Ti Rotary Files

Cyclic Fatigue

Torsional Stress

250-300

500-800

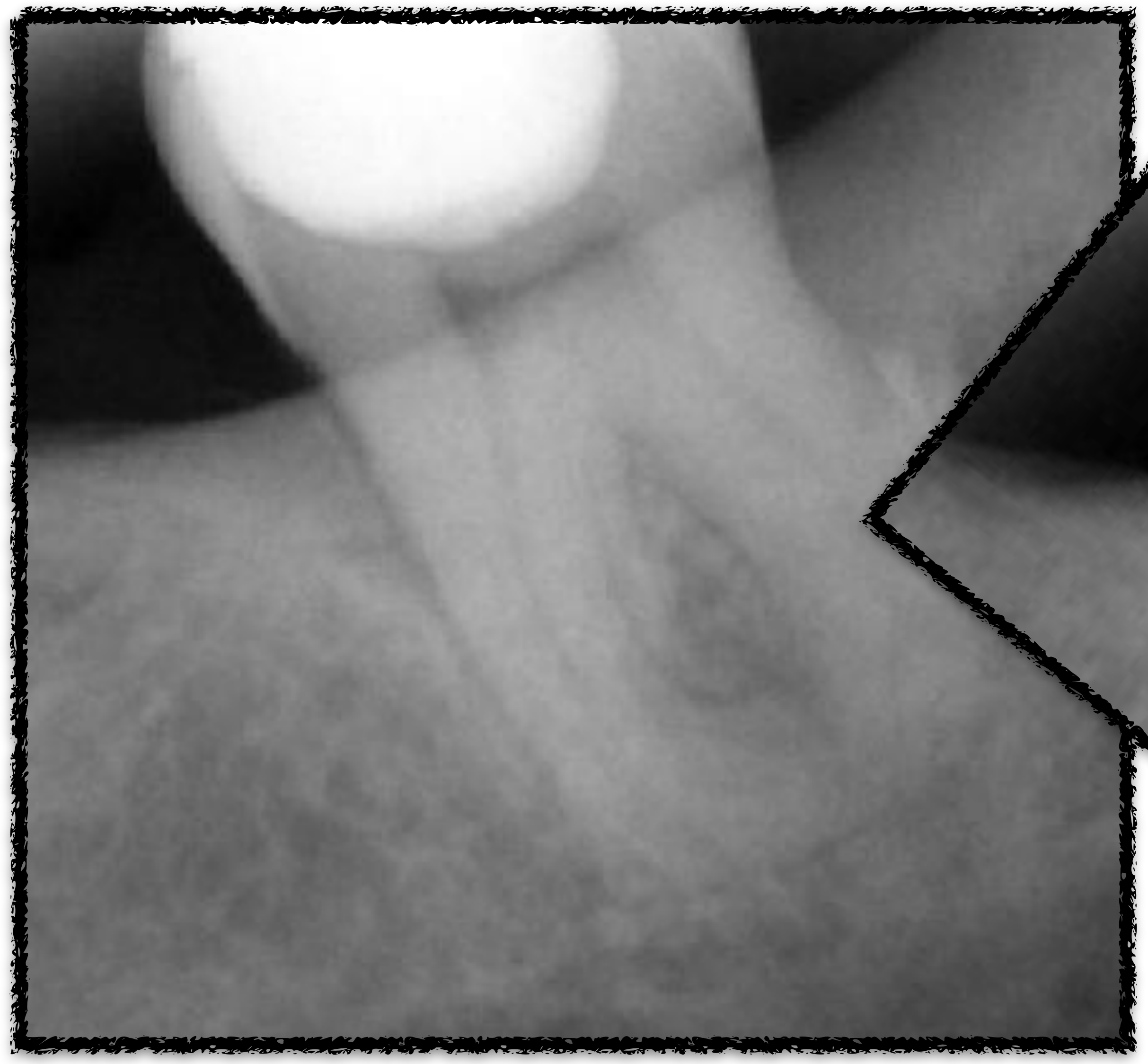
TORQUE
FORCE

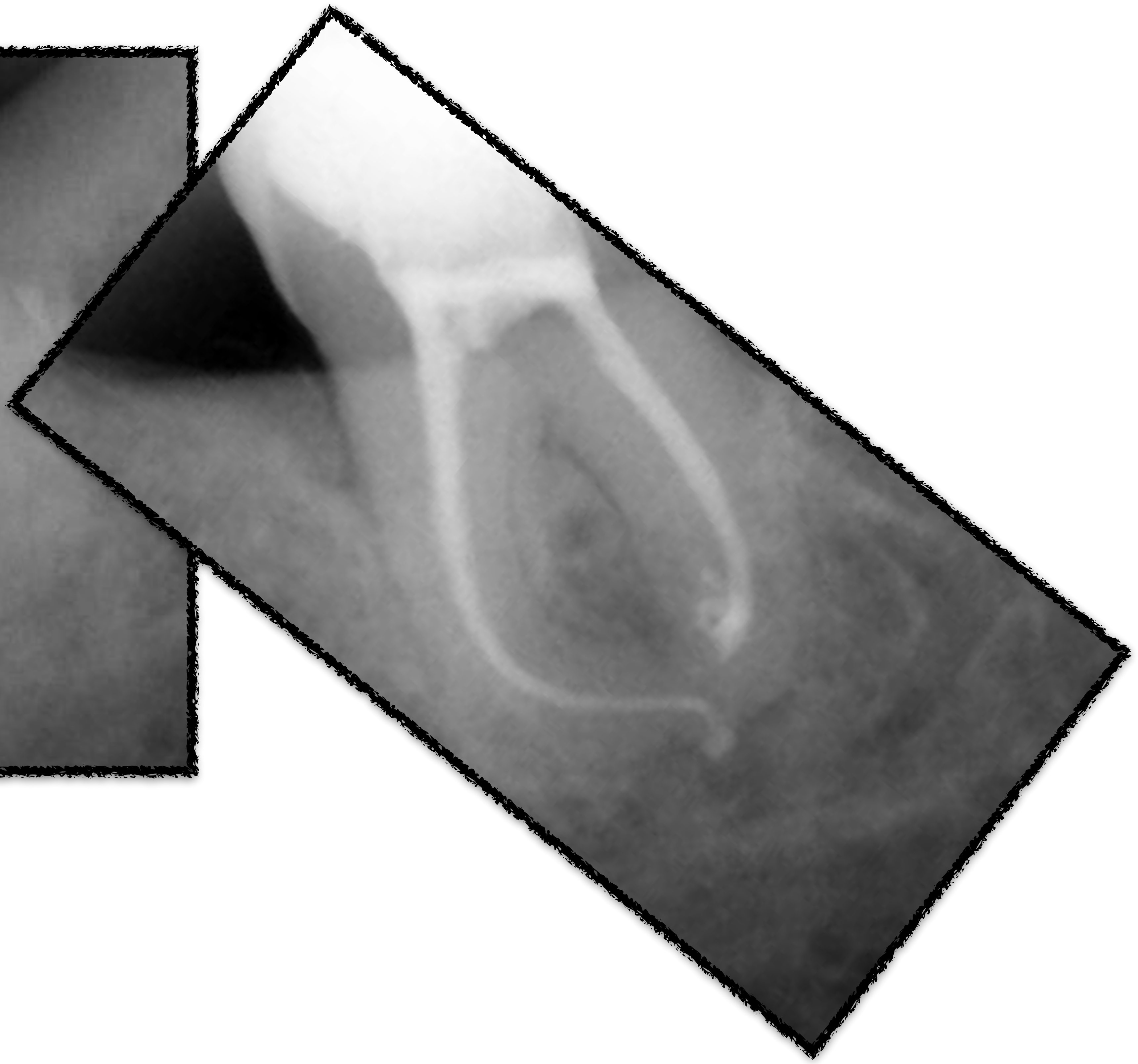
Low

1,5-2,5 N/cm

Niti Trattato termicamente

- Ridotto ritorno elastico (restoring force)
- Memoria di forma attivata dal calore
- Maggiore resistenza alla fatica ciclica





Niti Trattato termicamente

- Apertura piu' conservativa
- Risparmio dentina pericervicale

LA PRESERVAZIONE DELLA DENTINA PERICERVICALE DURANTE UN TRATTAMENTO ENDODONTICO RIDUCE IL RISCHIO DI CFR RIDUCENDO LA TRASMISSIONE DEL CARICO OCCLUSALE ALLE RADICI

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

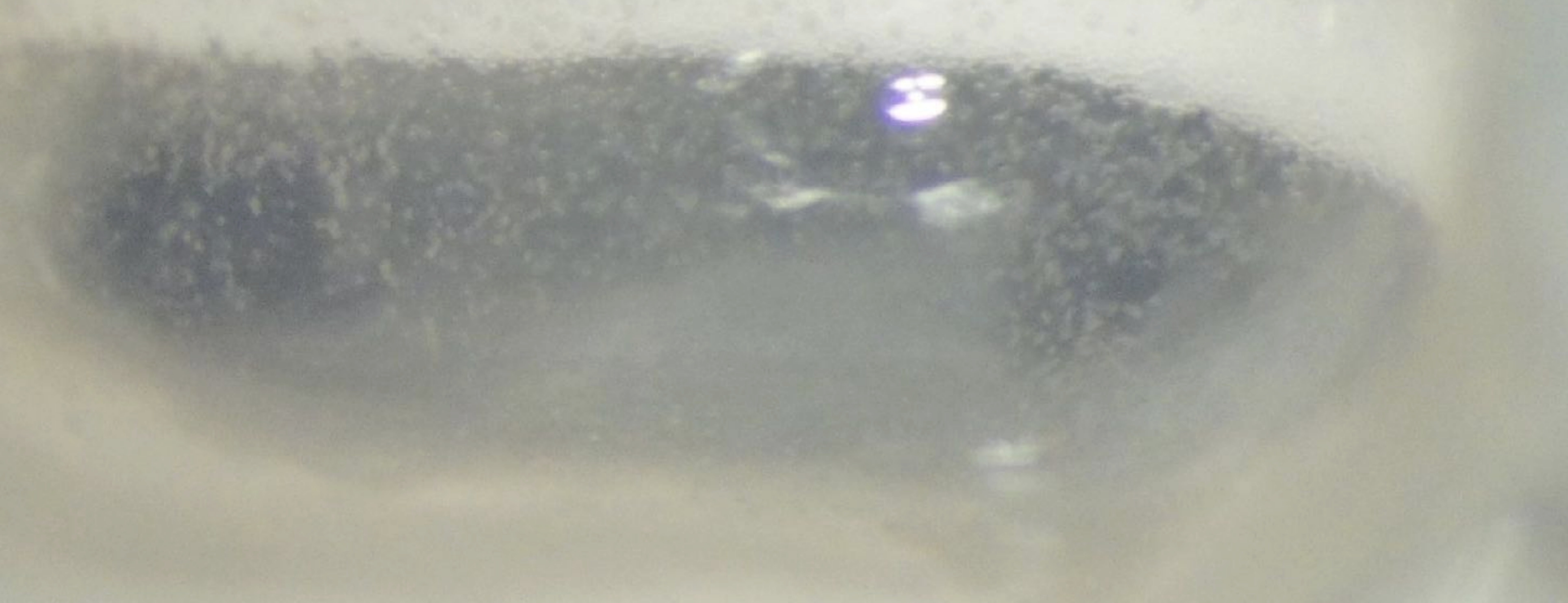
OBIETTIVI MECCANICI

* Conicità continua da corona ad apice
* Preservare le curvature del canale
* Preservare il diametro apicale

OBBIETTIVI BIOLOGICI

- Rimuovere la polpa malata
- Ridurre la carica batterica

Disinfection Protocol to Reduce the bacterial Load Beneath A Subcritical threshold



Siqueira et AL. Braz Dent Journ. 2007

Sinergia tra gli Irriganti canalari

Ipoclorito di sodio

EDTA

Clorexidina

Diametro di preparazione

La minima strumentazione necessaria per la penetrazione degli irriganti nel terzo apicale è #30 - 35.

Minimal apical preparation ... Srikanth P et al — *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

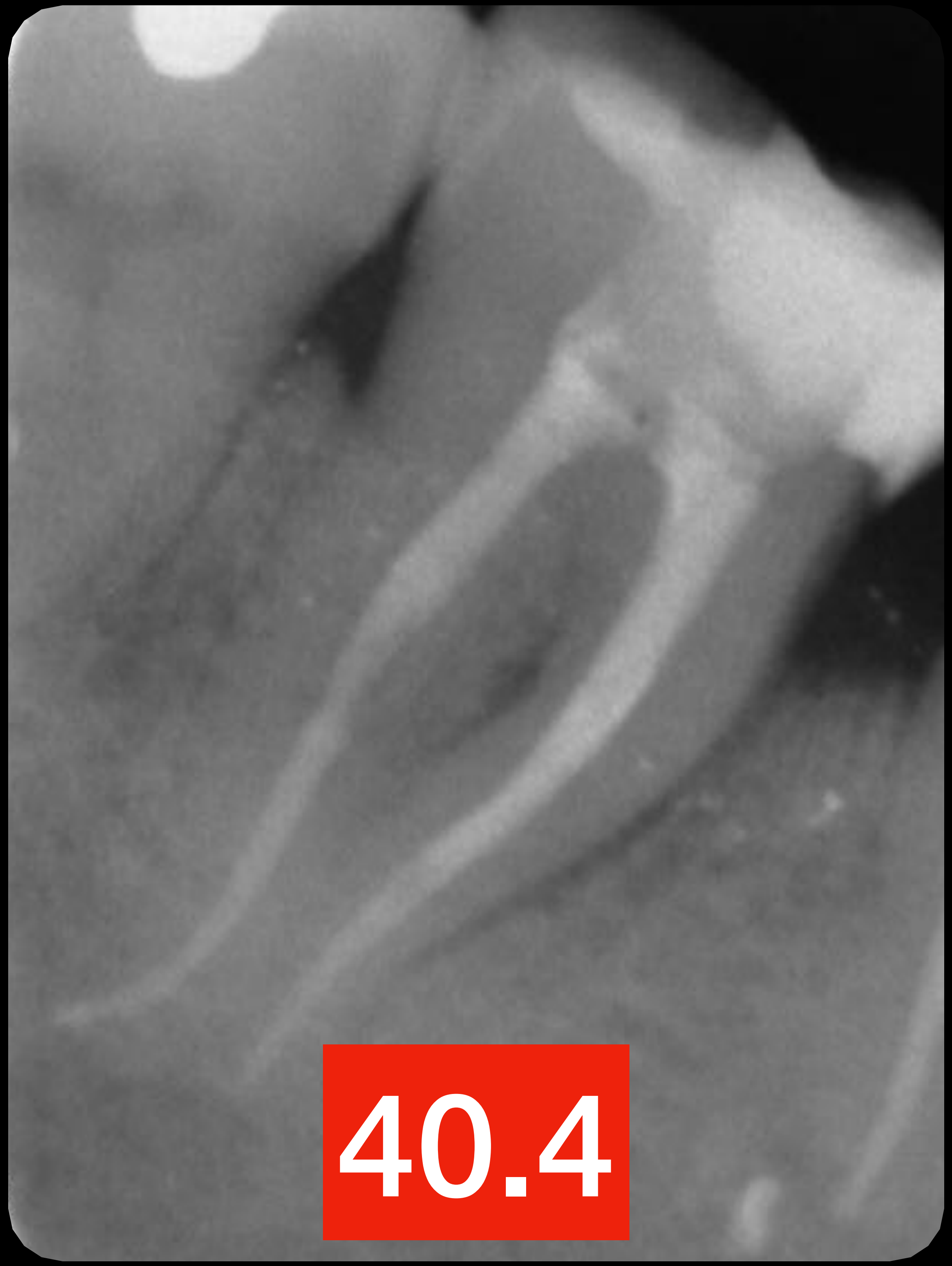
Smaller Apical Preparation in Higly Curved Canals are Safer...

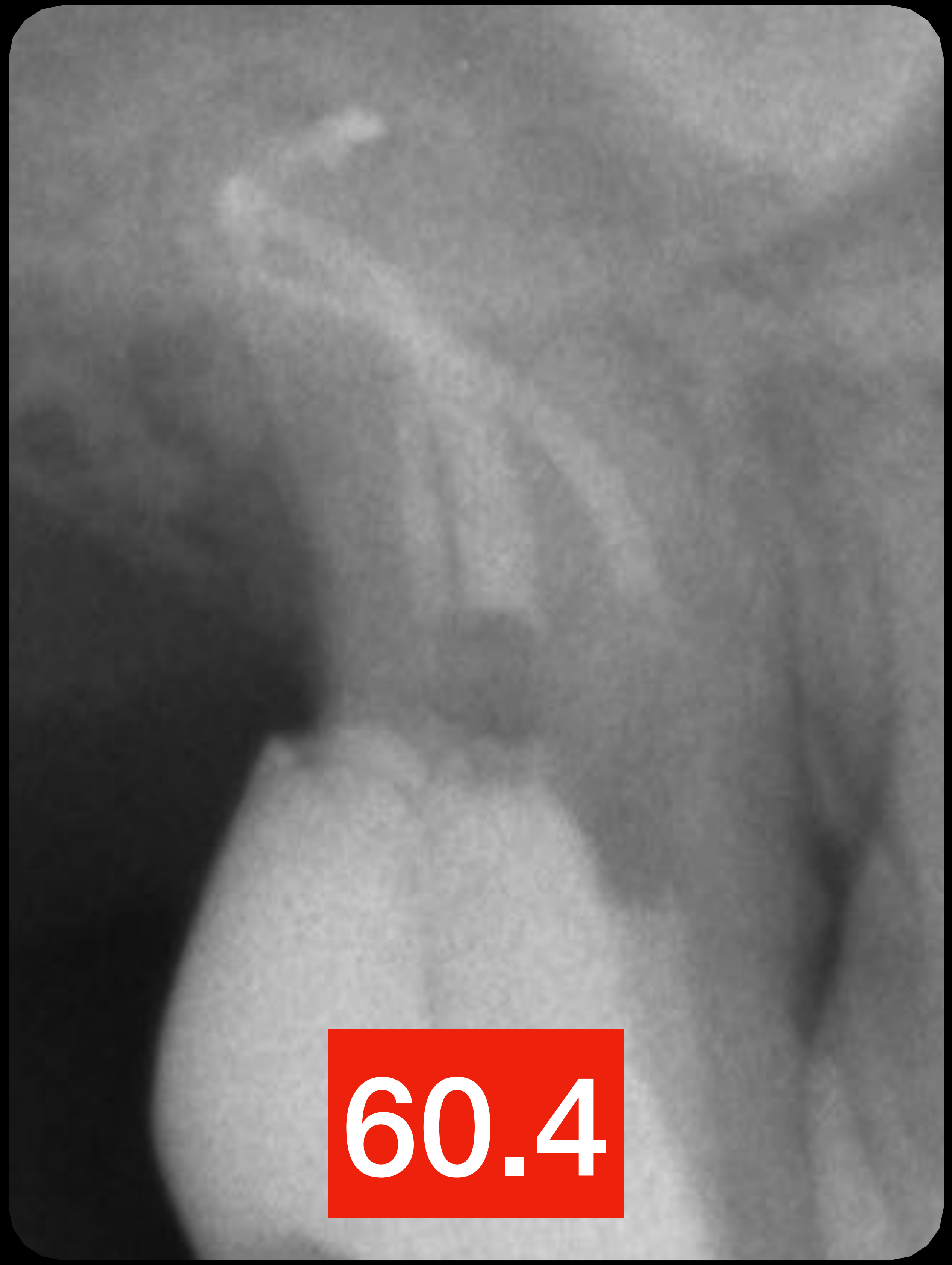
Increased Difficulty to Deliver Irrigant Solution

Boutsioukis et Al 2010


PROBLEM
SOLVING

Increasing diameter





Decreasing taper

OBBIETTIVI BIOLOGICI

* Rimuovere la polpa malata
* Ridurre la carica batterica


MOST OF the NEW FILES
IN THE MARKET
ARE HEAT TREATED

ALCUNE SISTEMATICHE NI-TI

INTERNATIONAL ENDODONTIC JOURNAL
The official journal of the British Endodontic Society and the European Society of Endodontology

REVIEW | Open Access

Present status and future directions: Canal shaping

Ana Arias, Ove A. Peters

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Generations of nickel-titanium instruments for canal preparation

There are currently more than 250 brands of instrument systems marketed for root canal preparation.

How can WE make the CHOICE?

Adapting The Anatomy
to the File/Sequence ?

Or

Adapting The FileSequence
to the Anatomy ?

Make our ENDO Unique

Dentist Point Of View

- X-Ray Evaluation
- Tactile Feedback
- Shaping Objectives
- Biological Objectives

NI-TI ROTARY FILES: TIPS AND TRICKS

- 2-3 Movimenti con leggera pressione apicale, senza forzare
- Movimenti di spazzolamento in uscita (brushing)
- Pulizia dello strumento dopo ogni fase di utilizzo
- Irrigazione, pervietà col K-10, Irrigazione dopo ogni utilizzo di uno strumento rotante.
- In caso di non progressione dello strumento, cambiare strategia di strumentazione, strumento, o sequenza.

NI-TI ROTARY FILES: TIPS AND TRICKS

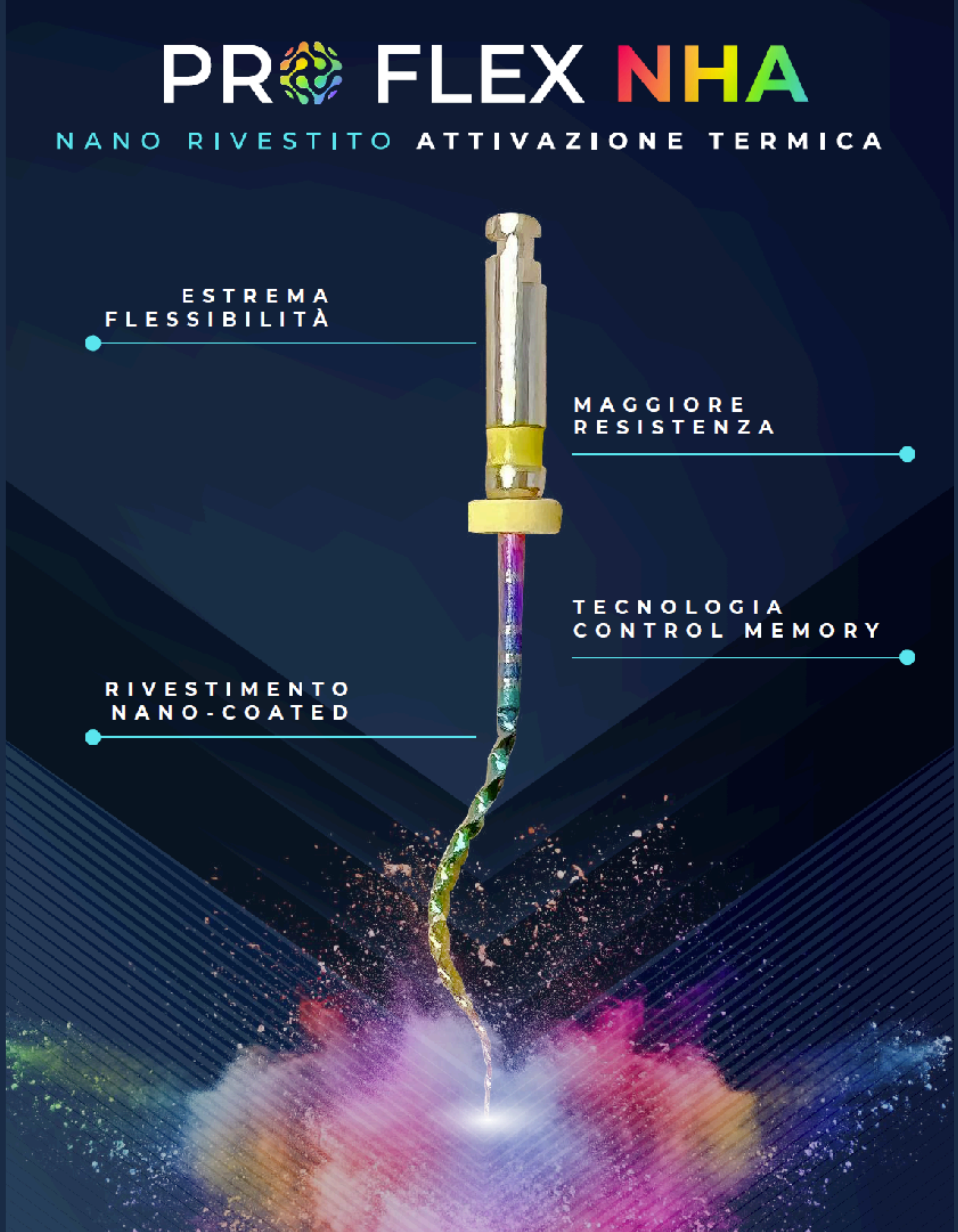
CANALI CALCIFICATI

- 1° scelta Austenite.
- 2° manuali e martensite. I manuali (preflaring e glidepath) preparano la stada ai rotanti allargando e riducendo lo stress torsionale

CANALI CURVI

- 1° scelta Martensite.
- 2° Austenitici di piccolo diametro e conicità per aumentare la flessibilità del file + rifinitura manuale con Reamers

SISTEMATICHE NI-TI ROTANTI

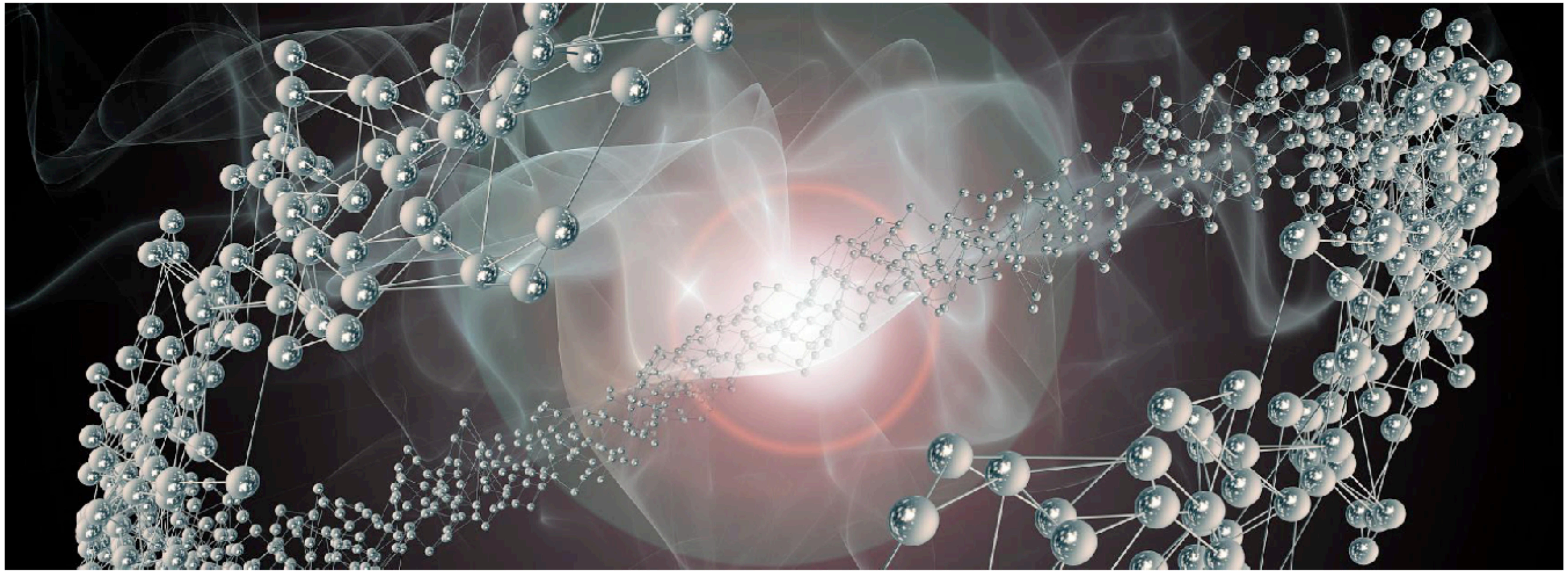

PRO FLEX NHA
NANO RIVESTITO ATTIVAZIONE TERMICA
ESTREMA FLESSIBILITÀ
MAGGIORE RESISTENZA
TECNOLOGIA CONTROL MEMORY
RIVESTIMENTO NANO-COATED


NEW ENTRY!!!


NEW ENTRY!!!


NEW ENTRY!!!

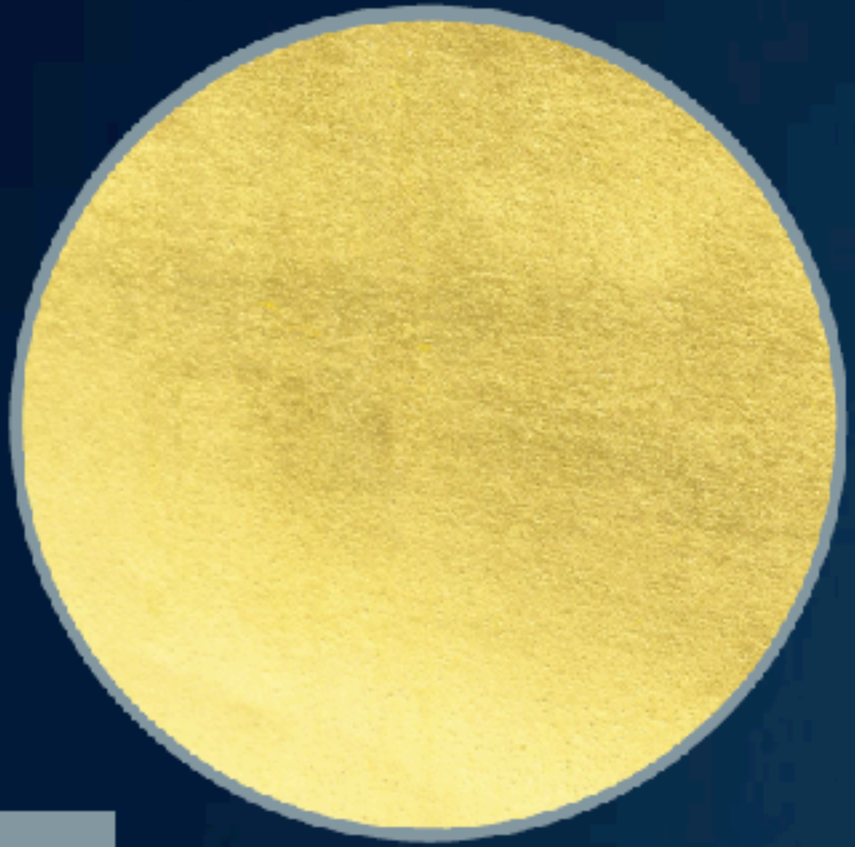
Cos'è il nano-rivestimento

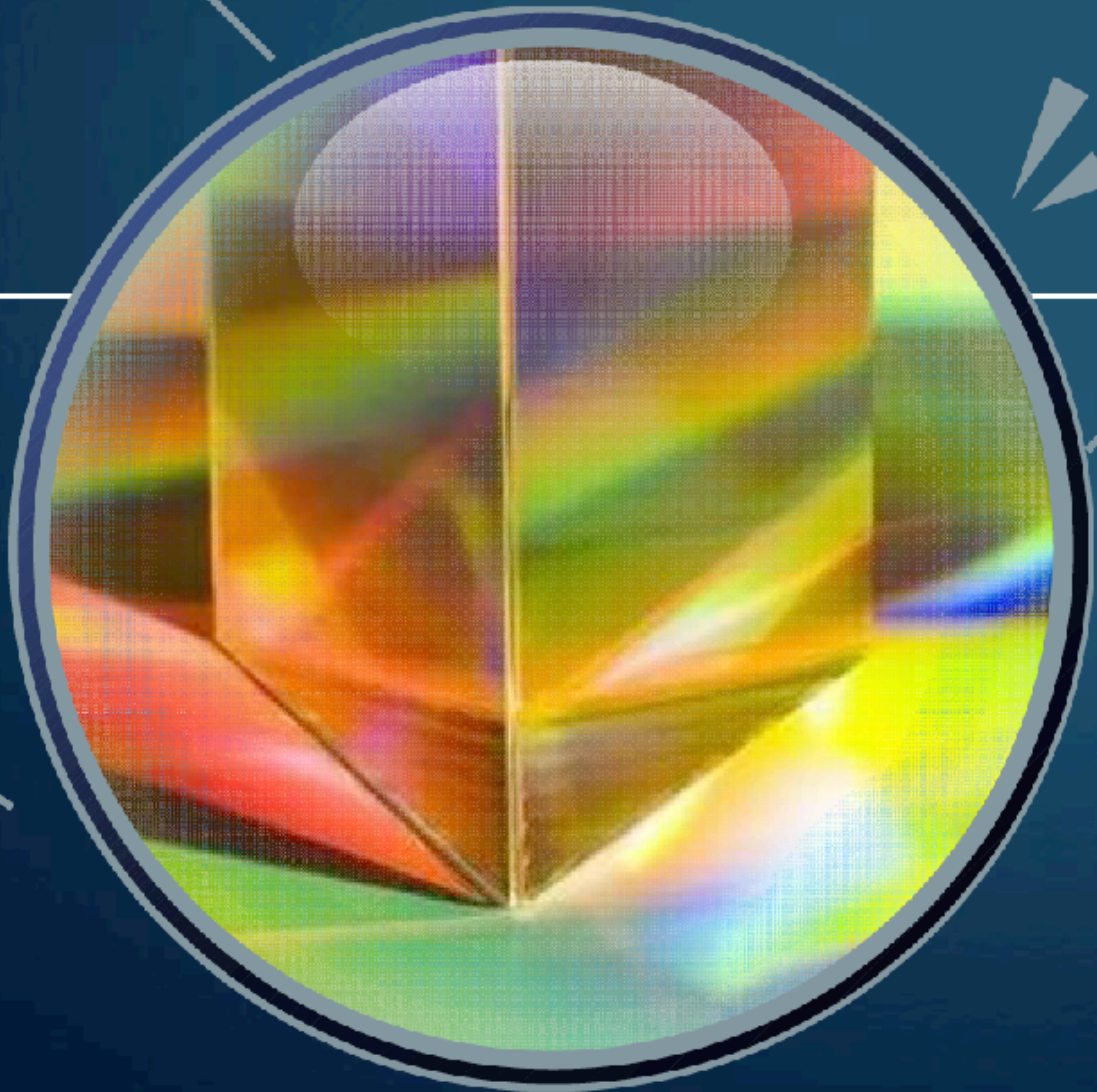


I nano-rivestimenti (noti anche come nano-film) hanno funzioni uniche in termini di proprietà ottiche, elettriche, termiche e meccaniche.

Caratteristiche del nano-rivestimento

Materiale metallico





Materiale ceramico

Nitruro di titanio

Il nitruro di titanio (TiN) (talvolta noto come "Tinite" o "TiNite" o "TiN") è un materiale ceramico estremamente duro, spesso utilizzato come rivestimento su leghe di titanio, acciaio, carburo e componenti in alluminio per migliorare le proprietà superficiali del substrato. Applicato come rivestimento sottile, il TiN viene utilizzato per indurire e proteggere le superfici di taglio e di scorrimento, per scopi decorativi (grazie al suo aspetto dorato) e come rivestimento non tossico per gli impianti medici. Nella maggior parte delle applicazioni, viene applicato un rivestimento inferiore a 5 micrometri (0,00020 in).

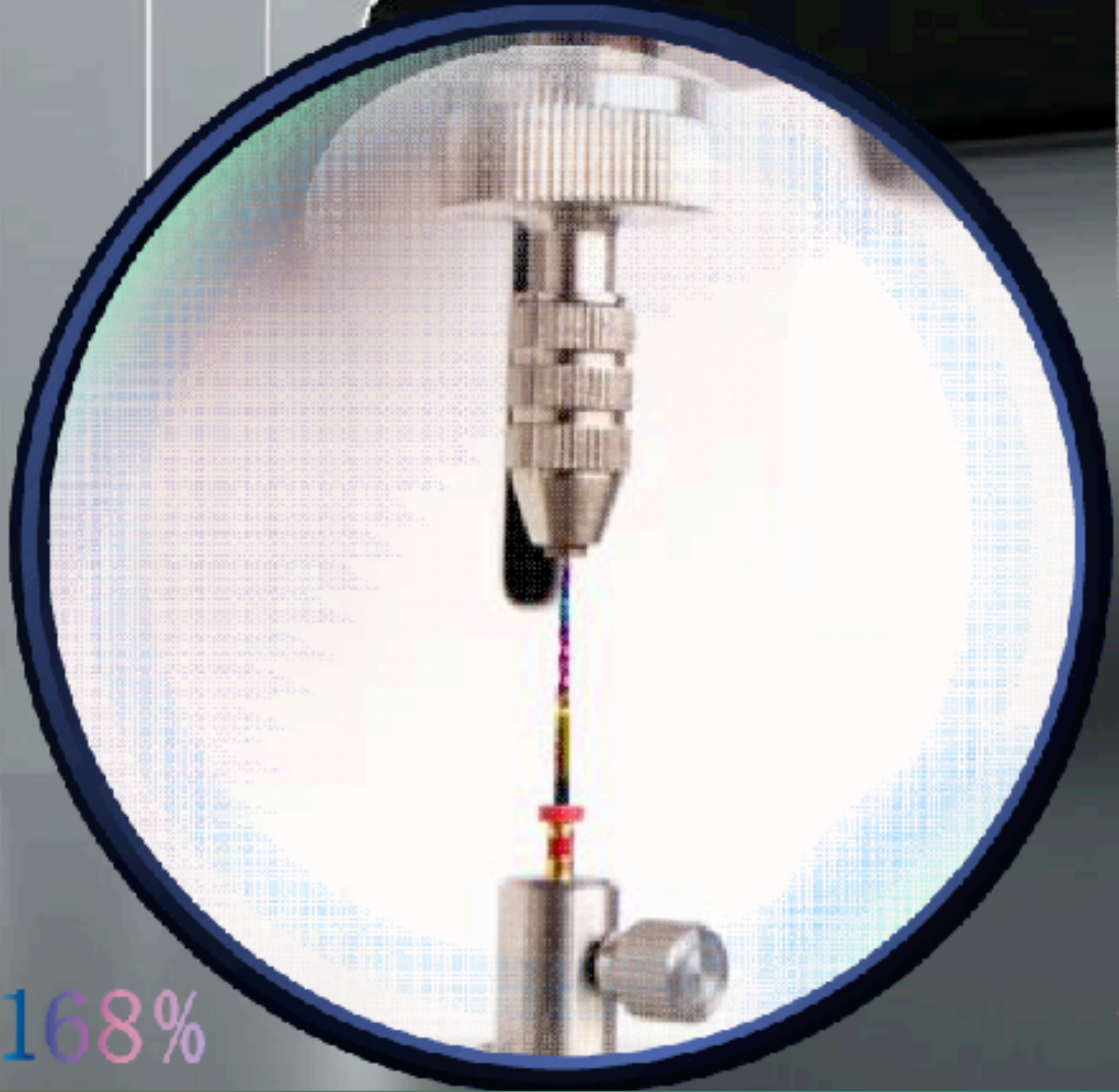
Strumenti in NiTi | Attivazione termica | Flessibilità | Riduzione dell'efficienza di taglio | Sfilameto

Tecnologia di attivazione termica convenzionale:

Oggi gli strumenti canalari in nichel-titanio sono prodotti con una tecnologia di trattamento termico che rende la lama più flessibile e risolve in gran parte il problema della rottura dello strumento nei canali radicolari curvi. Tuttavia, poiché la lama diventa più flessibile, la sua forza di taglio si riduce e tende a sfilarsi quando incontra canali radicolari calcificati.

Caratteristiche del nano-rivestimento

Sulla base del trattamento termico del materiale in nichel-titanio, la tecnologia di tempra laser viene utilizzata per aumentare la durezza superficiale degli strumenti canalari del 168%. Il nano-rivestimento riempie gli interstizi della struttura reticolare sulla superficie, formando una nuova tecnologia di struemnti canalari in nichel-titanio che combina attivazione termica, tempra laser e nano-rivestimento.



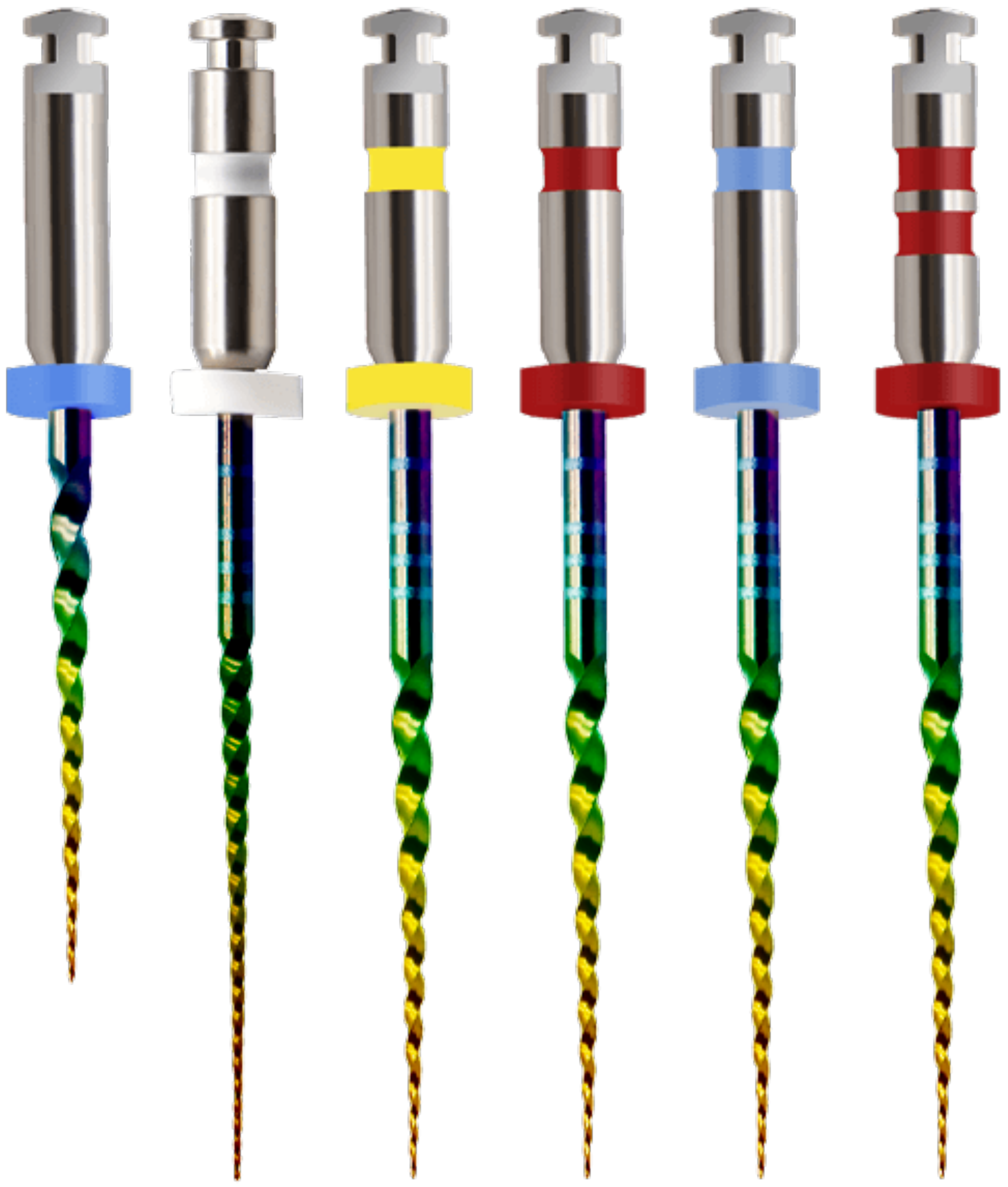
- Aumento della resistenza all'abrasione di 3-10 volte.
- Miglioramento della qualità della superficie e riduzione dei difetti.
- Rivestimento sottile e uniforme con un basso coefficiente di attrito.
- Nano-rivestimento sottile, circa 3 µm; pertanto, non influisce sull'accuratezza dimensionale del taglio.

ATTIVAZIONE TERMICA **TEMPRA LASER**
NANO-RIVESTIMENTO

Strumenti in NiTi   Attivazione termica   Tempra laser

PRO FLEX NHA

NANO RIVESTITO ATTIVAZIONE TERMICA



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.

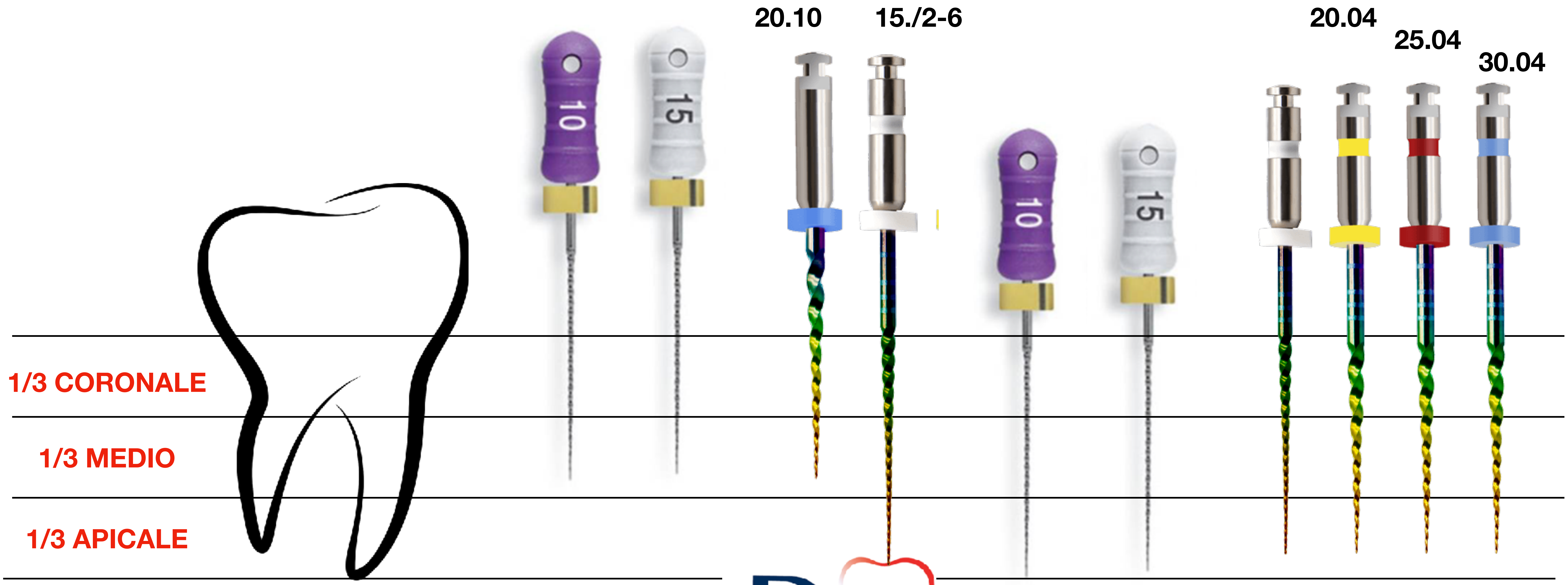
PRO FLEX *NHA*

	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

Sequenza PRO FLEX H.A.



DENTAL WORLD

BIOCERAMICHE IN ENDDONZIA

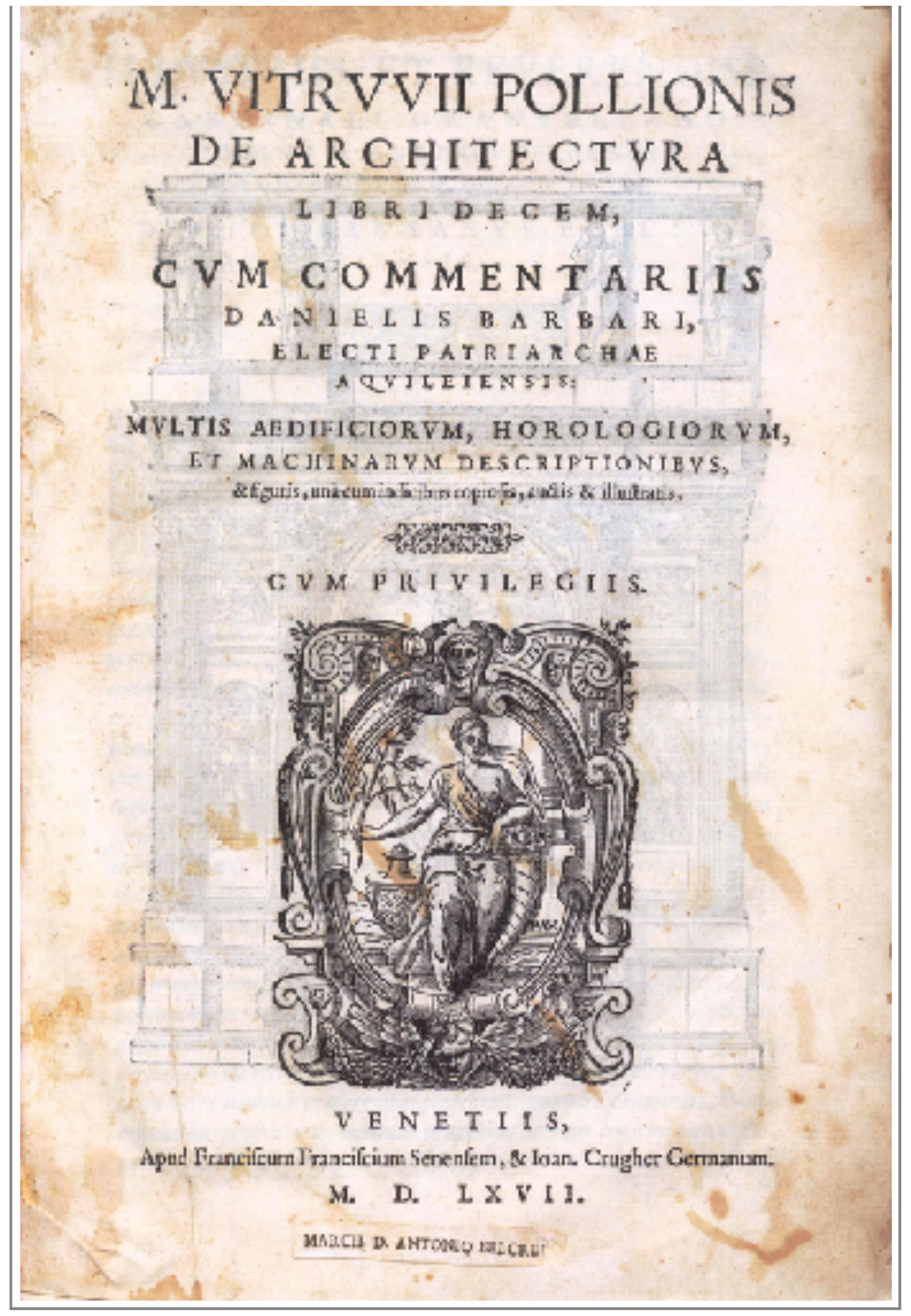
I Cementi Bioceramici: la storia

CALCE VIVA

+

MATERIALE VULCANICO

Vitruvio Marco Pollione.



M. VITRVVII POLLIONIS
DE ARCHITECTVRA
LIBRI DECEM,
CVM COMMENTARIIS
DANIELIS BARBARI,
ELECTI PATRIARCHAE
AQVILEIENSIS:
MVLTIS AEDIFICIORVM, HOROLOGIORVM,
ET MACHINARVM DESCRIPTIONIBVS,

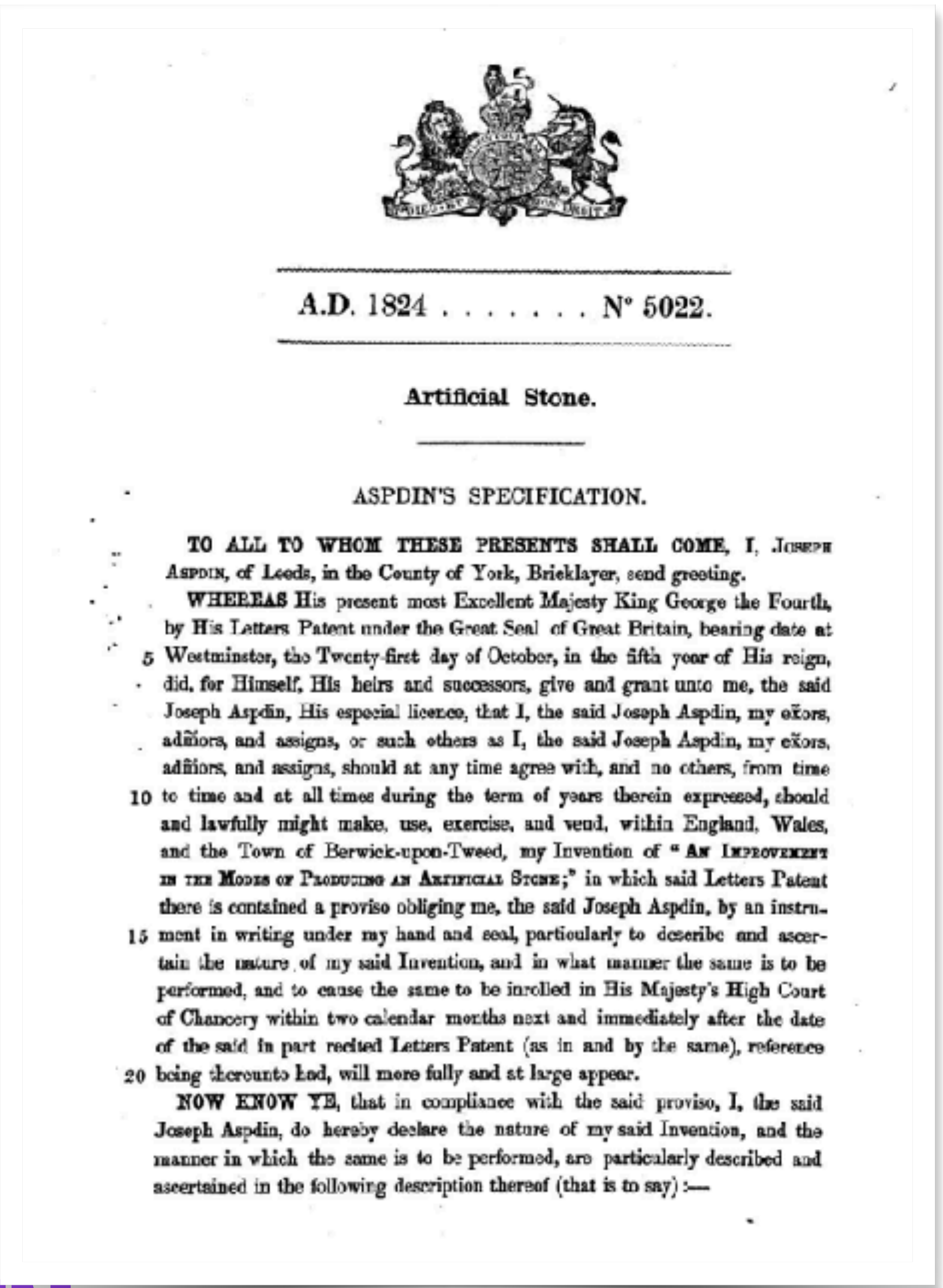
CVM PRIVILEGIIS.

VENETIIS,
Apud Franciscum Franciscium Senensem, & Ioan. Crugher Germanum.
M. D. LXVII.

" LA POZZOLANA
DI BAIA O DI CUMA FA
GAGLIARDA NON SOLO
OGNI SPECIE DI
COSTRUZIONE MA IN
PARTICOLARE QUELLE
CHE SI FANNO IN MARE
SOTT'ACQUA".

I Cementi Bioceramici: la storia

HISTORY



A.D. 1824 . . . . N° 5022.

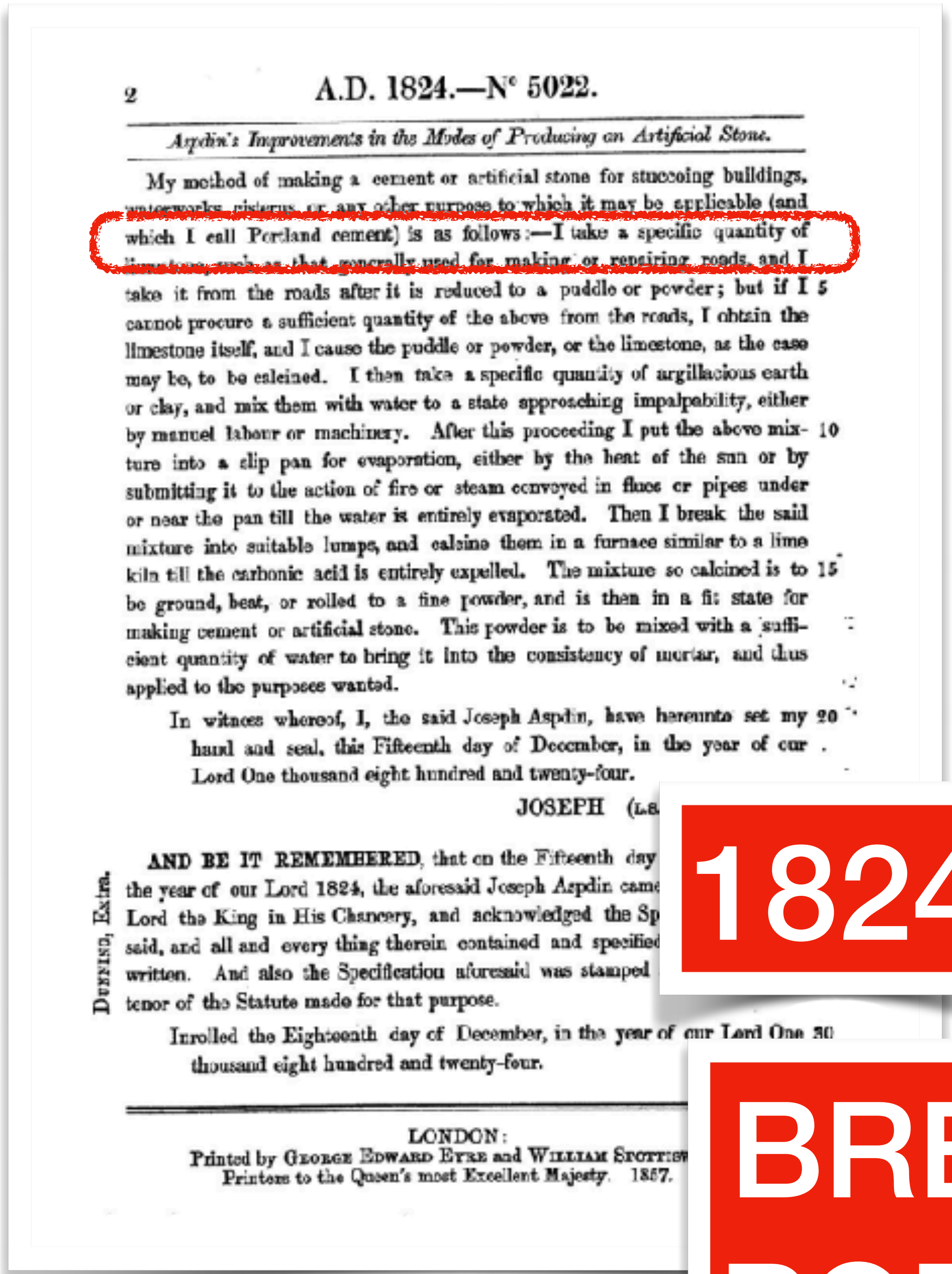
Artificial Stone.

ASPDIN'S SPECIFICATION.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, JOSEPH ASPDIN, of Leeds, in the County of York, Bricklayer, send greeting.

WHEREAS His present most Excellent Majesty King George the Fourth, by His Letters Patent under the Great Seal of Great Britain, bearing date at Westminster, the Twenty-first day of October, in the fifth year of His reign, did, for Himself, His heirs and successors, give and grant unto me, the said Joseph Aspdin, His especial licence, that I, the said Joseph Aspdin, my exors, admors, and assigns, or such others as I, the said Joseph Aspdin, my exors, admors, and assigns, should at any time agree with, and no others, from time to time and at all times during the term of years therein expressed, should and lawfully might make, use, exercise, and vend, within England, Wales, and the Town of Berwick-upon-Tweed, my Invention of "AN IMPROVEMENT IN THE MODES OF PRODUCING AN ARTIFICIAL STONE;" in which said Letters Patent there is contained a proviso obliging me, the said Joseph Aspdin, by an instrument in writing under my hand and seal, particularly to describe and ascertain the nature of my said Invention, and in what manner the same is to be performed, and to cause the same to be inrolled in His Majesty's High Court of Chancery within two calendar months next and immediately after the date of the said in part recited Letters Patent (as in and by the same), reference being thereunto had, will more fully and at large appear.

NOW KNOW YE, that in compliance with the said proviso, I, the said Joseph Aspdin, do hereby declare the nature of my said Invention, and the manner in which the same is to be performed, are particularly described and ascertained in the following description thereof (that is to say):—



Aspdin's Improvements in the Modes of Producing an Artificial Stone.

My method of making a cement or artificial stone for stuccoing buildings, waterworks, cisterns, or any other purpose to which it may be applicable (and which I call Portland cement) is as follows:—I take a specific quantity of limestone, such as that generally used for making or repairing roads, and I take it from the roads after it is reduced to a puddle or powder; but if I cannot procure a sufficient quantity of the above from the roads, I obtain the limestone itself, and I cause the puddle or powder, or the limestone, as the case may be, to be calcined. I then take a specific quantity of argillacious earth or clay, and mix them with water to a state approaching impalpability, either by manuel labour or machinery. After this proceeding I put the above mixture into a slip pan for evaporation, either by the heat of the sun or by submitting it to the action of fire or steam conveyed in flues or pipes under or near the pan till the water is entirely evaporated. Then I break the said mixture into suitable lumps, and calcine them in a furnace similar to a lime kiln till the carbonic acid is entirely expelled. The mixture so calcined is to be ground, beat, or rolled to a fine powder, and is then in a fit state for making cement or artificial stone. This powder is to be mixed with a sufficient quantity of water to bring it into the consistency of mortar, and thus applied to the purposes wanted.

In witness whereof, I, the said Joseph Aspdin, have hereunto set my hand and seal, this Fifteenth day of December, in the year of our Lord One thousand eight hundred and twenty-four.

JOSEPH (L.S.

AND BE IT REMEMBERED, that on the Fifteenth day the year of our Lord 1824, the aforesaid Joseph Aspdin came Lord the King in His Chancery, and acknowledged the Sp said, and all and every thing therein contained and specified written. And also the Specification aforesaid was stamped tenor of the Statute made for that purpose.

Inrolled the Eighteenth day of December, in the year of our Lord One thousand eight hundred and twenty-four.

DUNNING, Extra.

LONDON:
Printed by GEORGE EDWARD EYRE and WILLIAM SPOTTISW
Printers to the Queen's most Excellent Majesty. 1857.

1824

BREVETTO PORTLAND

JOSEPH ASPDIN

I Cementi Bioceramici: la storia

HISTORY

PORTLAND IN ENDO 1878

Witte

FILLING OF A ROOT CANALS WITH PORTLAND CEMENT
[DASFULLEN DER WURZELCAUALE MIT PORTLAND-CEMENT].

I Cementi Bioceramici: la storia

HISTORY

MTA

TORABINEJAD 1993

I Cementi Bioceramici: chimica

REAZIONE DI IDRATAZIONE

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

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

REAZIONE DI PRECIPITAZIONE

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

LE BIOCERAMICHE IN ENDODONZIA

REAZIONE DI IDRATAZIONE

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

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

L'IDRATAZIONE FA INDURIRE IL MATERIALE RENDENDOLO PARTICOLARMENTE STABILE E RILASCIA IDROSSIDO DI CALCIO ALZANDO IL PH (AZIONE ANTIBATTERICA) E STIMOLA ATTIVITA' RIPARATIVA DEI TESSUTI

LE BIOCERAMICHE IN ENDODONZIA

REAZIONE DI PRECIPITAZIONE

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

L'IDROSSIDO DI CALCIO INSIEME AI FOSFATI PRESENTE NEI TESSUTI DANNO ORIGINE ALL'IDROSSIAPATITE E ALTRA ACQUA CHE POTENZIA DI NUOVO IL CICLO

LE BIOCERAMICHE IN ENDODONZIA

- TOSSICITÀ PER I METALLI PESANTI (CROMO, ARSENICO)
- DISCOLORAZIONE DENTALE (OSSIDO DI BISMUTO + IPO)
- TEMPO INDURIMENTO(3-4H)
- DIFFICILE MISCELAZIONE
- DIMENSIONE PARTICELLE (GRANDI: POCHE PARTICELLE INTEGRAGISCONO CON ACQUA RISPETTO NUOVI MATERIALI)
- WASH-OUT
- RESISTENZA MECCANICA
- CONSISTENZA SABBIOSA

I cementi bioceramici in endodonzia

SILICATI PURI
2006-7

HANNO LA BIOCOMPATIBILITÀ DELL'MTA MA NE MIGLIORANO ALCUNE CARATTERISTICHE:

- TEMPO DI INDURIMENTO RIDOTTO
- FACILITÀ DI MANIPOLAZIONE
- ASSENZA DI DECOLORAZIONE
- RESISTENZA AL CARICO
- FLUIDITÀ'....

VANTAGGI

- Alta Biocompatibilità
- Non tossici
- Idrofilici
- Radiopacità
- Adesione alla dentina
- Dimensionalmente Stabili
- Bioattivi ed Osteoinduttivi
- Bassa risposta infiammatoria
- Formazione Idrossiapatite
- Antibatterici (ph basico)
- Facile utilizzo e manipolazione

I cementi bioceramici in endodonzia

II GEN

POLVERE: Silicato tricalcico, Silicato dicalcico, Carbonato di Calcio.
LIQUIDO: Acqua, Cloruro di Calcio, Agente riducente

III GEN

PREMISCELATO: Silicato tricalcico, Silicato dicalcico, Fosfato di Calcio. Idrossido di Calcio
Acqua, Cloruro di Calcio, Agente riducente

SILICATI PURI

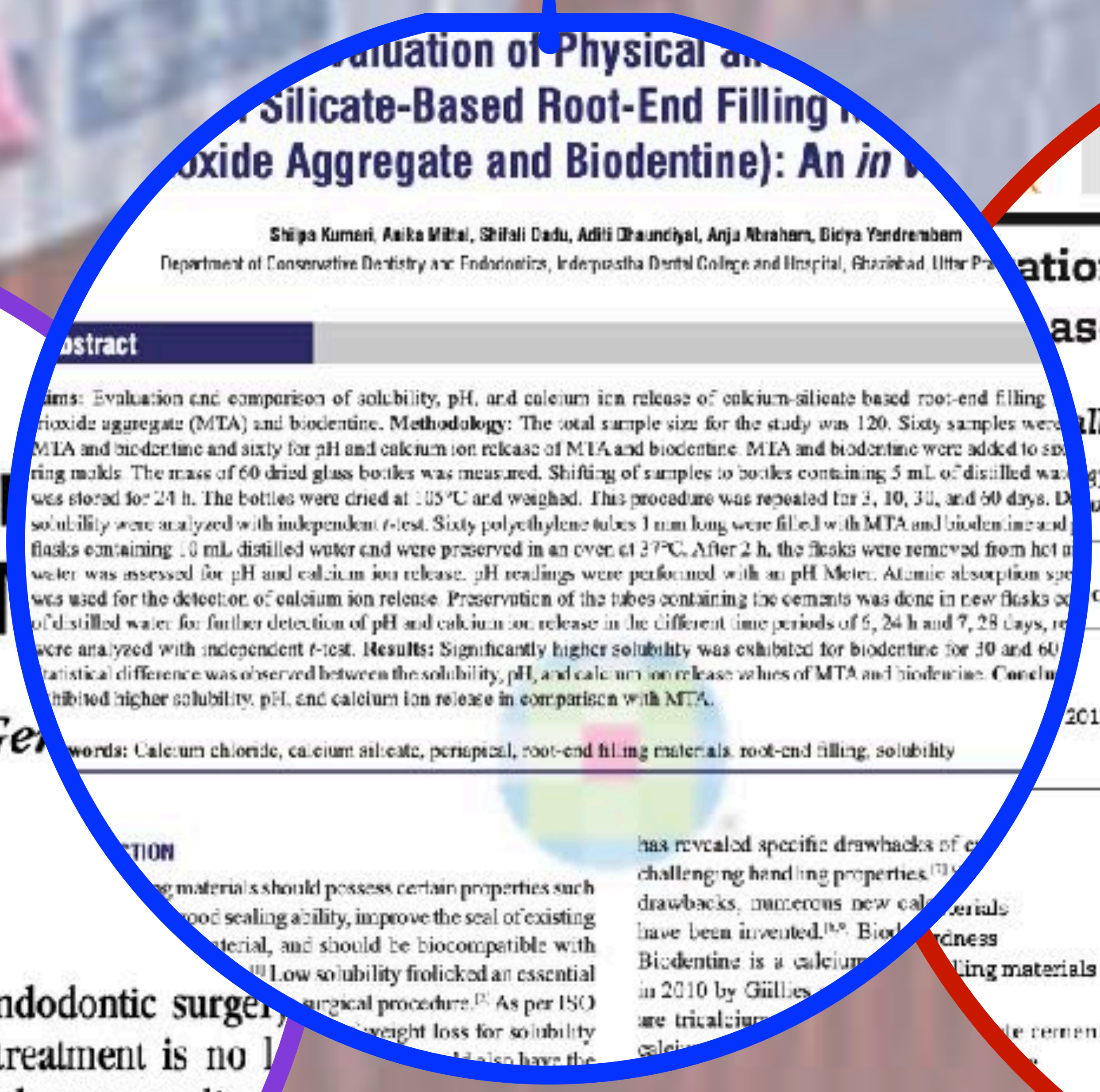
Cementi da Riparazione RRM

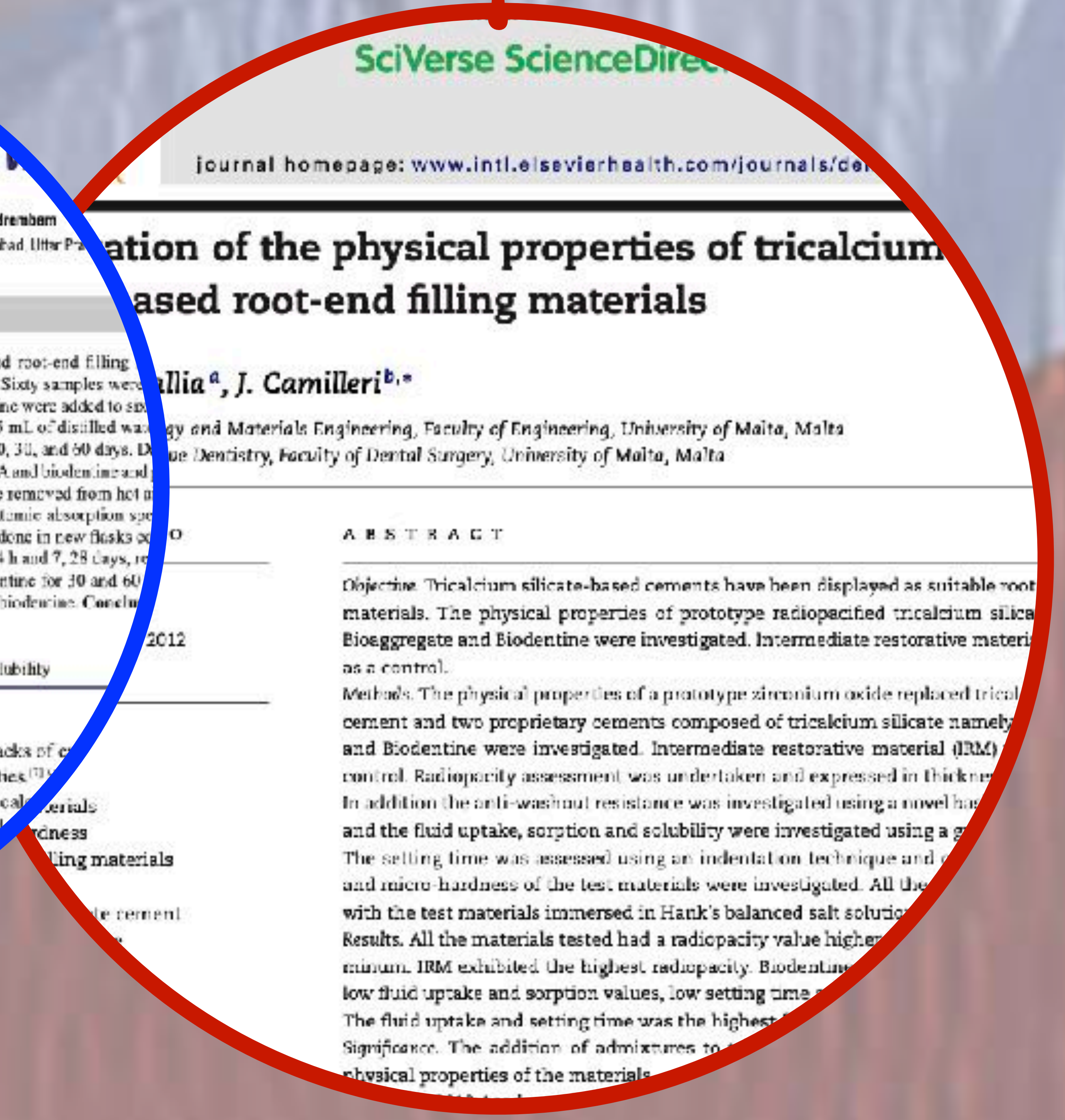
Cementi Sealers: Sigillo canalare

INCAPPUCCIAMENTO
BIOCERAMICS IN ENDODONTICS – A RE
Endodontide Biyoseramikler: Derleme
ABSTRACT
ÖZ
Silicate-Based Root-End Filling
oxide Aggregate and Biodentine): An in
SciVerse ScienceDire
igation of the physical properties of tricalcium
ent-based root-end filling materials
Sopportano carichi Occlusali
Maggiori rispetto all'MTA

PERFORAZIONI

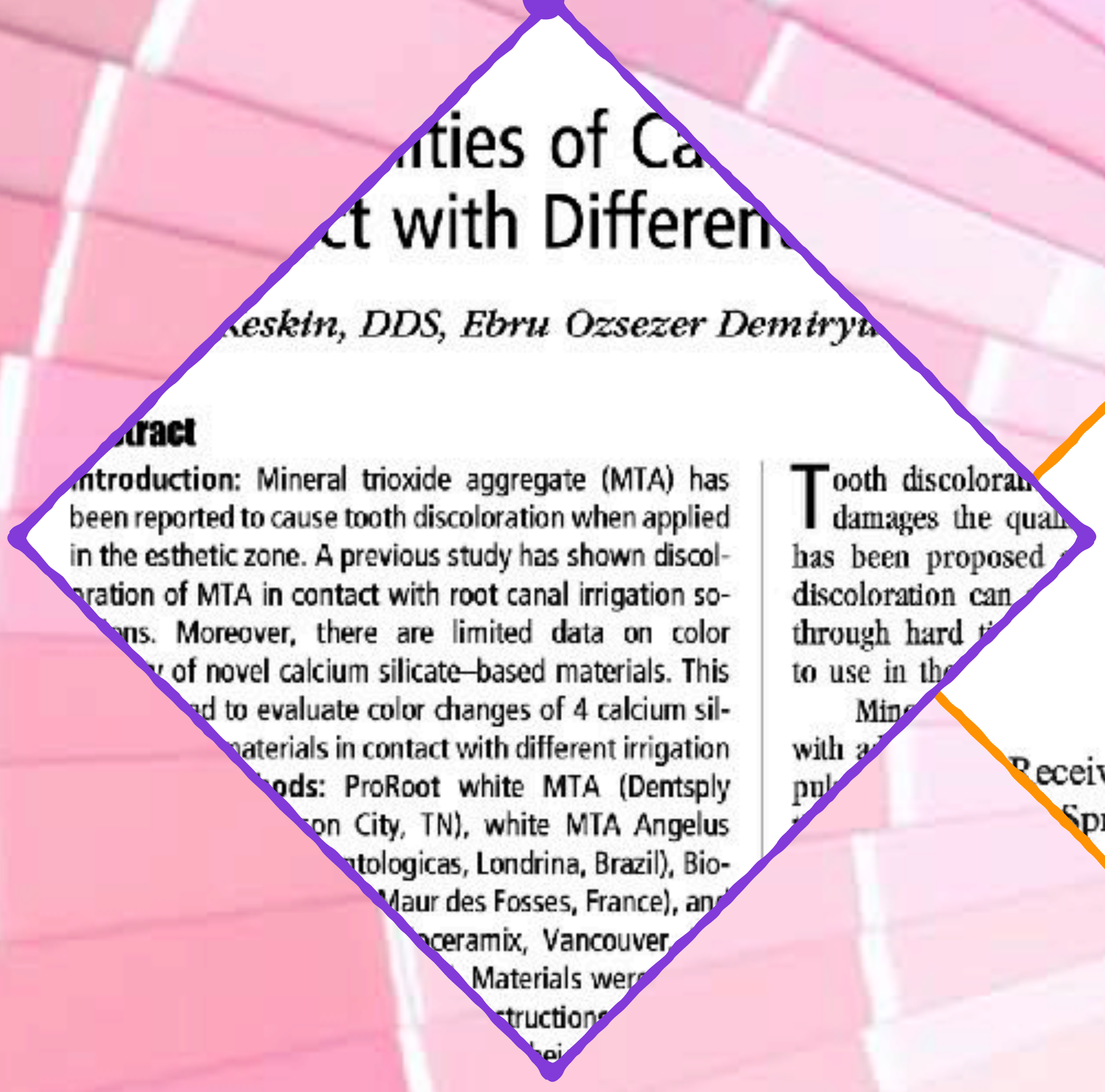
Push-out bond StrengthSuperiore all'MTA anche in ambiente acido: Single SeSSion

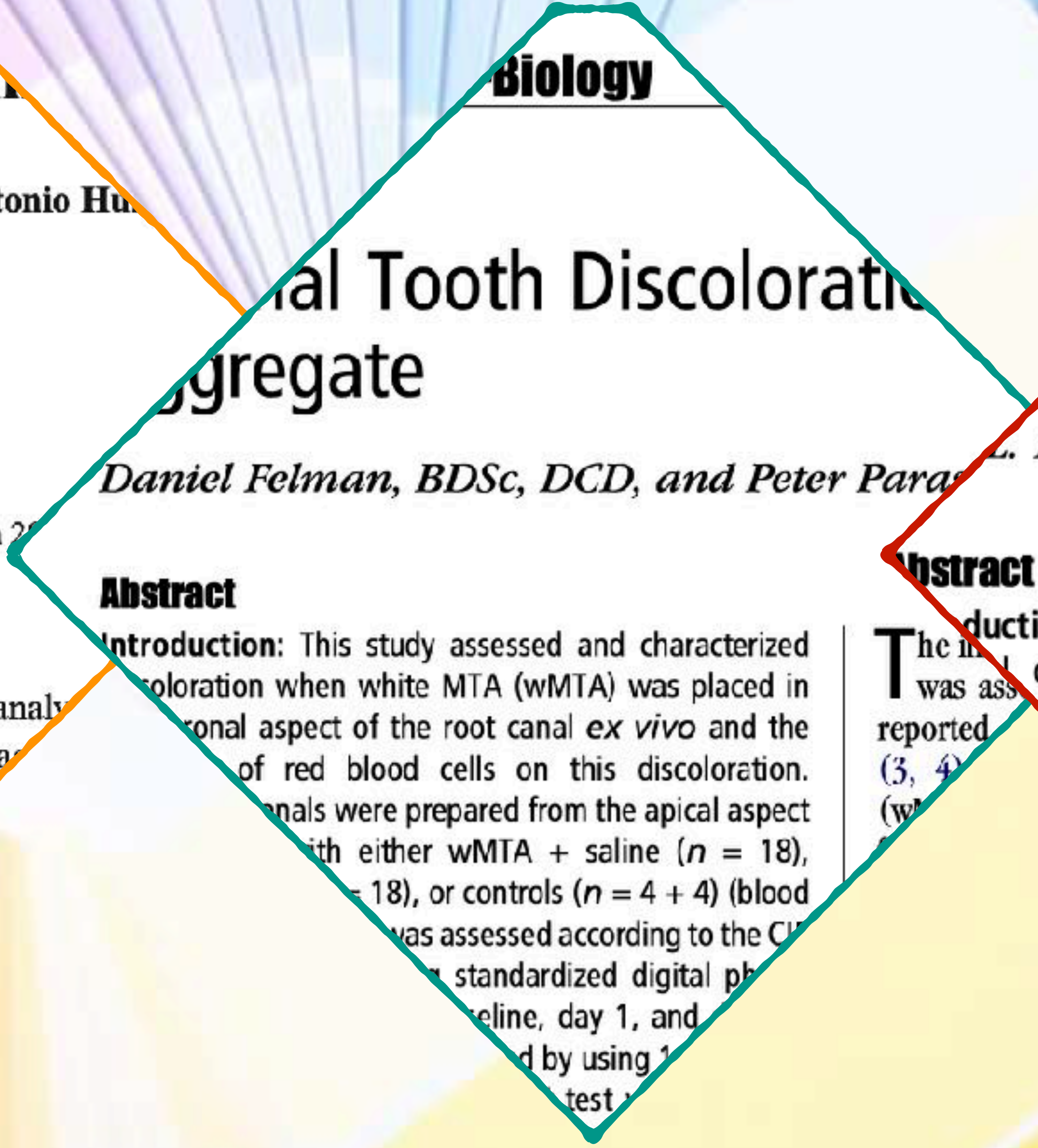


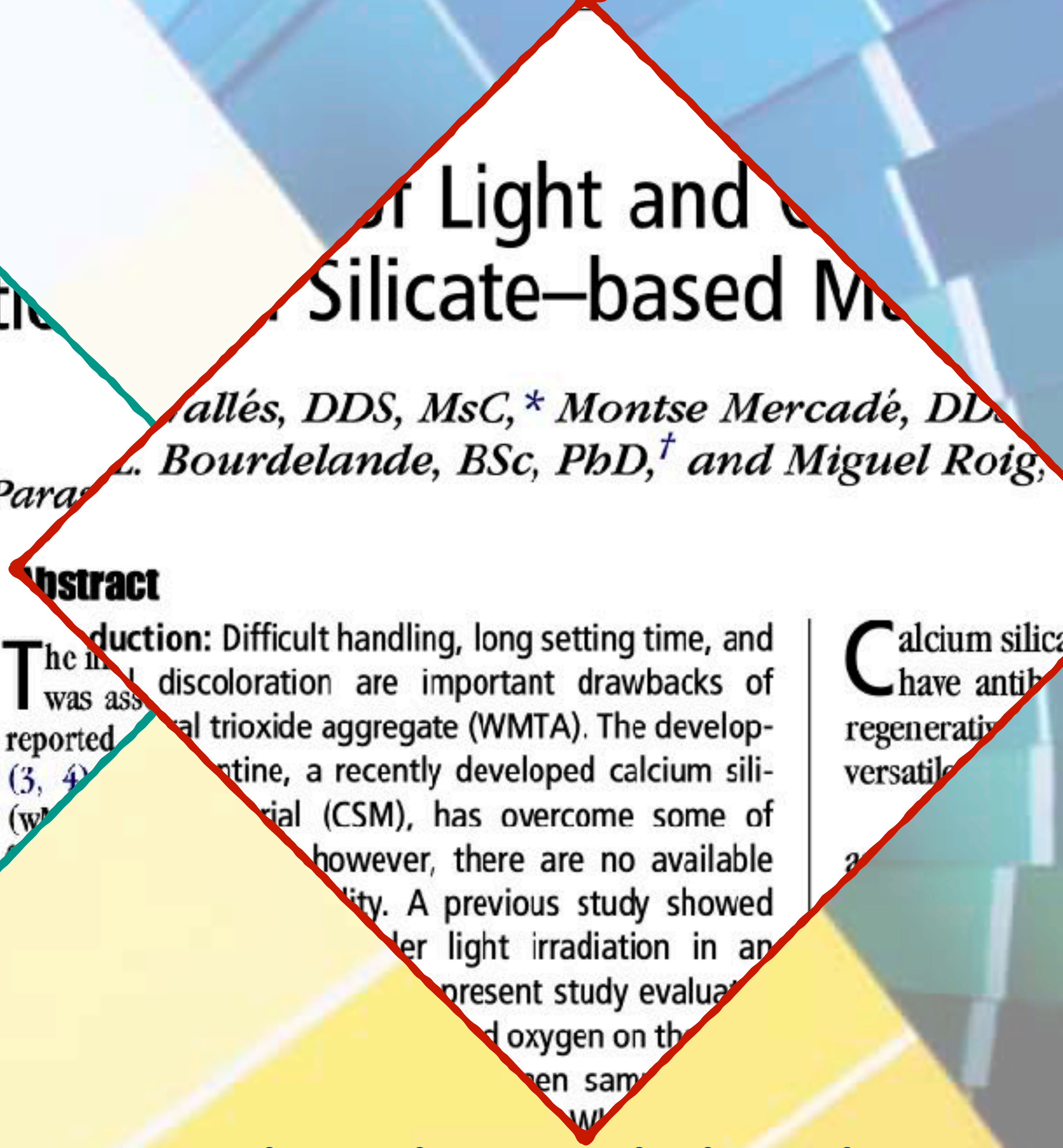


RIASSORBIMENTO

Wash-out inferiore ed adesione maggiore rispetto all'MTA



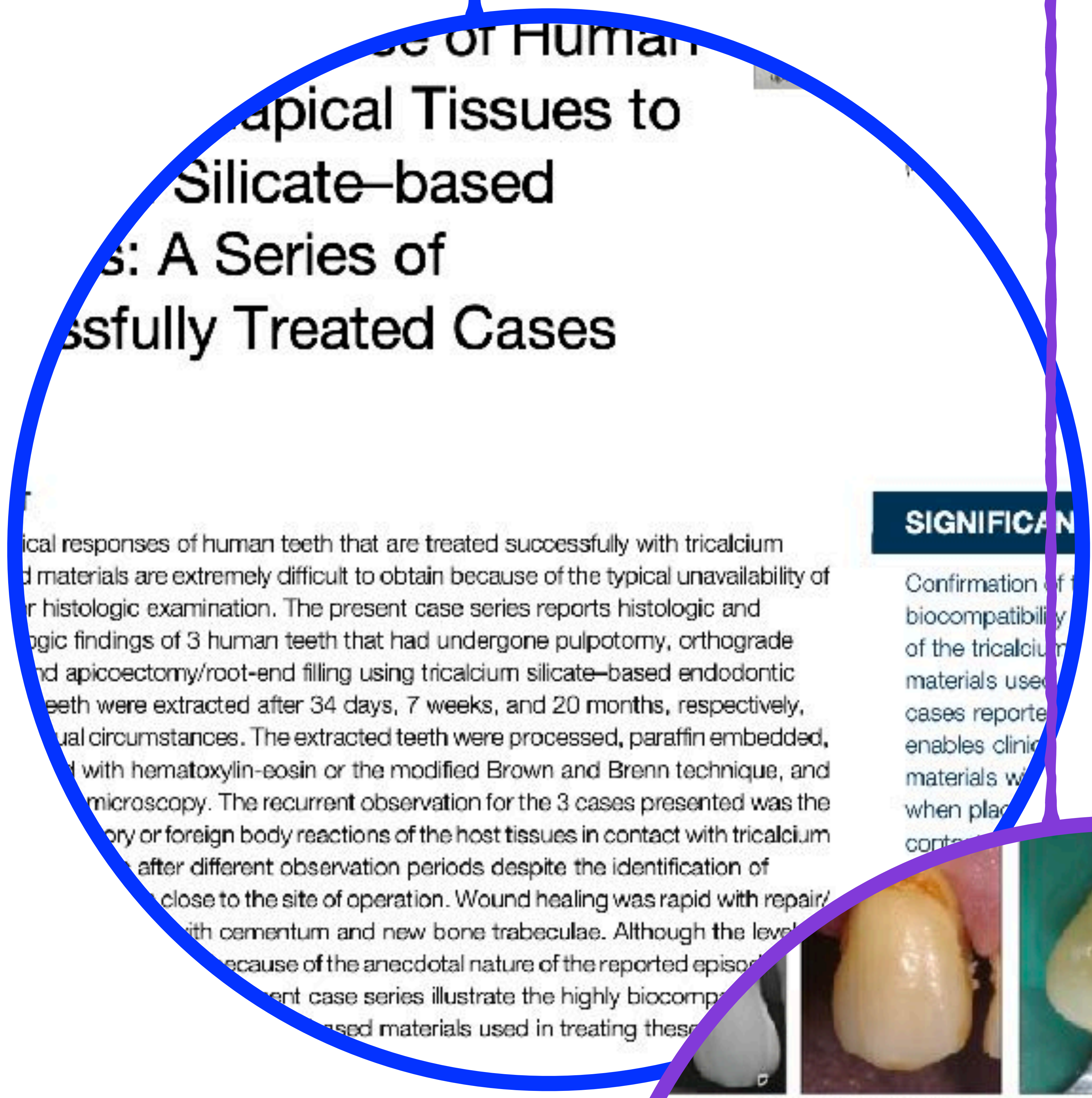




RIASSORBIMENTO

Minor rischio di decolorazione degli elementi trattati

Rispetto all'MTA (Ossido di Bismuto)



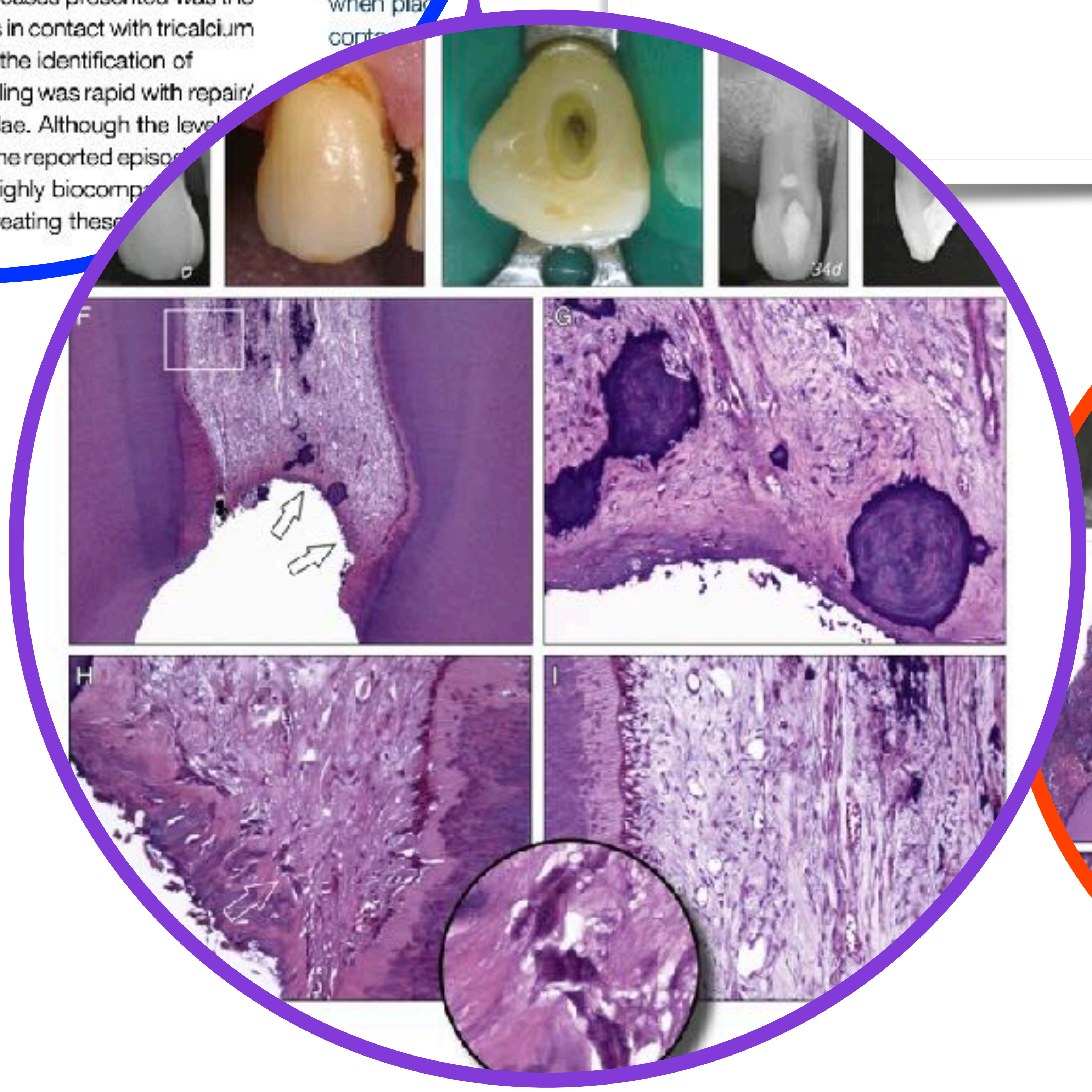
...se of Human
...apical Tissues to
... Silicate–based
...s: A Series of
...ssfully Treated Cases

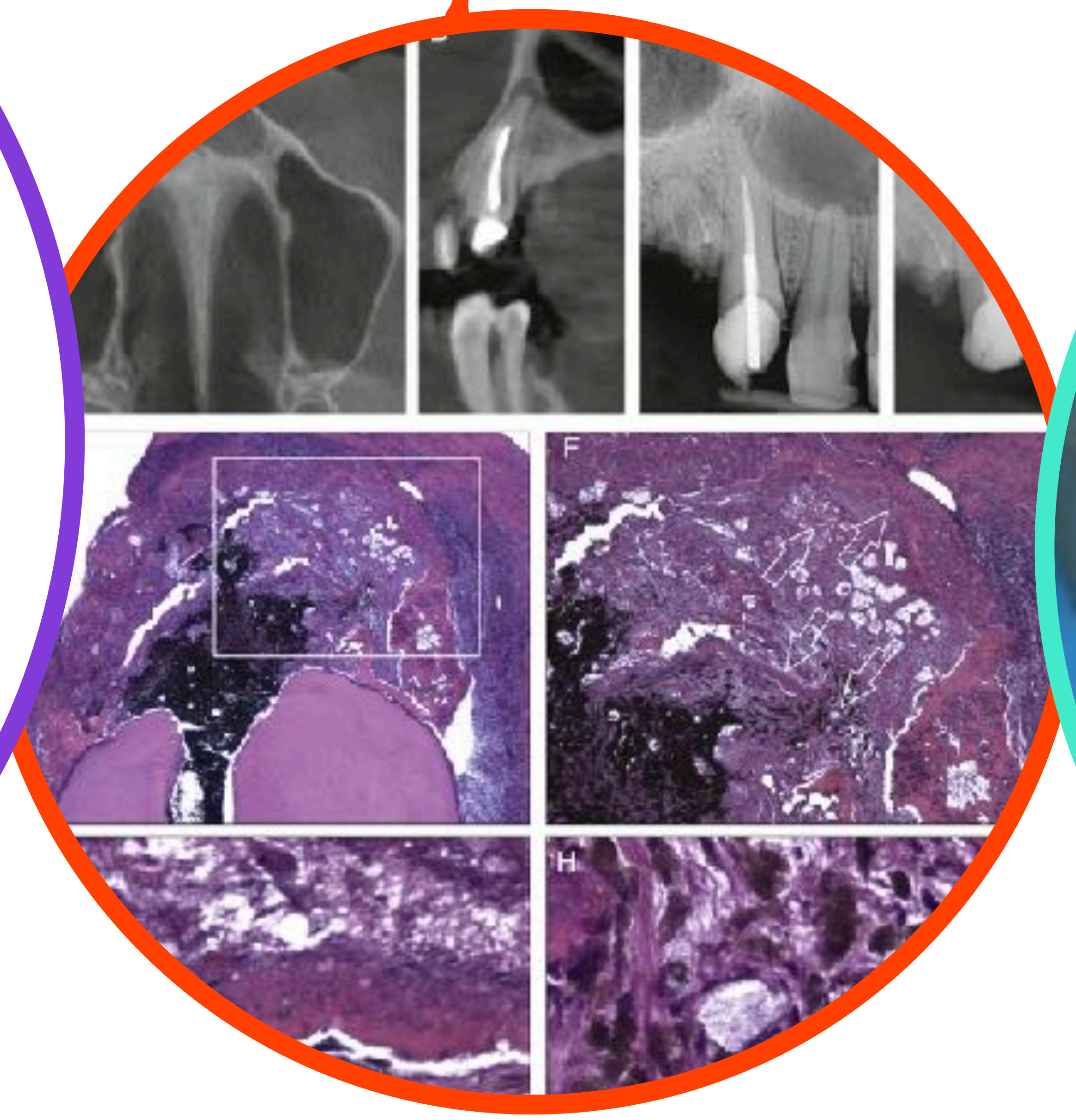
...ical responses of human teeth that are treated successfully with tricalcium
...d materials are extremely difficult to obtain because of the typical unavailability of
...r histologic examination. The present case series reports histologic and
...gic findings of 3 human teeth that had undergone pulpotomy, orthograde
...nd apicoectomy/root-end filling using tricalcium silicate–based endodontic
...eeth were extracted after 34 days, 7 weeks, and 20 months, respectively,
...ual circumstances. The extracted teeth were processed, paraffin embedded,
... with hematoxylin-eosin or the modified Brown and Brenn technique, and
...microscopy. The recurrent observation for the 3 cases presented was the
...ory or foreign body reactions of the host tissues in contact with tricalcium
... after different observation periods despite the identification of
... close to the site of operation. Wound healing was rapid with repair/
...ith cementum and new bone trabeculae. Although the level...
...ecause of the anecdotal nature of the reported episo...
...ent case series illustrate the highly biocomp...
...ased materials used in treating these...

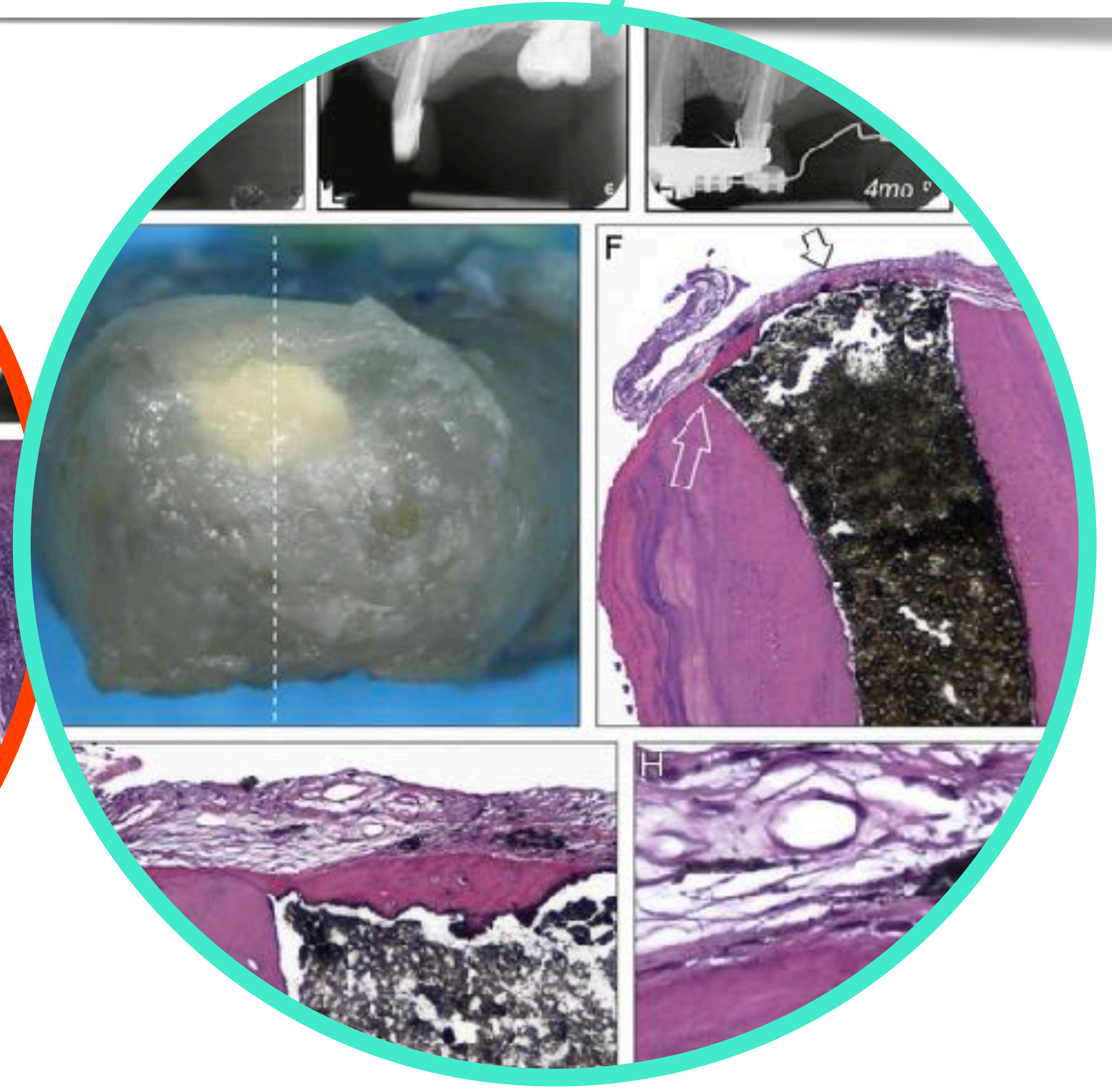
SIGNIFICA...

Confirmation of t...
biocompatibility...
of the tricalciu...
materials used...
cases reporte...
enables clinic...
materials w...
when plac...
conta...

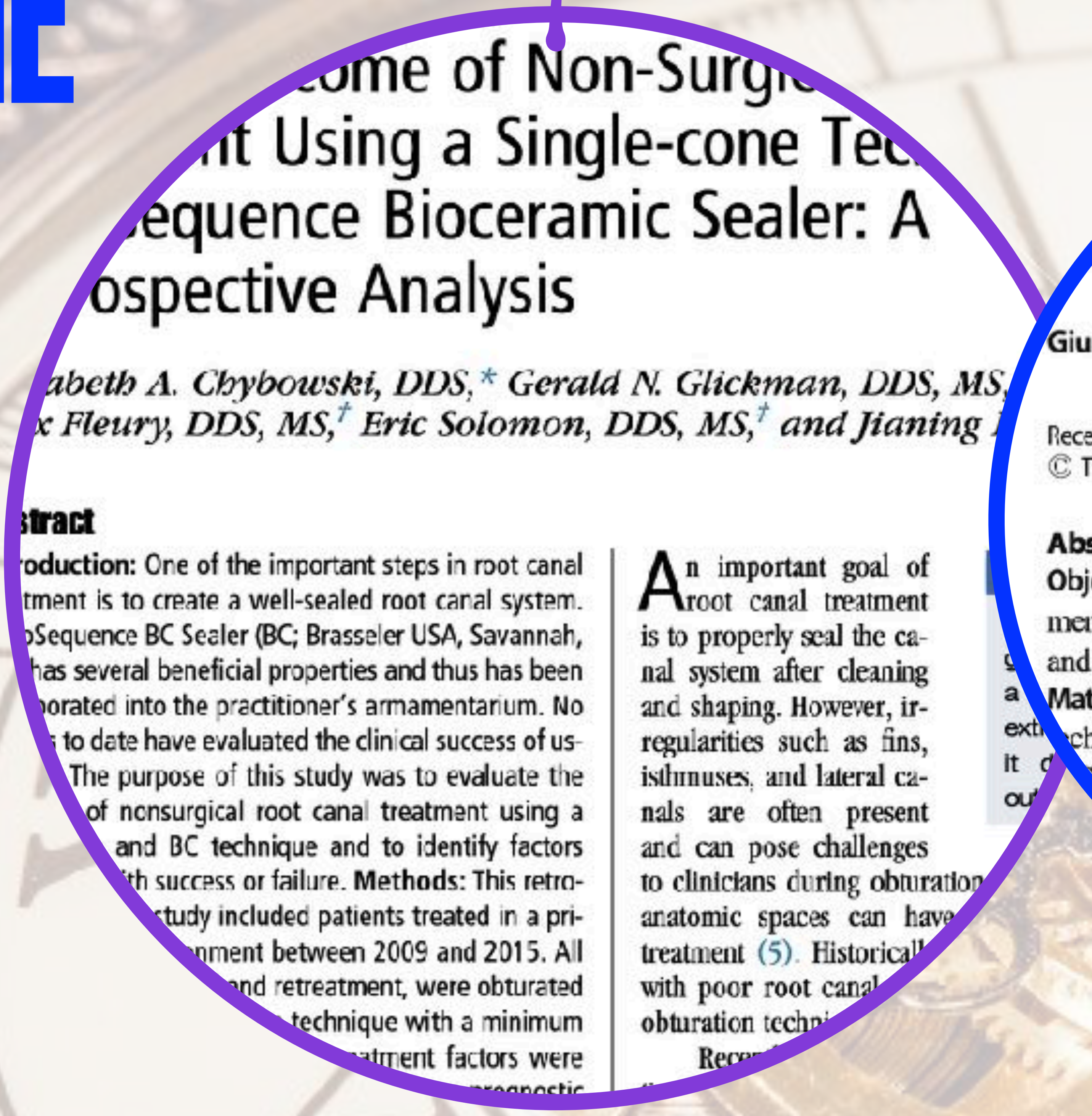
Confirmation of the biocompatibility and bioactivity of the tricalcium silicate–based materials used in treating the cases reported in this series enables clinicians to use these materials with confidence when placing them in direct contact with pulpal and periapical tissues.

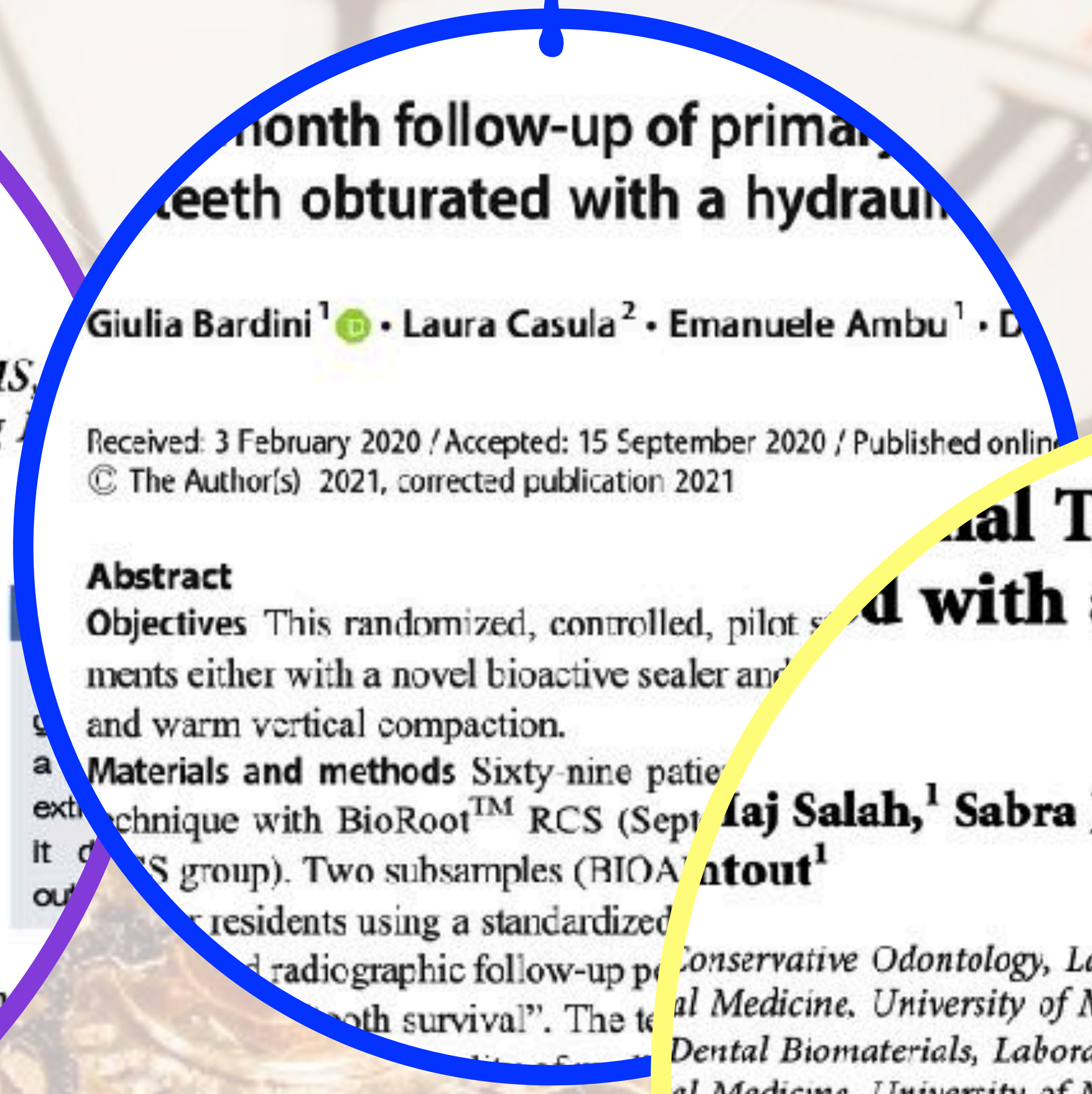


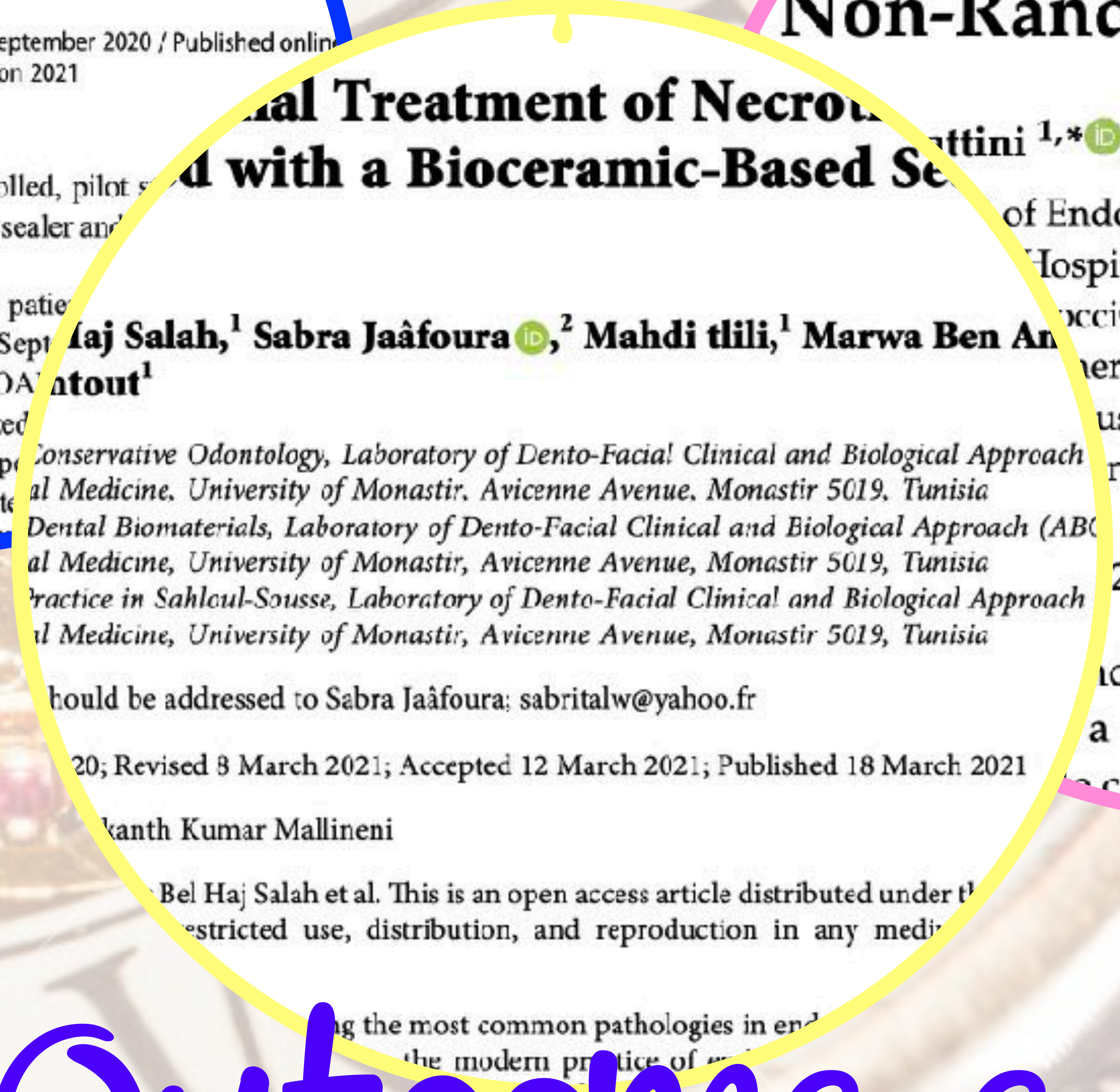


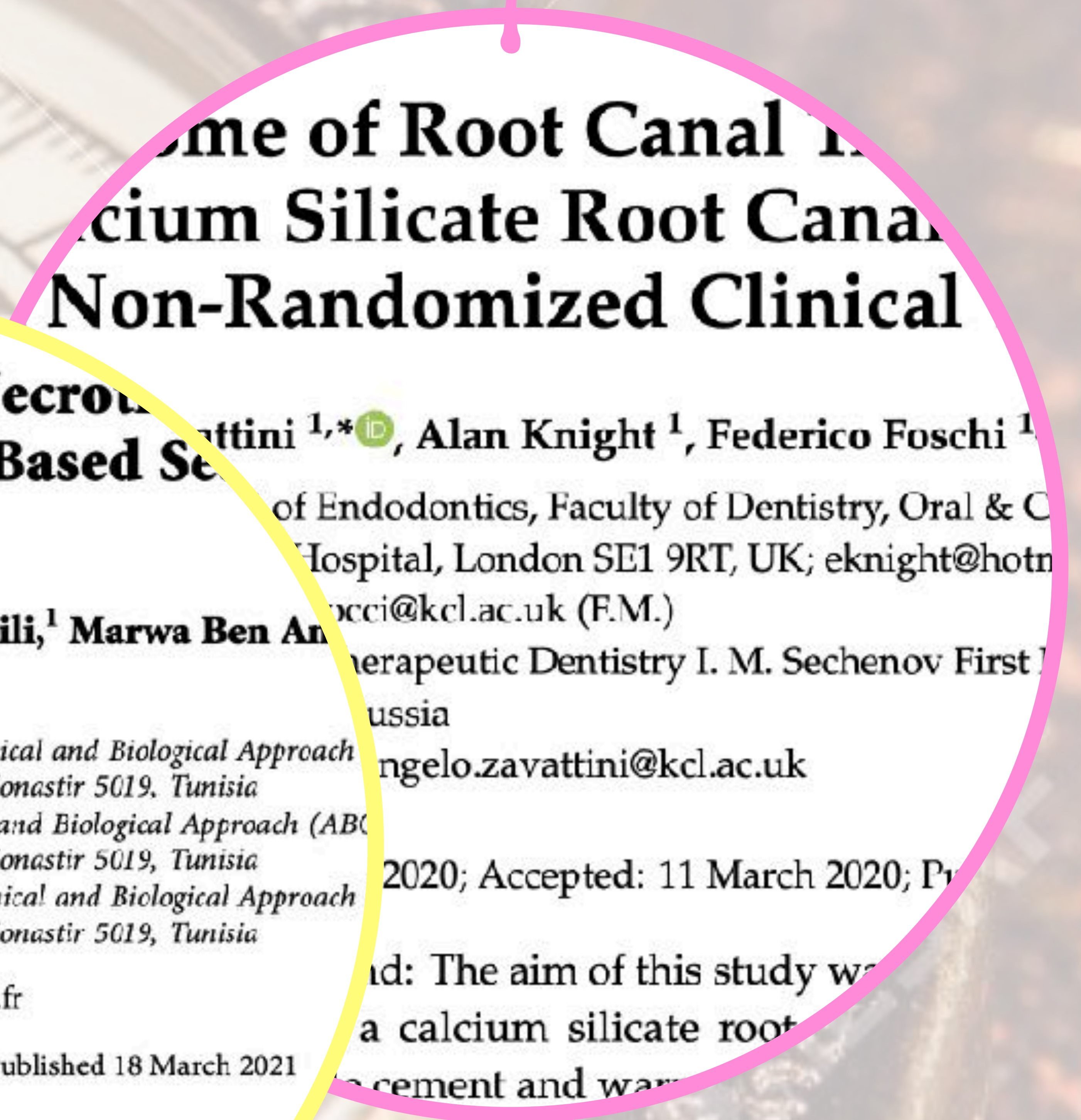


OUTCOME









Miglioramento Outcome e Maggior velocità di guarigione

CONDENSAZIONE IDRAULICA

Otturazione Canalare: Condensazione idraulica

The Effect of Obturation Technique on the Push-out Bond Strength of Calcium Silicate Sealers

Christopher DeLong, DDS, Jianing He, DMD, PhD, and Karl F. Woodmansey, DDS

Abstract

Introduction: Calcium silicate–based sealers are known to have excellent sealing ability and bioactivities. They are typically recommended to be used in a single-cone (SC) technique. No studies have evaluated the effects of the thermoplastic obturation technique on the dentin interface of these sealers. The purpose of this study was to evaluate the push-out bond strengths of MTA Plus Sealer (Avalon Biomed Inc, Bradenton, FL) and EndoSequence BC Sealer (BC; Brasseler USA, Savannah, GA) when they were used in a thermoplastic technique. **Methods:** Fifty single-rooted human extracted teeth were randomly divided into 5 groups (n = 10), instrumented, and obturated with the SC technique or continuous wave (CW) technique: group 1, BC-SC; group 2, BC-CW; group 3, MTA Plus–SC; group 4, MTA Plus–CW; and group 5, AH Plus (Dentsply DeTrey, Konstanz, Germany)–CW. The roots were sectioned into 1.0-mm-thick slices, and bond strengths were measured using a standardized push-out test. The mode of failure was determined by visual inspection under magnification. **Results:** The MTA Plus–CW had statistically significant lower bond strengths than all other groups. The BC-SC group had statistically higher bond strengths than the MTA Plus–SC and AH Plus–CW groups. No significant differences were seen among the other groups. Modes of failure were predominately cohesive or mixed except for group 4 (ie, MTA Plus–CW) in which nearly half the specimens had no visible sealer. **Conclusions:** BC and MTA Plus sealer showed favorable bond strengths when used in an SC technique. The CW obturation technique decreased the bond strengths of these sealers. *(J Endod 2015;41:385–388)*

Key Words

Bond strength, continuous wave, EndoSequence BC Sealer, MTA Plus, push-out test

From the Department of Endodontics, Texas A&M University Baylor College of Dentistry, Dallas, Texas.

Address requests for reprints to Dr Jianing He, Department of Endodontics, Texas A&M University Baylor College of Dentistry, 3302 Gaston Avenue, Dallas, TX 75246. E-mail address: jhe@bcd.tamhsc.edu

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Tenets of endodontic obturation include effectively sealing the root canal system to prevent apical and coronal leakage (1). Because of the poor adhesiveness of gutta-percha (GP), it has been used in conjunction with root canal sealers to accomplish this goal. Traditional root canal sealers include zinc oxide eugenol, calcium hydroxide, and resin-based sealers. Although these sealers have been effective, there is still a quest for a sealer with better properties (2). ProRoot MTA (Dentsply, Tulsa, OK) is a calcium silicate cement that has proved to have excellent sealing ability, bioactivity, and osteoconductivity (3). Because of these characteristics, there is a strong interest in developing calcium silicate–based sealers for root canal obturation.

One of the more recently introduced cements is MTA Plus (Avalon Biomed Inc, Bradenton, FL). It is a powdered tricalcium and dicalcium silicate–based material that can be mixed with a liquid or a gel. Although similar in composition to ProRoot MTA, MTA Plus has a finer particle size. It can be used as a root canal sealer when mixed with the gel, which also improves the handling properties and washout resistance (4). Another hydraulic silicate cement root canal sealer is EndoSequence BC Sealer (BC; Brasseler USA, Savannah, GA [also known as iRoot SP Injectable Root Canal Sealer, Innovative BioCeramix Inc, Vancouver, BC, Canada]). Similarly, its major inorganic components include tricalcium and dicalcium silicate, calcium phosphates, colloidal silica, and calcium hydroxide. It is sold as a premixed paste containing water-free thickening vehicles (5). Because of the excellent flowability and dimensional stability, both manufacturers recommend using a single-cone (SC) obturation technique for MTA Plus and BC.

Thermoplasticized obturation techniques such as the continuous wave (CW) technique have been shown to effectively fill canal irregularities and are popular, especially among endodontists (6–8). Despite the manufacturers' recommendations, many practitioners may feel uncomfortable using the SC technique and still prefer to use a thermoplasticized technique with these new calcium silicate–based sealers. Whether the thermoplasticized technique will affect the sealing properties of these sealers has not been studied.

Therefore, the purpose of the current study was to determine whether the thermoplasticized technique has any influence on the push-out bond strengths of MTA Plus Sealer and BC. The CW technique will be compared with the manufacturers' recommended SC technique, and AH Plus sealer (Dentsply DeTrey, Konstanz, Germany) will be used as the control.

Materials and Methods

Tooth Selection and Preparation

Fifty extracted single-rooted human teeth were used for this study. Each tooth was subjected to a proximal radiograph to verify the presence of a single canal. Criteria for tooth selection included a completely formed apex and the absence of root canal filling or resorption. The external surfaces of the teeth were cleaned with gauze and sodium hypochlorite (NaOCl). Each tooth was sectioned at the cementoenamel junction with a low speed diamond blade, and the roots were then stored in saline. The root canal was negotiated with a size 10 stainless steel endodontic file (FlexoFiles; Dentsply Maillefer, Johnson City, TN) until visualized at the apical foramen. This length was recorded, and the working length was established by subtracting 1 mm from the recorded length. All canals were instrumented to the working length using 0.06 taper nickel-titanium rotary instruments (EndoSequence, Brasseler USA) to an apical size of 0.50 mm. Canals were irrigated with 5.25% NaOCl throughout instrumentation with a side-vented needle at the

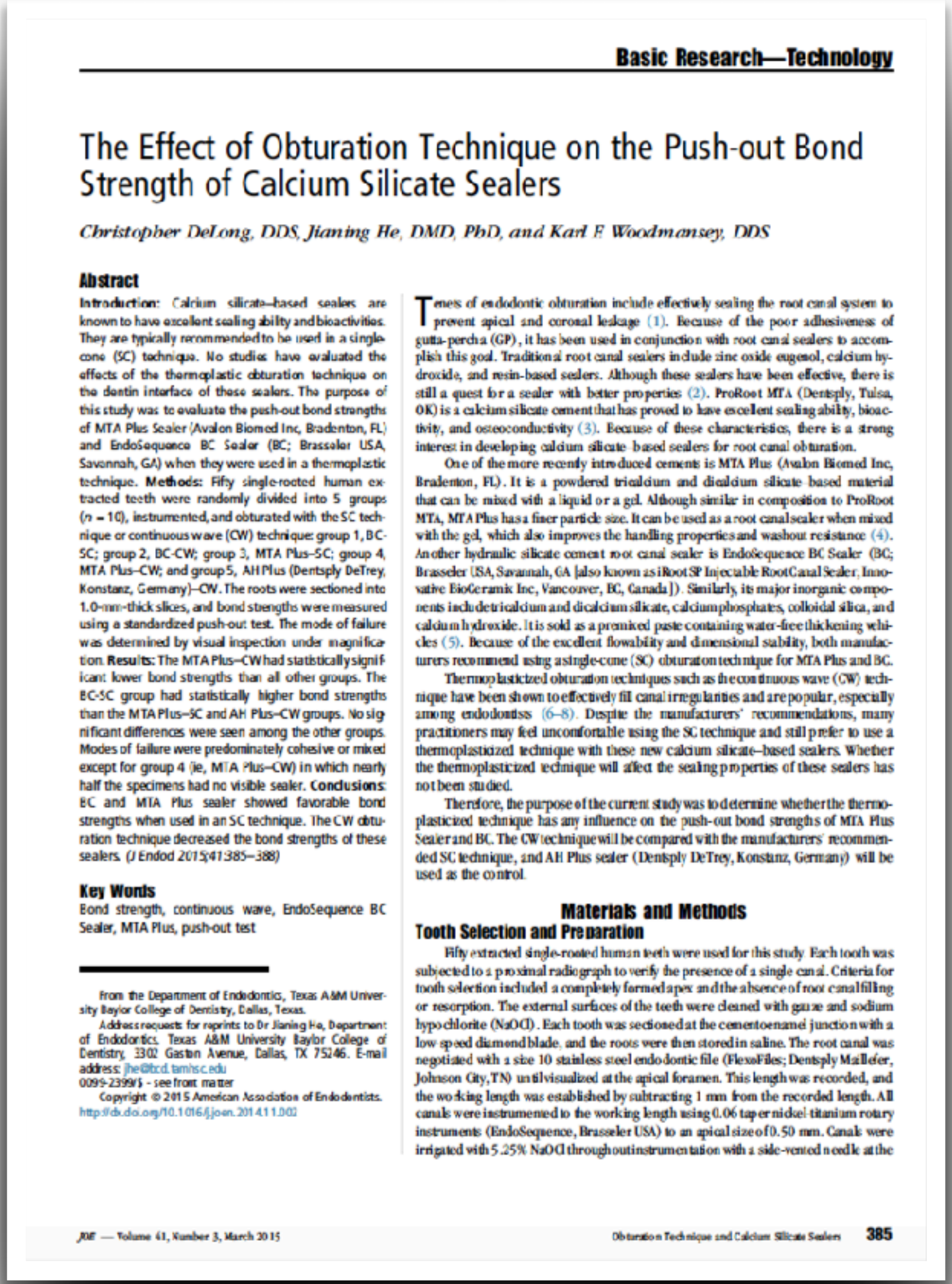
TABLE 1. Mean and Median Bond Strength Values (Mpa) and Standard Deviation (SD)

Group	Formulation	Mean	Median	SD
1 (n = 30)	BC-SC	3.43	3.40	0.85
2 (n = 30)	BC-CW	2.86	3.13	2.02
3 (n = 31)	MTA Plus–SC	2.27	2.33	0.78
4 (n = 34)	MTA Plus–CW	0.98	0.54	1.16
5 (n = 27)	AH Plus–CW	2.57	2.63	1.02

BC, EndoSequence BC sealer; CW, continuous wave; SC, single cone.

DELONG JIANING 2015

Otturazione Canalare: Condensazione idraulica



The Effect of Obturation Technique on the Push-out Bond Strength of Calcium Silicate Sealers

Christopher DeLong, DDS, Jianing He, DMD, PhD, and Karl F. Woodmansey, DDS

Abstract

Introduction: Calcium silicate–based sealers are known to have excellent sealing ability and bioactivities. They are typically recommended to be used in a single-cone (SC) technique. No studies have evaluated the effects of the thermoplastic obturation technique on the dentin interface of these sealers. The purpose of this study was to evaluate the push-out bond strengths of MTA Plus Sealer (Avalon Biomed Inc, Bradenton, FL) and EndoSequence BC Sealer (BC; Brasseler USA, Savannah, GA) when they were used in a thermoplastic technique. **Methods:** Fifty single-rooted human extracted teeth were randomly divided into 5 groups ($n = 10$), instrumented, and obturated with the SC technique or continuous wave (CW) technique: group 1, BC-SC; group 2, BC-CW; group 3, MTA Plus–SC; group 4, MTA Plus–CW; and group 5, AH Plus (Dentsply DeTrey, Konstanz, Germany)–CW. The roots were sectioned into 1.0-mm-thick slices, and bond strengths were measured using a standardized push-out test. The mode of failure was determined by visual inspection under magnification. **Results:** The MTA Plus–CW had statistically significant lower bond strengths than all other groups. The BC-SC group had statistically higher bond strengths than the MTA Plus–SC and AH Plus–CW groups. No significant differences were seen among the other groups. Modes of failure were predominately cohesive or mixed except for group 4 (ie, MTA Plus–CW) in which nearly half the specimens had no visible sealer. **Conclusions:** BC and MTA Plus sealer showed favorable bond strengths when used in an SC technique. The CW obturation technique decreased the bond strengths of these sealers. *(J Endod 2015;41:385–388)*

Key Words

Bond strength, continuous wave, EndoSequence BC Sealer, MTA Plus, push-out test

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BIOCERAMIC SEALER SHOWED FAVORABLE BOND STRENGTHS WHEN USED IN AN SC TECHNIQUE.
THE CW OBTURATION TECHNIQUE DECREASED THE BOND STRENGTHS OF THESE SEALERS.

DELONG JIANING 2015

Otturazione Canalare: Condensazione idraulica

THE CHOICE OF SEALER SHOULD BE CONSIDERED WHEN SELECTING THE OBTURATION TECHNIQUE. THE USE OF EXPERIMENTAL TRICALCIUM SILICATE–BASED SEALER IS RECOMMENDED FOR OBTURATIONS USING COLD LATERALLY CONDENSED GUTTA-PERCHA. THIS NOVEL SEALER EXHIBITS THE FORMATION OF CALCIUM HYDROXIDE ON HYDRATION AND THUS WOULD POTENTIALLY PROMOTE BIOACTIVITY AND ADHESION TO THE CANAL WALL THROUGH MINERAL TAGS.

Sealers and Warm Gutta-percha Obturation Techniques

Josette Camilleri, BChD, MPhil, PhD, FADM, FIMMM

Abstract

Introduction: Warm vertically compacted gutta-percha obturation techniques use root canal sealers that are heated during the obturation. This study aims at investigating the suitability of selected sealers with warm gutta-percha obturation techniques. **Methods:** The composition of an experimental sealer (Septodont; Saint Maur-des-Fosses, France), MTA Fillapex (Angelus, Londrina, Brazil), Apexit Plus (Ivoclar, Schaan, Lichtenstein), and AH Plus (Dentsply International, Addlestone, UK) was assessed by scanning electron microscopic and energy-dispersive spectroscopic analysis. The effect of temperature during warm vertical compaction technique was investigated by testing the sealers' properties after 1 minute to 100°C or 37°C. The reaction products after setting were assessed by X-ray diffraction analysis and Fourier transform infrared spectroscopy. Changes in setting time, flow, and film thickness were determined using ISO 6876 (2012) specifications. **Results:** The experimental tricalcium silicate–based sealer and Apexit Plus contained calcium hydroxide peaks after setting, which were absent in MTA Fillapex. The properties of AH Plus and the experimental sealer were modified by heat; the setting time was reduced, and film thickness increased. AH Plus had diminished N-H groups when heated to 100°C for 1 minute. MTA Fillapex, Septodont sealer, and Apexit Plus were unaffected by heat application. **Conclusions:** The choice of sealer should be considered when selecting the obturation technique. The Septodont sealer is recommended for obturations using cold laterally condensed gutta-percha, whereas MTA Fillapex and Apexit Plus were suitable with warm gutta-percha obturation techniques. *(J Endod 2015;41:72–78)*

Key Words

AH Plus, Apexit Plus, characterization, MTA Fillapex, physical properties, root canal sealers, Septodont experimental tricalcium silicate–based sealer, warm vertical compaction

Obturation of the root canal involves the use of gutta-percha in combination with root canal sealer to provide an adequate seal. The use of sealer is necessary to fill voids and gaps between the main material and the root canal walls. Without a sealer, canal obturations exhibit greater leakage (1, 2).

Warm gutta-percha obturation techniques have been developed to produce 3-dimensional root canal obturations because thermoplasticized gutta-percha can fill better canal irregularities than solid gutta-percha points (3). The phase changes of gutta-percha as a function of temperature have been reported, and gutta-percha exhibits 2 phase changes with a rise in temperature; namely, it goes from beta to alpha phase and then amorphous and from amorphous to beta on cooling (4–6). The maximum temperature required to achieve the amorphous phase in gutta-percha is 60°C (5). Regardless of the low temperature required to cause phase changes in gutta-percha, most thermoplasticized systems operate at 200°C. The temperature at the tip of the pluggers is much lower than the temperature of 200°C set on the liquid crystal display. Previous research on different thermoplasticized gutta-percha units reported temperatures approximately 50°C below the liquid crystal display readout when settings were above 200°C (7). The highest temperature reported in 0.06 taper System B Pluggers (SybronEndo, Orange, CA) was 80°C at the shank, whereas lower temperatures were measured at the tip and middle part of the plugger (8).

The effect of temperatures during warm vertical compaction on root canal sealers has not been extensively investigated. The effects of temperature on AH Plus (Dentsply International, Addlestone, UK), MTA Fillapex (Angelus, Londrina, Brazil), pulp canal sealer, and a prototype resin-based material have recently been reported (8). AH Plus obturations caused higher temperatures at the external root surface, and the chemical composition of AH Plus sealer was affected by high temperature. Analysis of heated AH Plus showed variations in the high-frequency part of the infrared spectrum between 4000 and 1300/cm. The stretching vibration of the nitrogen to hydrogen bond (N-H) group present at 2900/cm was absent after heat was applied (8, 9) AH Plus contains dibenzyldiamine, aminoadamantane, and tricyclodecane-diamine in paste B. These polyamines act as initiators and react with the resins in paste A, resulting in polymerization. The heat seems to disintegrate these phases. The amines present in a prototype epoxy resin–based sealer were unaffected (9). Furthermore, a reduction in sealer setting time and strength was observed. The heat did not affect the pulp canal sealer or MTA Fillapex (8).

Investigation of MTA Plus, AH Plus, and 2 prototypes based on radiopacified tricalcium silicate using water or epoxy resin as vehicles showed that although the water-based prototype sealer and MTA Plus had a similar chemical composition, MTA Plus was unaffected by heat application as opposed to the prototype water-based sealer, which exhibited flattening out of the O-H stretching vibration at 3400/cm. The application of heat evaporated the water present in the sealer composition (9). Sealer porosity was considerably reduced in all sealer types (9).

Recently, a novel tricalcium silicate–based sealer has been introduced by Septodont (Saint Maur-des-Fosses, France). According to the manufacturer, this sealer is

From the Department of Restorative Dentistry, Faculty of Dental Surgery, University of Malta, Malta.

Address requests for reprints to Prof Josette Camilleri, Department of Restorative Dentistry, Faculty of Dental Surgery, University of Malta, Medical School, Mater Dei Hospital, Msida MSD 2090, Malta. E-mail address: josette.camilleri@um.edu.mt

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CAMILLERI 2015

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Otturazione Canalare: Condensazione idraulica

BIOCERAMICO

FILLER

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Condensazione idraulica

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ITALIAN MANUFACTURER

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Remake Root HT

Pre-mixed bioceramic sealant.

FLOW hydraulic cement based on calcium aluminosilicate.

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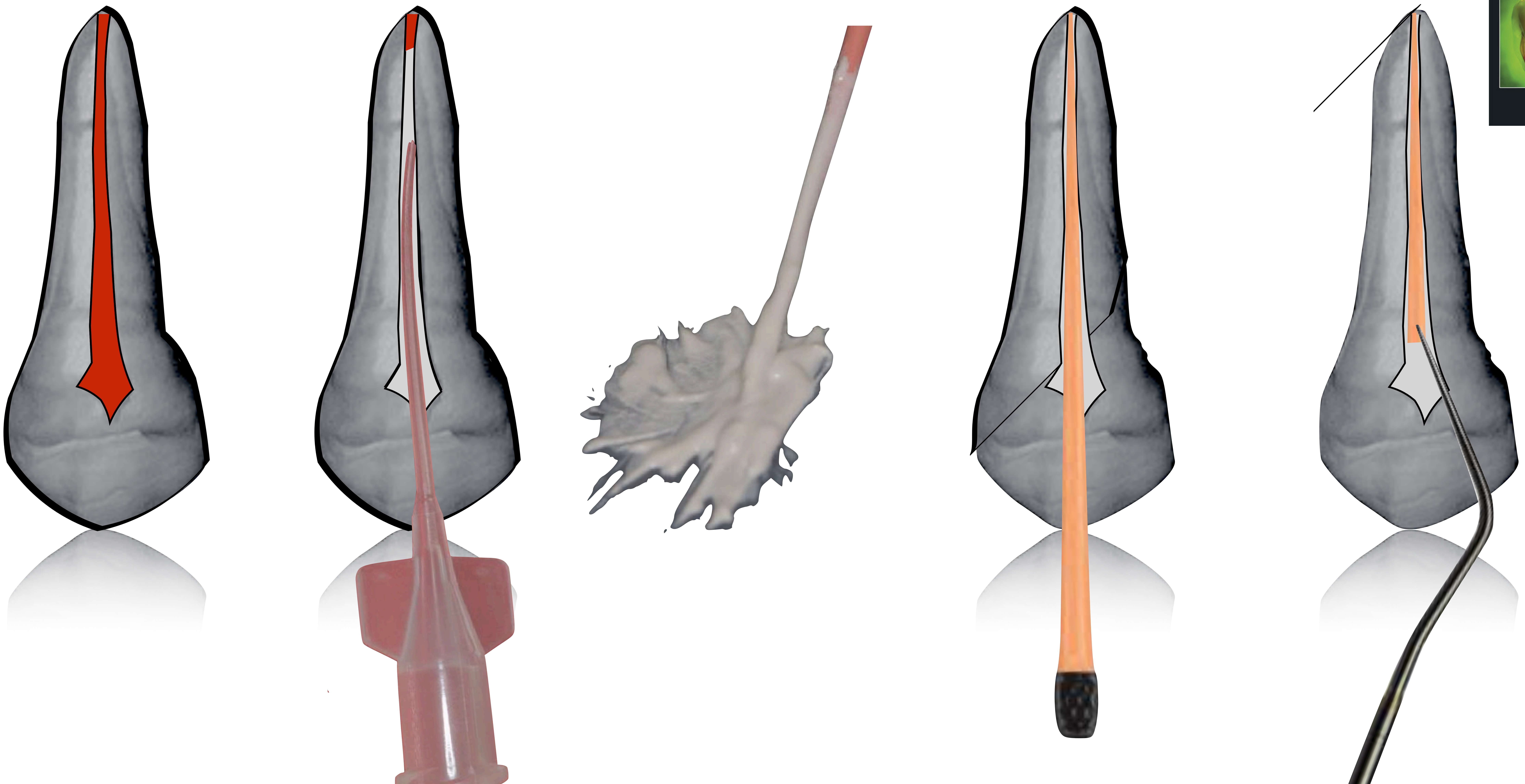
- Three-dimensional adherent sealing
- Generation of hydroxyapatite
- Chemical bonding to gutta-percha and dentin
- Setting time: work (25 min.)
- Setting time: total (2.5 hours)
- No contraction
- Wet field activation
- Resistance 100 MPa

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

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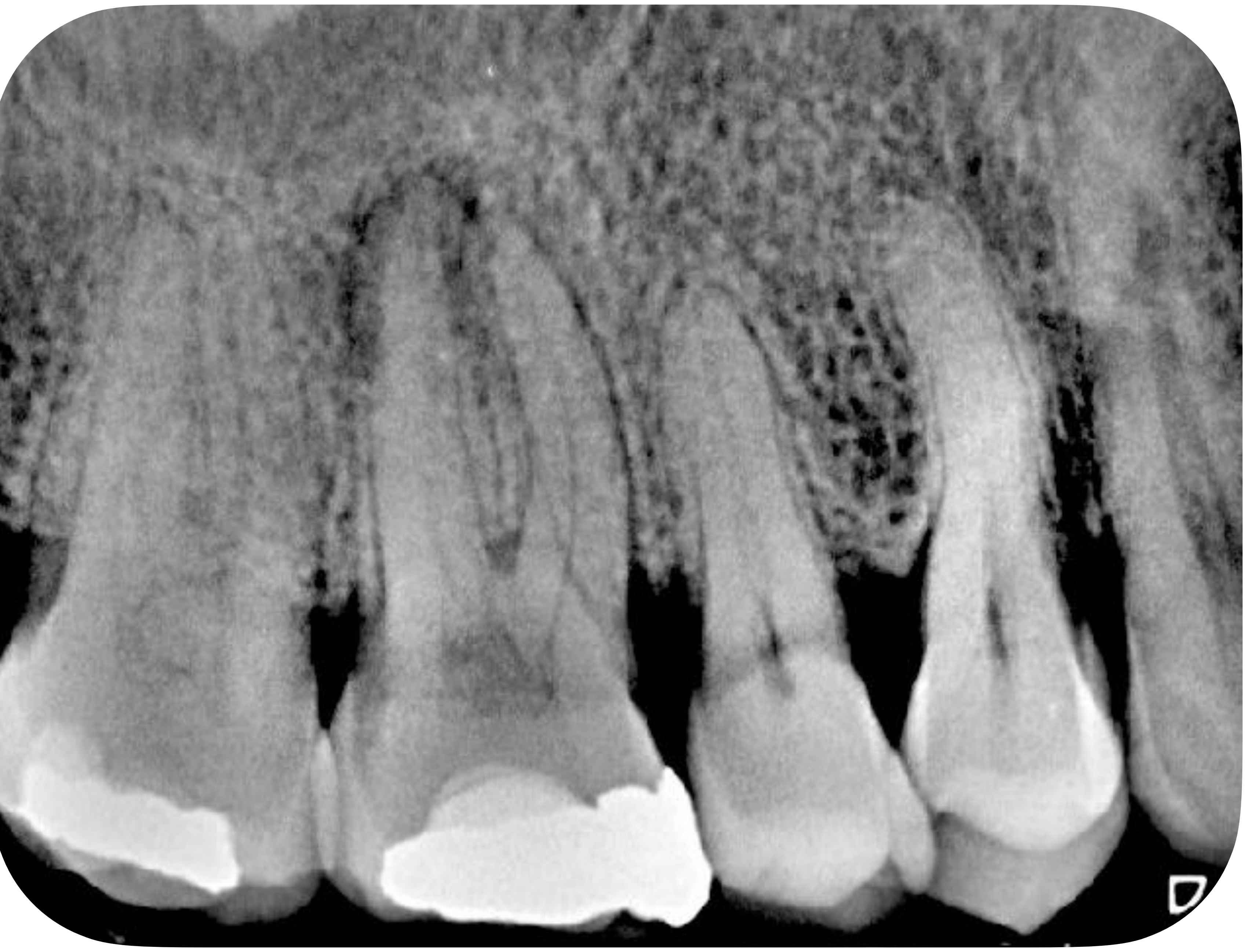
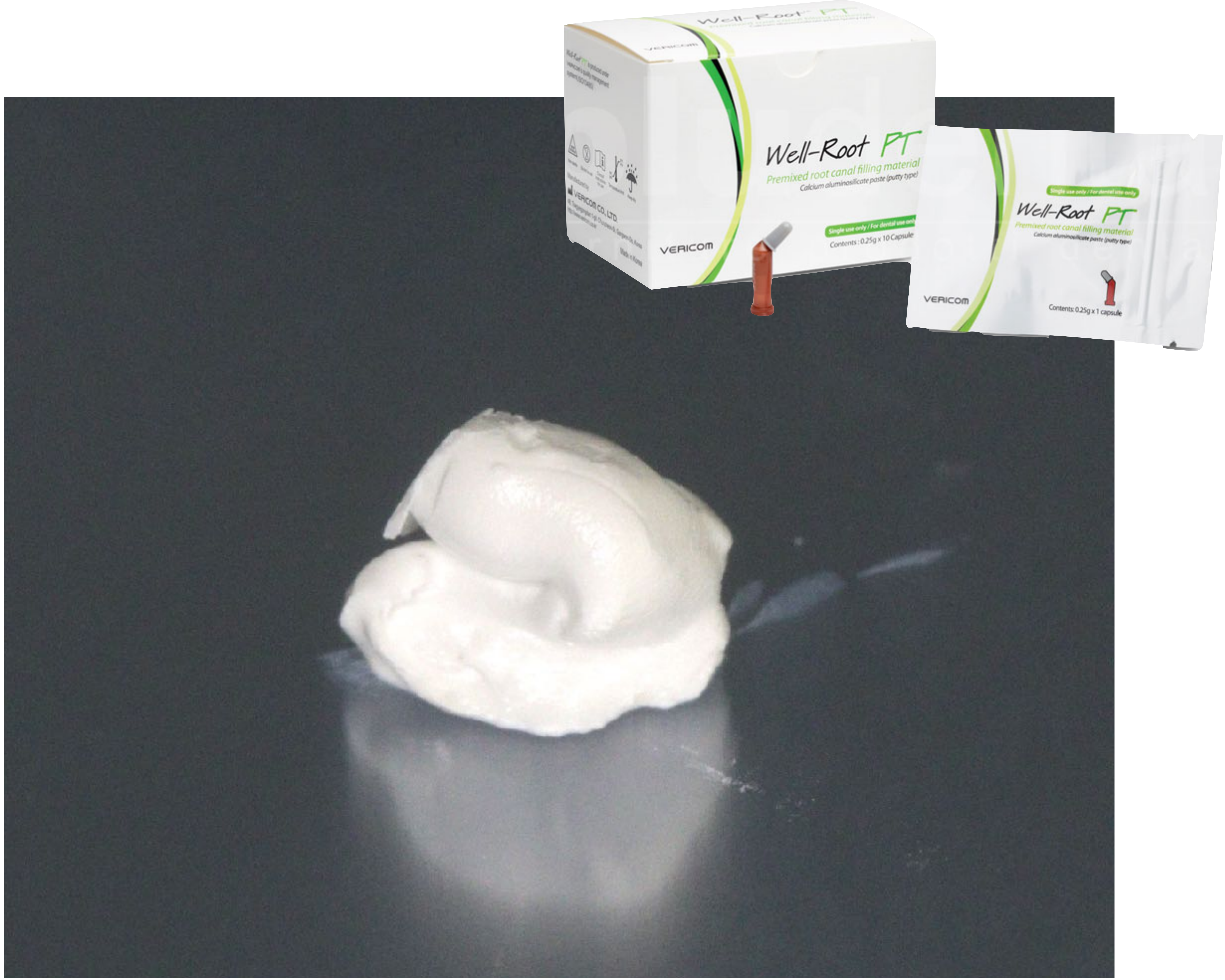


BIOCERAMIC PUTTY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Single use only / For dental use only
Contents : 0.25g x 10 Capsule
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Well-Root PT
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Calcium aluminosilicate paste (putty type)
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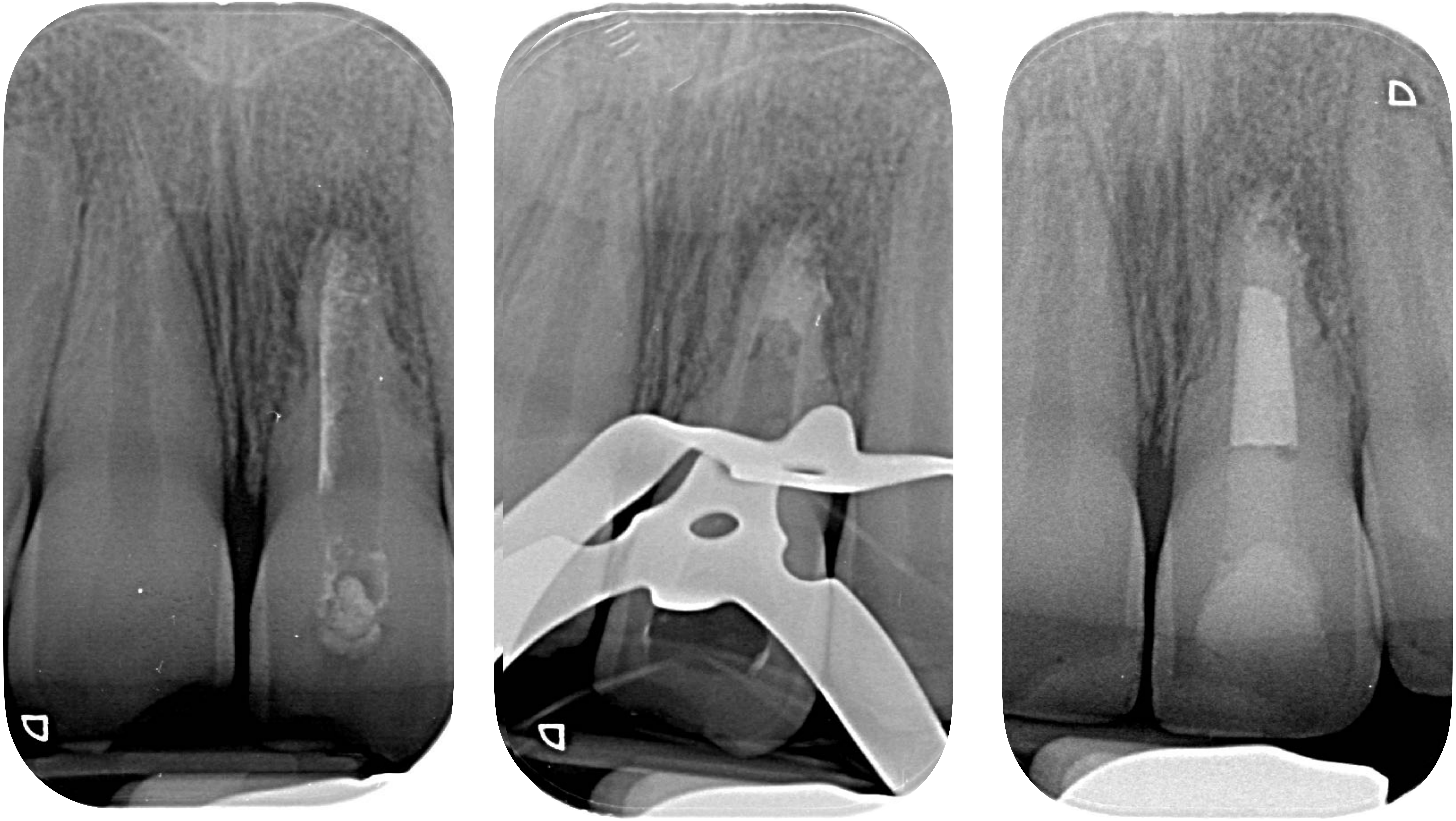

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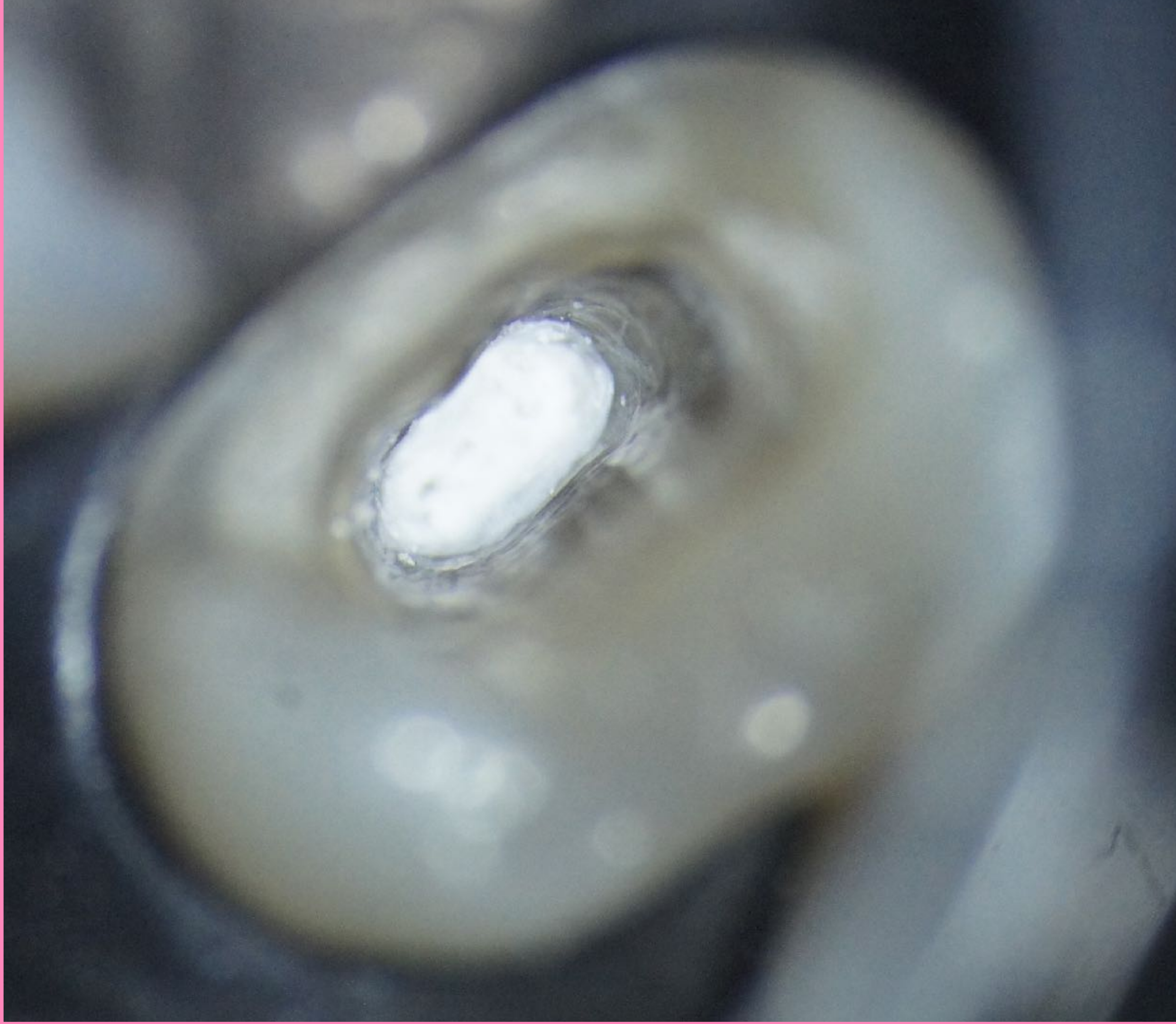
APICAL PLUG



APICAL PLUG: SEQUENZA OPERATIVA

- Anestesia ed isolamento del campo operatorio
- Terapia cnanalare completa fino alla LL, detersione accurata
- Asciugatura ed eventuale applicazione di barriera riassorbibile oltre apice
- Mta o Cemento bioceramico Putty posizionato con plugger, anime del termafill, coni di carta o appositi portatori
- Cotone o coni di carta umidi per permettere indurimento del bioceramico
- Otturazione provvisoria
- Verifica dell'indurimento del bioceramico dopo 24-48...o più (il bioceramico potrebbe non indurire in ambiente con Ph acido)
- Backfill in gutta
- Rx finale e controlli radiografici periodici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KEY POINT

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gfumei@tiscali.it

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