

“UTILIZZO DI LE LEGHE TRATTATE
TERMICAMENTE NELLA
SAGOMATURA MINI INVASIVA -

Your Endo Guide

Practical. Innovative. Leading the way.



AIE ACCADEMIA
ITALIANA
ENDODONZIA

ShapeIT



Fabio_PiccottiDDS

LA STRUMENTAZIONE NON MODIFICA I PRINCIPI BASE DELL' ENDODONZIA



Endodonzia

E DETERSIONE DI UNO SPAZIO
ANATOMICO COMPLESSO



obiettivi del trattamento

MECCANICI

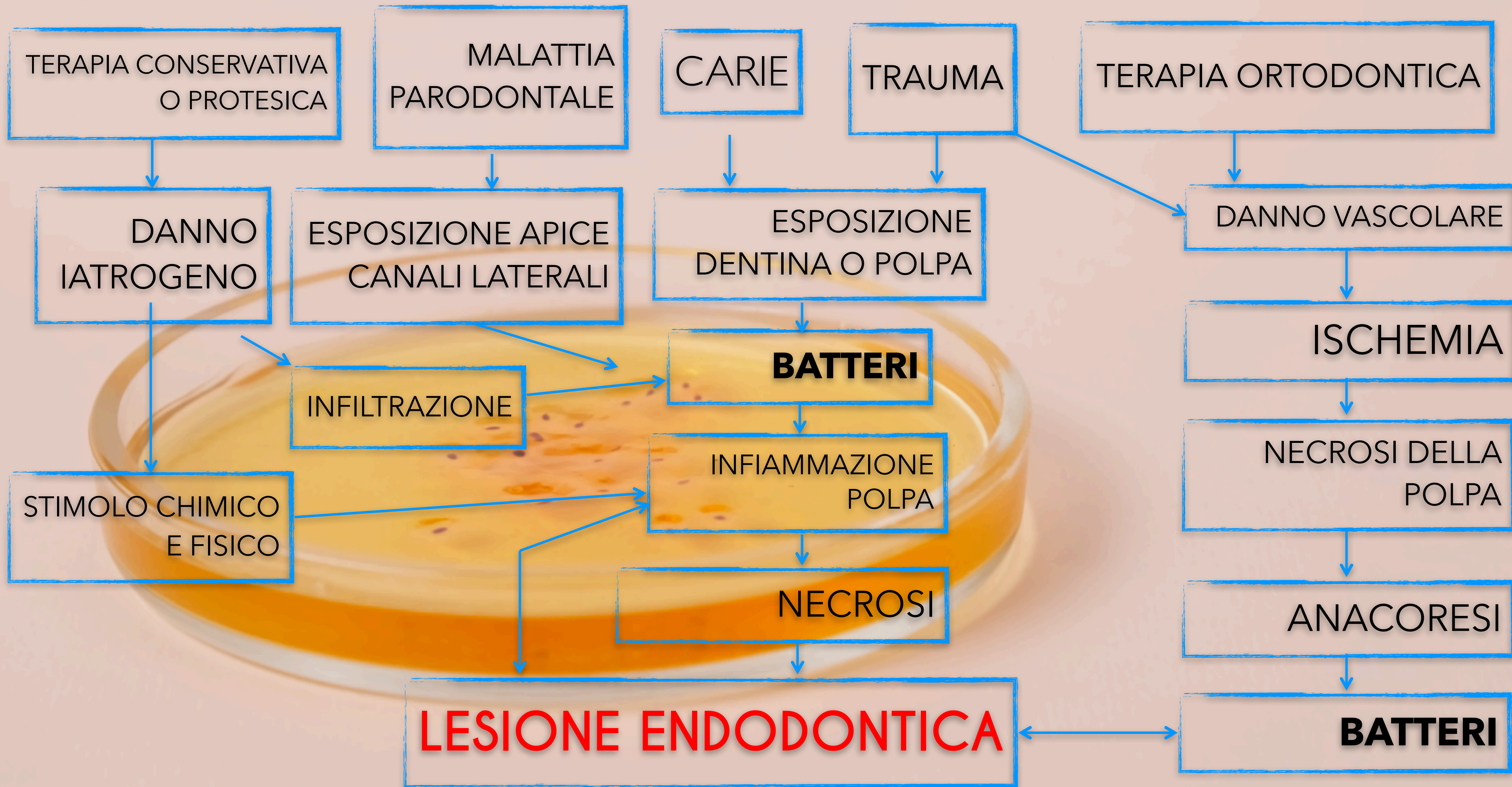
- * CONICITA CONTINUA DA CORONA AD APICE
- * PRESERVARE LE CURVATURE DEL CANALE
- * PRESERVARE IL DIAMETRO APICALE

BIOLOGICI

- * RIMUOVERE LA POLPA MALATA
- * RIDURRE LA CARICA BATTERICA

“BACTERIA ARE
RESPONSABLE FOR EVERY
ENDODONTIC LESION”

KAKEHASHI 1965



ENDO SUCCESS RATE

81,5% TORABINEJAD

75-85% STRICT/LOOSE CRITERIA
NG

86-93% SURVIVAL RATE

ENDO SUCCESS
RATE

TOOTH SURVIVAL FOLLOWING NON-SURGICAL ROOT CANAL TREATMENT: A SYSTEMATIC REVIEW OF THE LITERATURE.
NG YL, MANN V, GULABIVALA K. INT ENDOD J. 2010 MAR;43(3):171-89

LEVELS OF EVIDENCE FOR THE OUTCOME OF NONSURGICAL ENDODONTIC TREATMENT.
TORABINEJAD M, KUTSENKO D, MACHNICK TK, ISMAIL A, NEWTON CW. J ENDOD. 2005 SEP;31(9):637-46. REVIEW

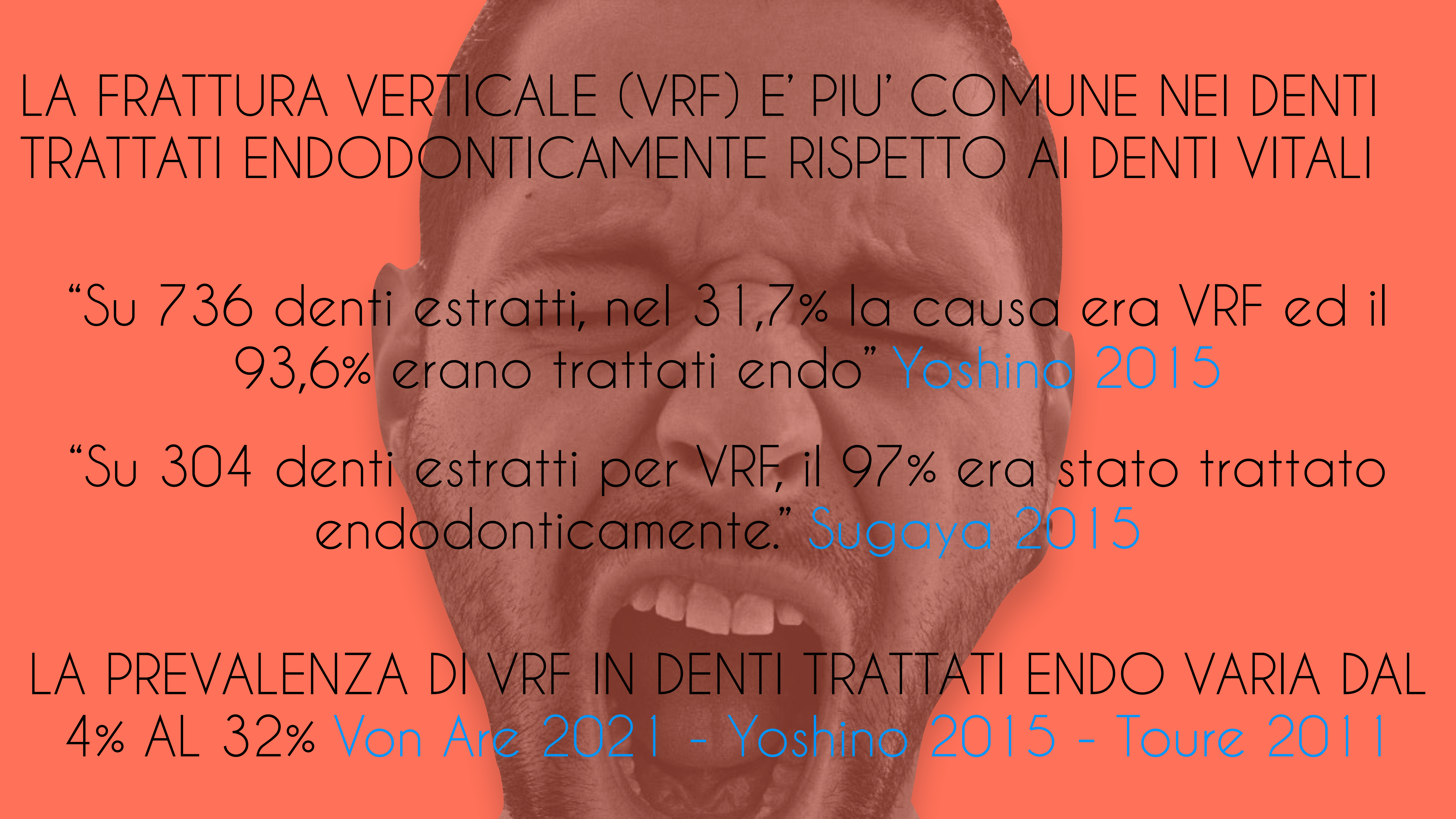
OUTCOME OF PRIMARY ROOT CANAL TREATMENT: SYSTEMATIC REVIEW OF THE LITERATURE - PART 1. EFFECTS OF STUDY CHARACTERISTICS
ON PROBABILITY OF SUCCESS.
NG YL, MANN V, RAHBARAN S, LEWSEY J, GULABIVALA K. INT ENDOD J. 2007 DEC;40(12):921-39.

ENDO SUCCESS RATE

89.7% NOT SKILLED DENTISTS vs 98.1%
ENDODONTISTS

LO STRUMENTARIO e l'OPERATORE INCIDE
SULLA QUALITA' DEL RISULTATO





LA FRATTURA VERTICALE (VRF) E' PIU' COMUNE NEI DENTI TRATTATI ENDODONTICAMENTE RISPETTO AI DENTI VITALI

“Su 736 denti estratti, nel 31,7% la causa era VRF ed il 93,6% erano trattati endo” [Yoshino 2015](#)

“Su 304 denti estratti per VRF, il 97% era stato trattato endodonticamente.” [Sugaya 2015](#)

LA PREVALENZA DI VRF IN DENTI TRATTATI ENDO VARIA DAL 4% AL 32% [Von Aré 2021](#) - [Yoshino 2015](#) - [Toure 2011](#)



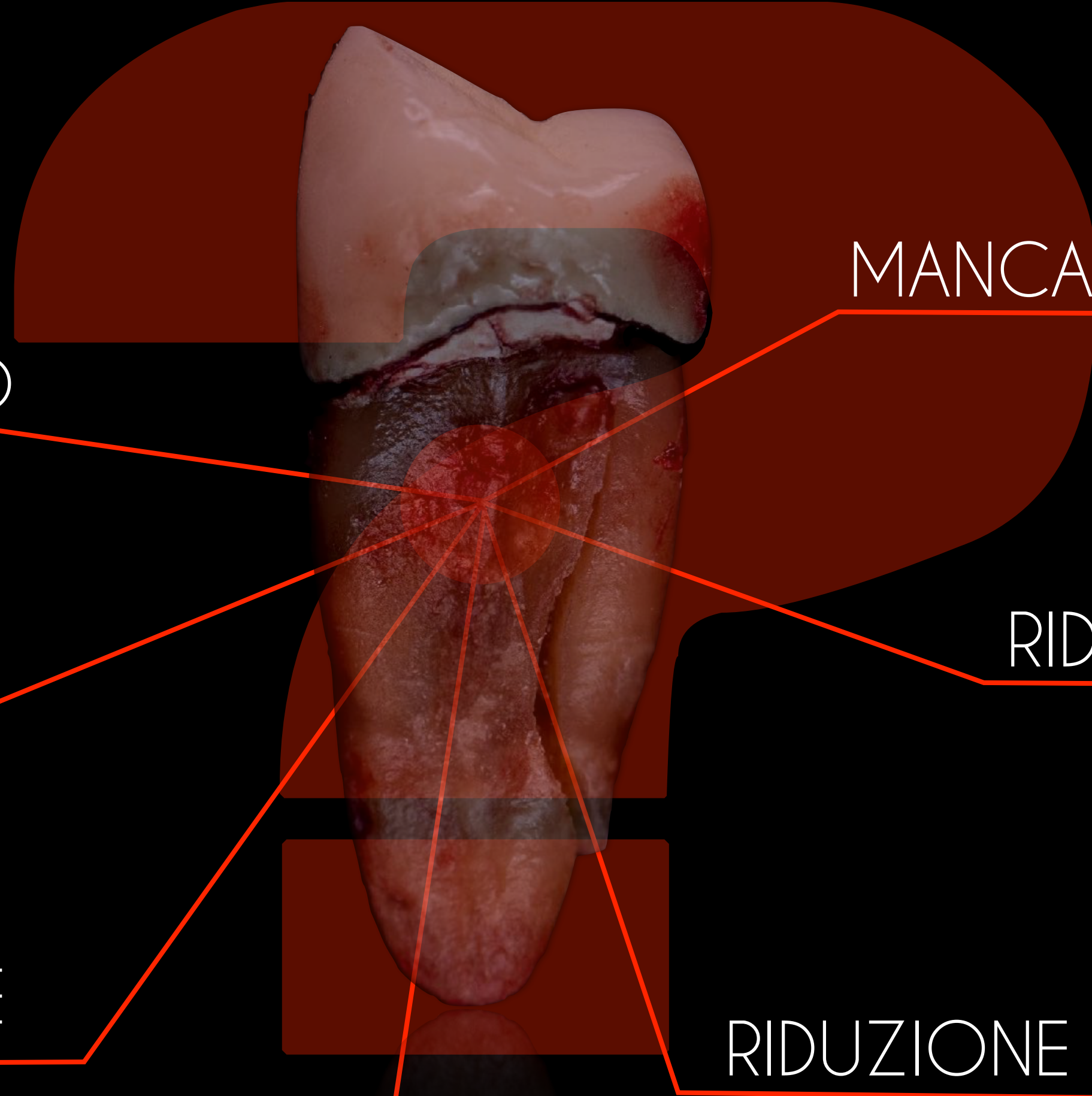
DOPO 20 ANNI, LA VFR È STATA LA
CAUSA MAGGIORE DI FALLIMENTO

48%

- VRF 48%
- Progressione Parodontite 31%
- Carie 11%
- Frattura Orizzontale 4%
- Fallimento endodontico 3%
- Wash Out cemento 3%

Di Febo 2015

CAUSE VRF NEI DENTI TRATTATI ENDODONTICAMENTE:



MANCATA COPERTURA CUSPIDALE

TRATTAMENTO ENDODONTICO

GEOMETRIA DEL CANALE

RIDOTTA PROPRIOCEZIONE

PARAFUNZIONI & POSIZIONE

RIDUZIONE QUOTA ACQUA

MICROCRACKS

TRATTAMENTO ENDODONTICO



COPERTURA CUSPIDALE

APERTURA CAMERA

SAGOMATURA CANALI

COPERTURA CUSPIDALE

97% DEI DENTI TRATTATI CON COPERTURA CUSPIDALE
SOPRAVVIVE A 8 ANNI

85% DEI DENTI ESTRATTI NON AVEVA COPERTURA
CUSPIDALE

Lazaraski 2004

I DENTI CHE GODONO DI UNA COPERTURA CUSPIDALE
OLTRE I 4 MESI DAL TRATTAMENTO ENDODONTICO
HANNO UN RISCHIO DI ESSERE ESTRATTI QUASI 3 VOLTE
SUPERIORE AI DENTI CHE SONO RESTAURATI PRIMA DEI
4 MESI

Pratt 2016





APERTURA CAMERA

LA MAGGIOR PARTE DEGLI STUDI DIMOSTRANO CHE
VARIAZIONI NELLA DIMENSIONE DELL'ACCESSO ALLA
CAMERA PULPARE NON DETERMINANO DIFFERENZE
STATISTICHE NELLA RESISTENZA AL CARICO DEL DENTE

Plotino 2017 - Rover 2017 - Sabeti 2018 - Augusto
2020 - Barbosa 2020 - Lima 2021



REVIEW

Current status on minimal access cavity preparations: a critical analysis and a proposal for a universal nomenclature

E.J.N.L. Silva^{1,2,3} , K.P. Pinto², C.M. Ferreira² , F.G. Belladonna³ , G. De-Deus³ ,
P.M.H. Dummer⁴  & M.A. Versiani³ 

¹Department of Endodontics, School of Dentistry, Grande Rio University (UNIGRANRIO), Rio de Janeiro, RJ; ²Department of Endodontics, School of Dentistry, Rio de Janeiro State University (UERJ), Rio de Janeiro, RJ; ³Department of Endodontics, School of Dentistry, Fluminense Federal University (UFF), Niterói, RJ, Brazil; and ⁴School of Dentistry, College of Biomedical and Life Sciences, Cardiff University, Cardiff, UK

Keywords: conservative endodontic cavity, endodontics, fracture resistance, minimal access cavity preparation, minimally invasive access cavity, root canal treatment.

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REVIEW

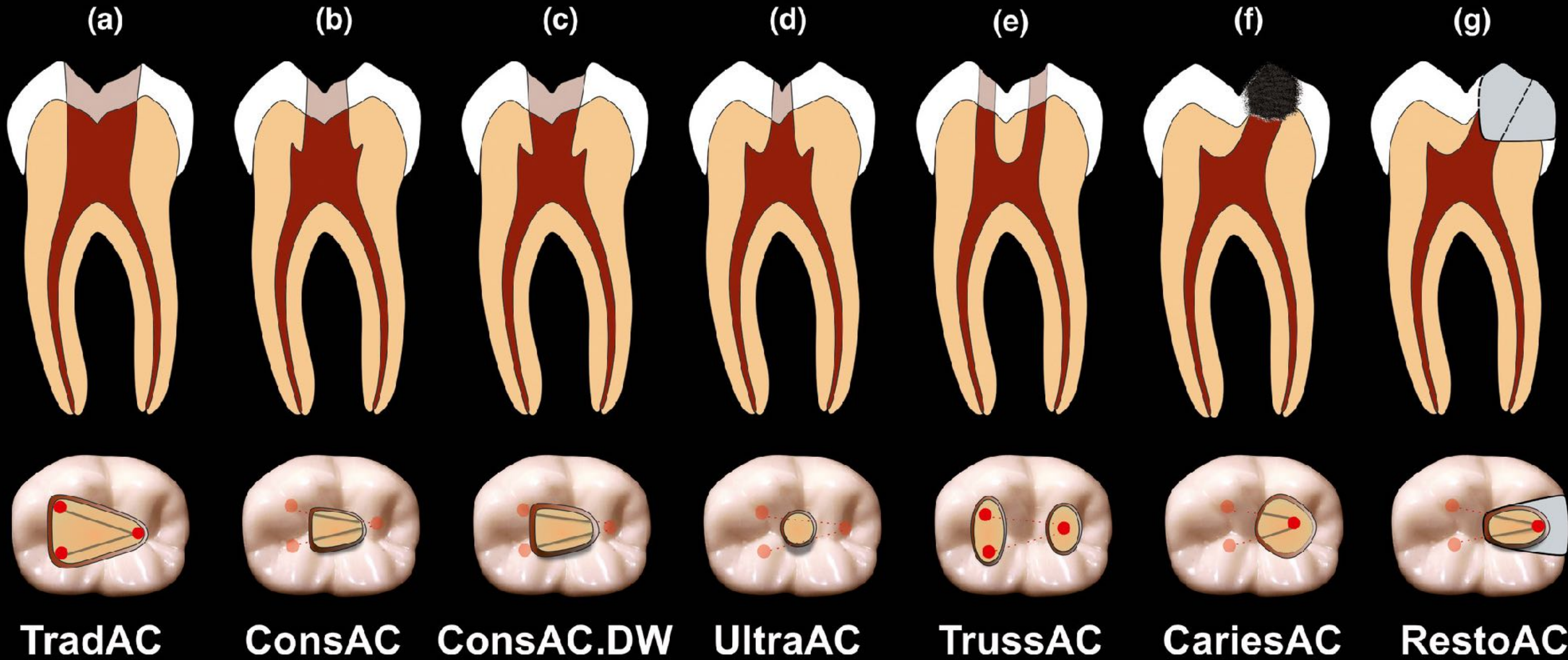
Current status on minimal access cavity preparations: a critical analysis and a proposal for a universal nomenclature

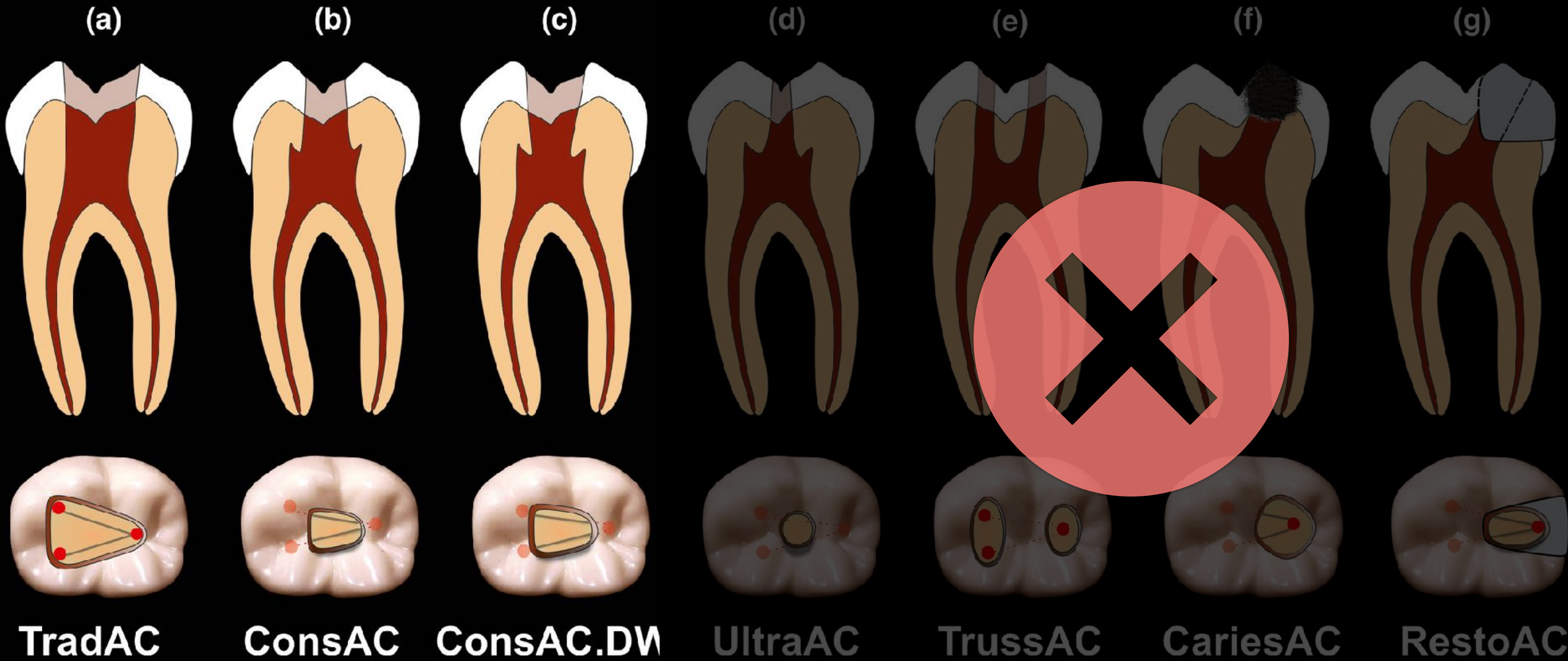
E.J.N.L. Silva^{1,2,3} , K.P. Pinto², C.M. Ferreira² , F.G. Belladonna³ , G. De-Deus³ , P.M.H. Dummer⁴  & M.A. Versiani³ 

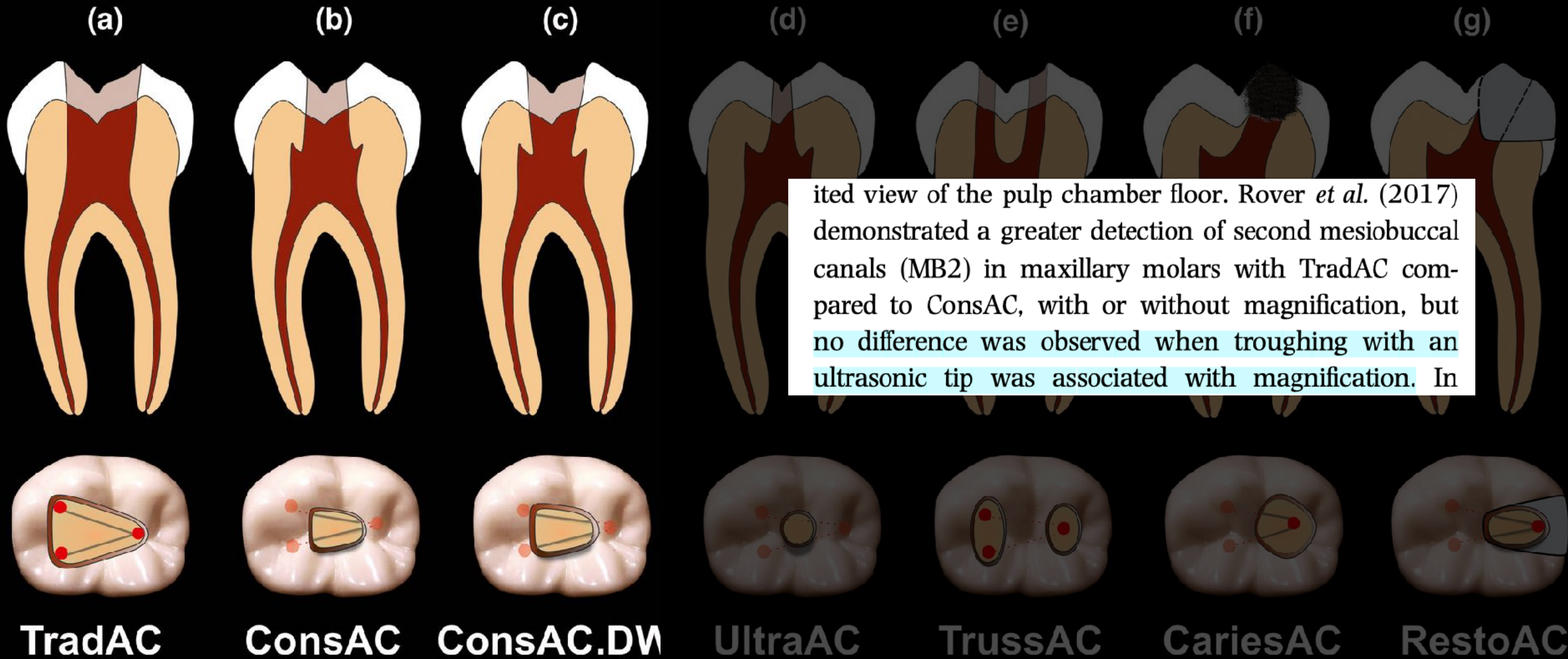
¹Department of Endodontics, School of Dentistry, Grande Rio University (UNIGRANRIO), Rio de Janeiro, RJ; ²Department of Endodontics, School of Dentistry, Rio de Janeiro State University (UERJ), Rio de Janeiro, RJ; ³Department of Endodontics, School of Dentistry, Fluminense Federal University (UFF), Niterói, RJ, Brazil; and ⁴School of Dentistry, College of Biomedical and Life Sciences, Cardiff University, Cardiff, UK

Endodontics, was also performed. The initial search retrieved 1831 publications. The titles and abstracts of these papers were reviewed, and the full text of 94 studies was assessed. Finally, a total of 28 studies were identified as evaluating the influence of minimally invasive access cavity designs on the fracture resistance of teeth

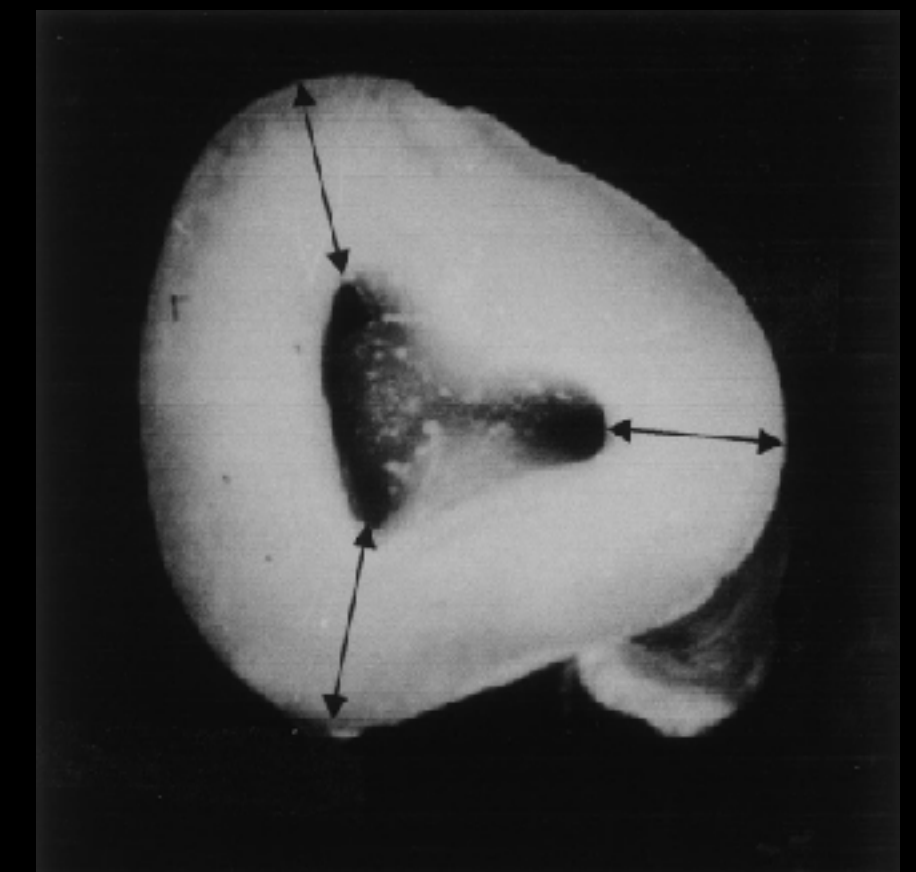
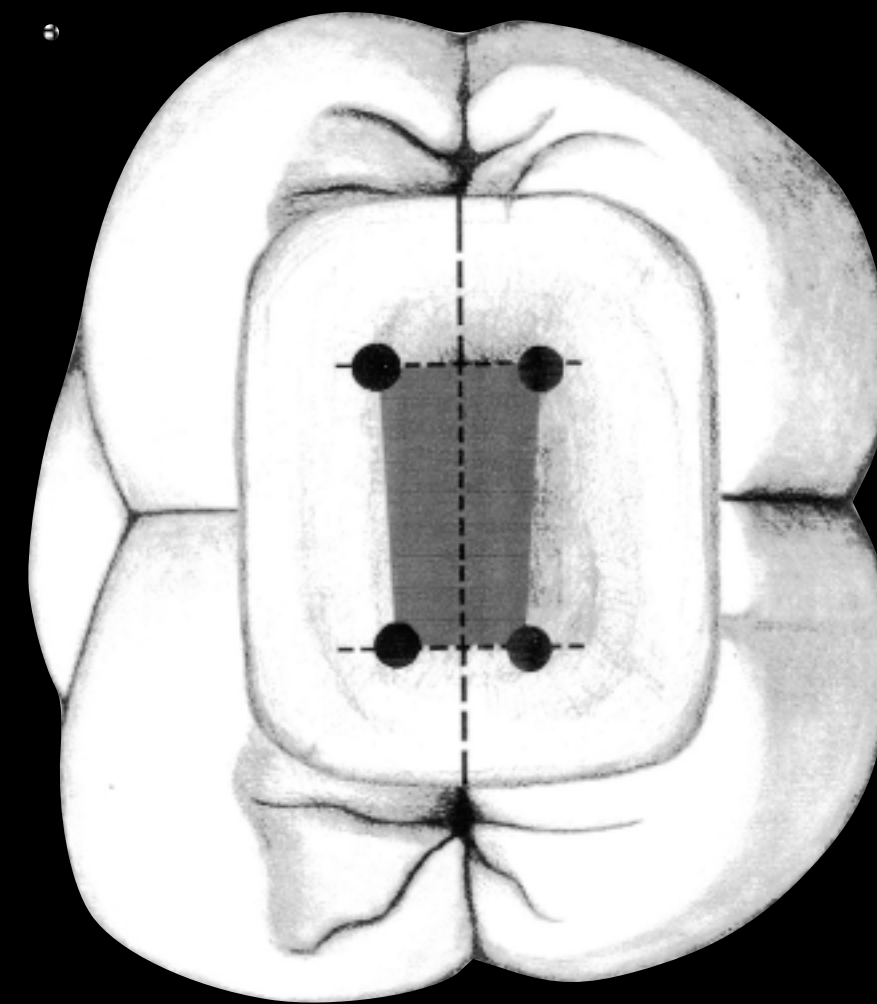
et al. 2020). Even though several articles have been published on this topic and there is substantial interest in such techniques on social media, there is a lack of scientific evidence to support the introduction of these new designs of access cavities into routine clinical practice and/or training of undergraduate and postgraduate students. Therefore, this study aimed to (a)





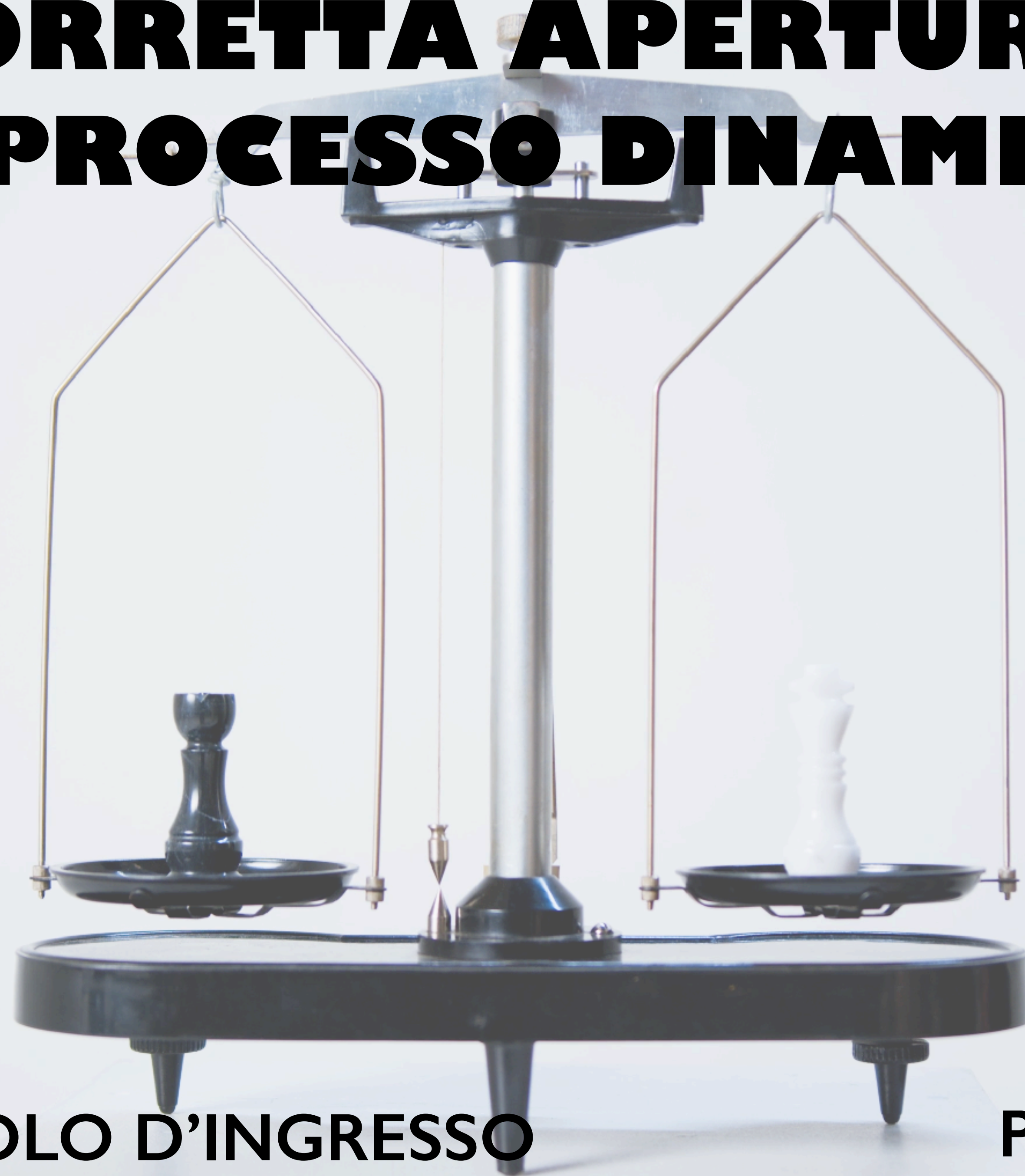


LE INDICAZIONI AD UN CORRETTO ACCESSO NON SONO CAMBIATE MOLTO IN 20 ANNI



Krasner 2003

LA CORRETTA APERTURA E' UN PROCESSO DINAMICO



**APRO DI PIU'
VEDO DI PIU'
RIDUCO ANGOLO D'INGRESSO**

PRESERVO DENTINA

Anatomy of the Pulp-Chamber Floor

Paul Krasner, DDS, and Henry J. Rankow, DDS

Locating the number and position of orifices on pulp-chamber floors can be difficult. This is especially true when the tooth being treated is heavily restored, malposed, or calcified. After evaluating 500 pulp chambers of extracted teeth, new laws for finding pulp chambers and root-canal orifices are proposed. The use of these laws can aid in the determination of the pulp-chamber position and the exact location and number of root canals in any individual tooth.

Endodontic therapy is essentially a surgical procedure, a micro-neurologic surgical procedure. Because the fundamental foundation on which all surgical procedures are performed is an intimate knowledge of anatomy, any attempt to perform endodontic therapy must be preceded with a thorough understanding of the anatomy of both the pulp chamber and the root-canal system. Attempting to treat the root-canal system without detailed anatomic description would be the equivalent of a physician looking for an appendix without ever having read *Gray's Anatomy*.

Literature describing pulp-chamber anatomy in the past has been very general and offered little specificity for determining orifice number and location. Discussions, in print and in the classroom, typically present generalizations about the average number of canals in different teeth. However, the average number of canals in a tooth is of no value when dealing with an individual tooth. Likewise, the description of the location of canal orifices has often been presented in a nonsystematic manner. Essentially, most advice has been to make an access in an appropriate position in the clinical crown and look for the orifices in the hope that they are seen. If they are not easily seen, there is little guidance for safely locating them without the danger of excessive tooth destruction or even perforation. As any experienced operator knows, looking for root-canal orifices in teeth that are heavily restored, cariously broken down, or gouged by previous accessing is very difficult. In these cases, normal anatomy is often severely distorted and the advice given in articles and textbooks is of little value.

We felt, after accessing thousands of teeth in our practices, that there are consistent, identifiable, anatomic configurations of the pulp chamber and the pulp-chamber floor. This study was undertaken to observe the anatomy of the pulp chamber and the pulp-chamber floor and to see if specific, consistent landmarks or configurations exist and are quantifiable. If these landmarks exist, then the task of locating orifices can be made more systematic and,

therefore, with greater certainty. This could aid in a rational approach to root-canal therapy.

MATERIALS AND METHODS

A total of 500 extracted, permanent, human teeth were used. The teeth were equally distributed between maxillary and mandibular anteriors, premolars, and molars. The teeth had a wide variety of crown conditions: virgin crowns, small restorations, large restorations, metal and porcelain crowns, and caries. A total of 400 teeth had their crowns cut off horizontally at the level of the CEJ so that the outline of the pulp chamber relative to the external surface of the tooth could be observed. Fifty teeth were sectioned in a buccolingual direction through the crown and the roots. Fifty teeth were sectioned in a mesiodistal direction through the crown and the roots. Each cut section was irrigated with water, dried, and examined. Two observers examined each specimen independently and recorded all observed anatomical relationships. These relationships included orifice location, size, color, and shape. These observations were then correlated and any consistent patterns were listed. Lines were drawn on horizontal sections to observe the relationships more easily.

RESULTS

Two categories of anatomic patterns were observed: relationships of the pulp chamber to the clinical crown and relationships of orifices on the pulp-chamber floor.

Relationships of the Pulp Chamber to the Clinical Crown

The following observations were noted:

1. The pulp chamber was always in the center of the tooth at the level of the CEJ (Figs. 1-3).
2. The walls of the pulp chamber were always concentric to the external surface of the crown at the level of the CEJ (Fig. 2).
3. The distance from the external surface of the clinical crown to the wall of the pulp chamber was the same throughout the circumference of the tooth at the level of the CEJ (Fig. 3).

These observations were consistent enough that several anatomic laws could be formulated:

Law of centrality: the floor of the pulp chamber is always located in the center of the tooth at the level of the CEJ (Figs. 1-3).

Law of concentricity: the walls of the pulp chamber are always



FIG 1. Cut specimen of a mandibular molar showing the centrality of the pulp chamber.

concentric to the external surface of the tooth at the level of the CEJ (Figs. 1-3).

Law of the CEJ: the CEJ is the most consistent, repeatable landmark for locating the position of the pulp chamber.

Relationships on the Pulp-chamber Floor

The following observations were noted relative to all teeth:

1. The floor of pulp chamber is always a darker color than the surrounding dentinal walls (Fig. 4A).
2. This color difference creates a distinct junction where the walls and the floor of the pulp chamber meet (Figs. 4B and 5).
3. The orifices of the root canals are always located at the junction of the walls and floor (Figs. 5 and 6).
4. The orifices of the root canals are located at the angles in the floor wall junction [Fig. 6 (A and B)].
5. The orifices lay at the terminus of developmental root fusion lines, if present [Fig. 7 (A-C)].
6. The developmental root fusion lines are darker than the floor color (Fig. 7A).
7. Reparative dentin or calcifications are lighter than the pulp-chamber floor and often obscure it and the orifices (Fig. 8).

The following observations were noted relative to all teeth except maxillary molars:

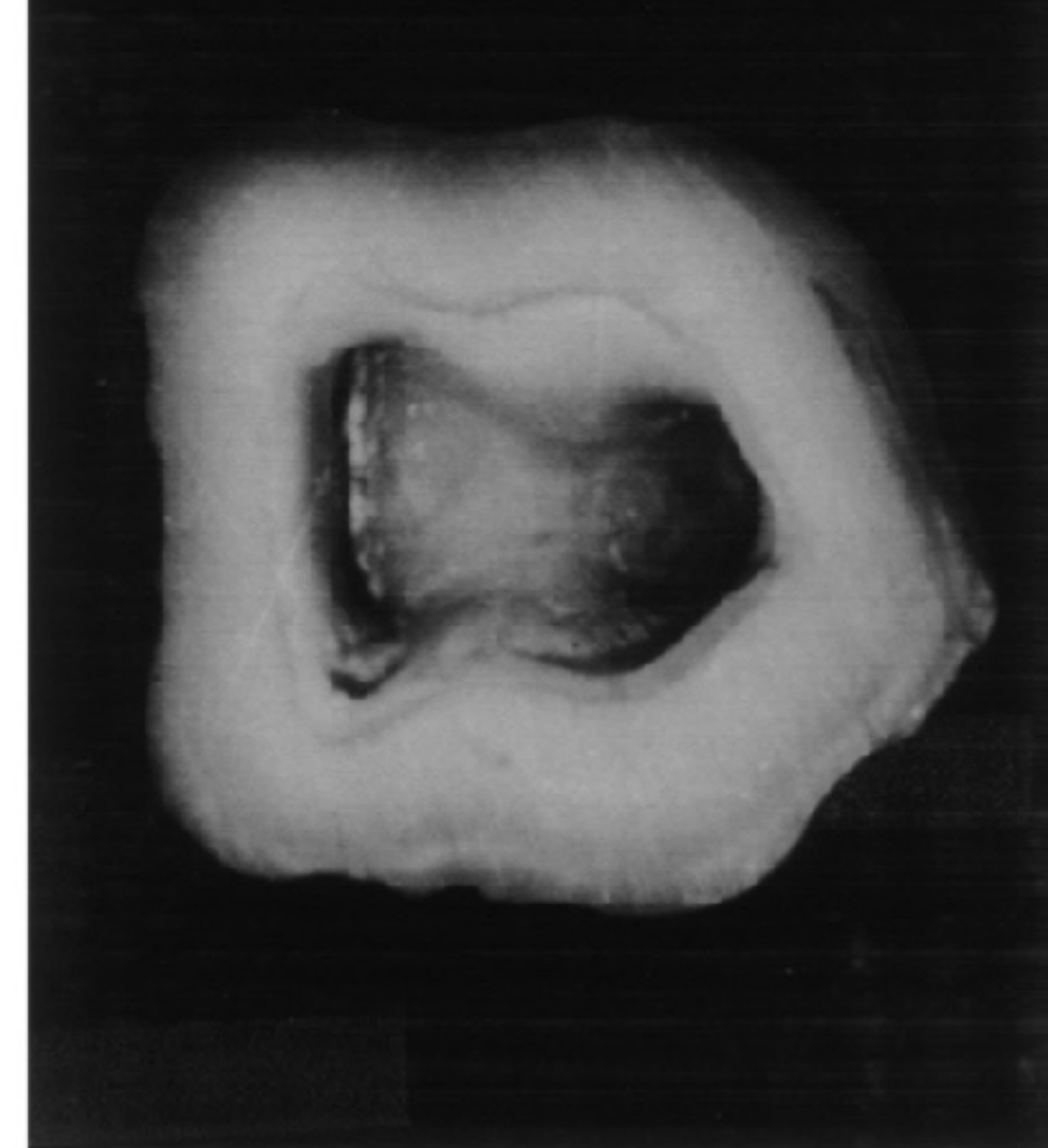


FIG 2. Cut specimen of a mandibular molar showing the concentricity of the pulp-chamber walls to the external tooth surface at the CEJ.

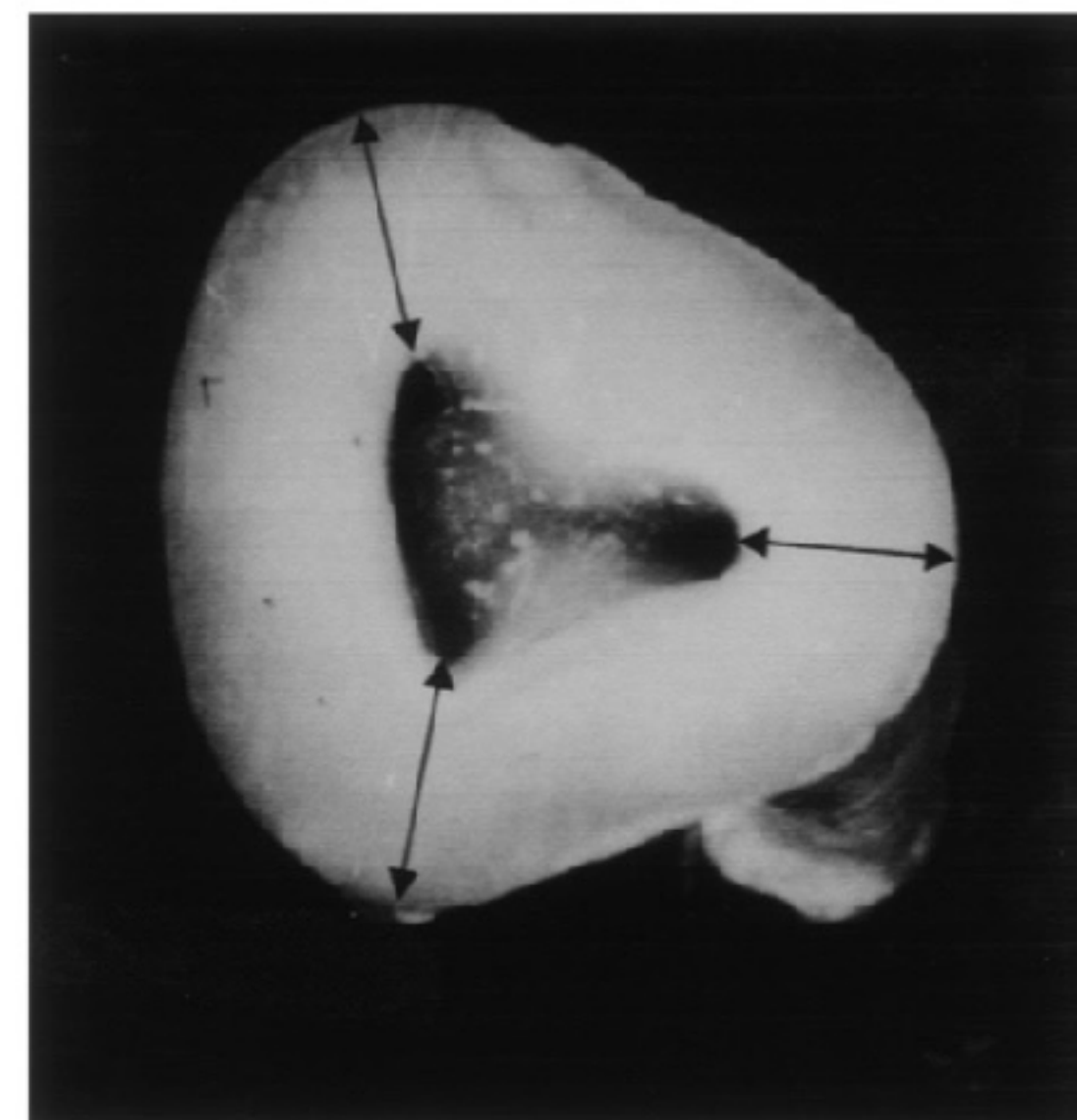


FIG 3. Cut specimen of a mandibular molar showing the equality of the distance of the pulp chamber walls from the external root surface (arrows).

Anatomy of the Pulp-Chamber Floor

Paul Krasner, DDS, and Henry J. Rankow, DDS

Locating the number and position of orifices on pulp-chamber floors can be difficult. This is especially true when the tooth being treated is heavily restored, malposed, or calcified. After evaluating 500 pulp chambers of extracted teeth, new laws for finding pulp chambers and root-canal orifices are proposed. The use of these laws can aid in the determination of the pulp-chamber position and the exact location and number of root canals in any individual tooth.

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LEGGI DELLA CAMERA PULPARE:

- CENTRALITA'
- CONCENTRICITA'
- EQUIDISTANZA

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The following observations were noted relative to all teeth except maxillary molars:



FIG 2. Cut specimen of a mandibular molar showing the concentricity of the pulp-chamber walls to the external tooth surface at the CEJ.

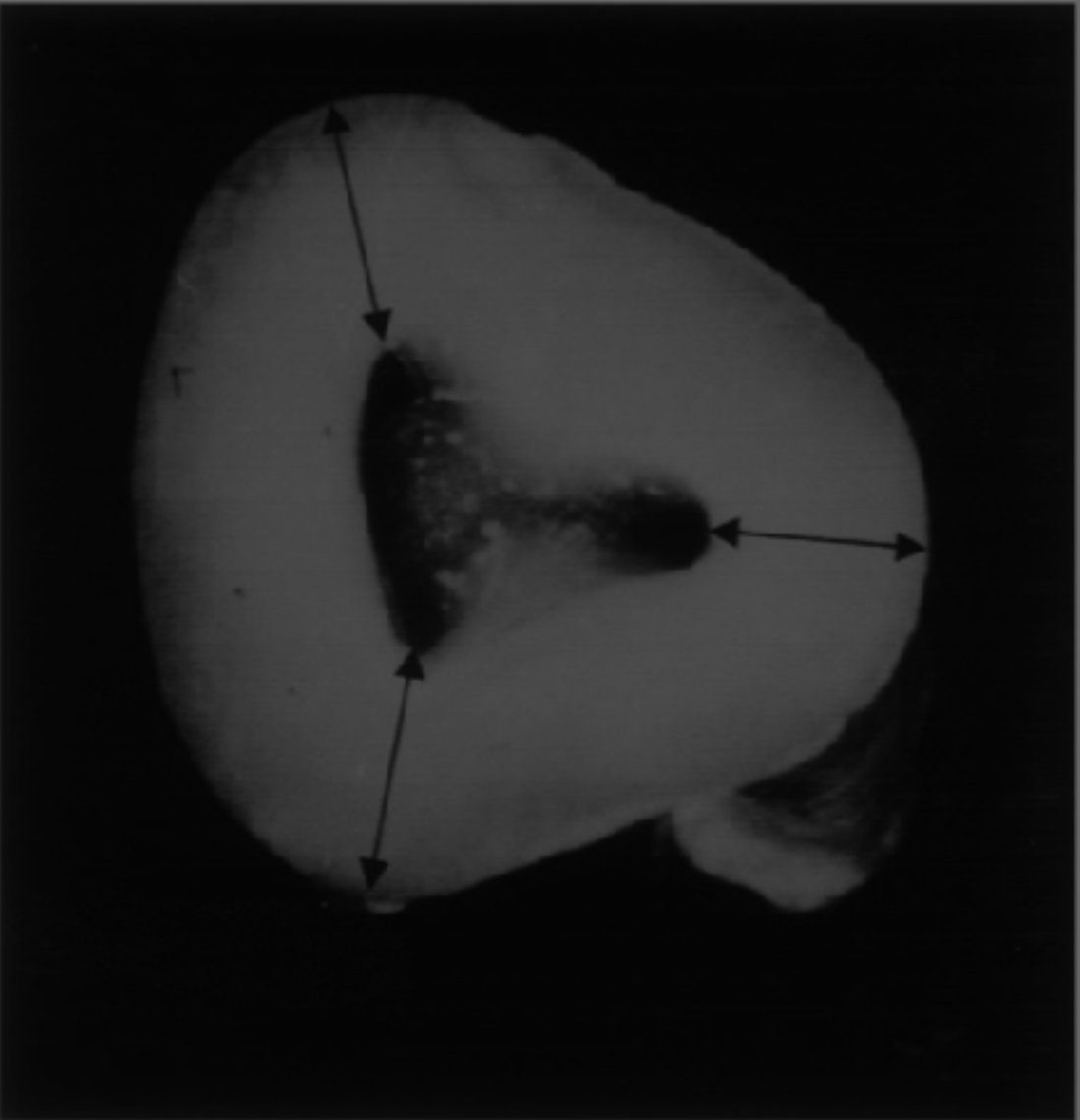


FIG 3. Cut specimen of a mandibular molar showing the equality of the distance of the pulp chamber walls from the external root surface (arrows).

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The following observations were noted relative to all teeth except maxillary molars:

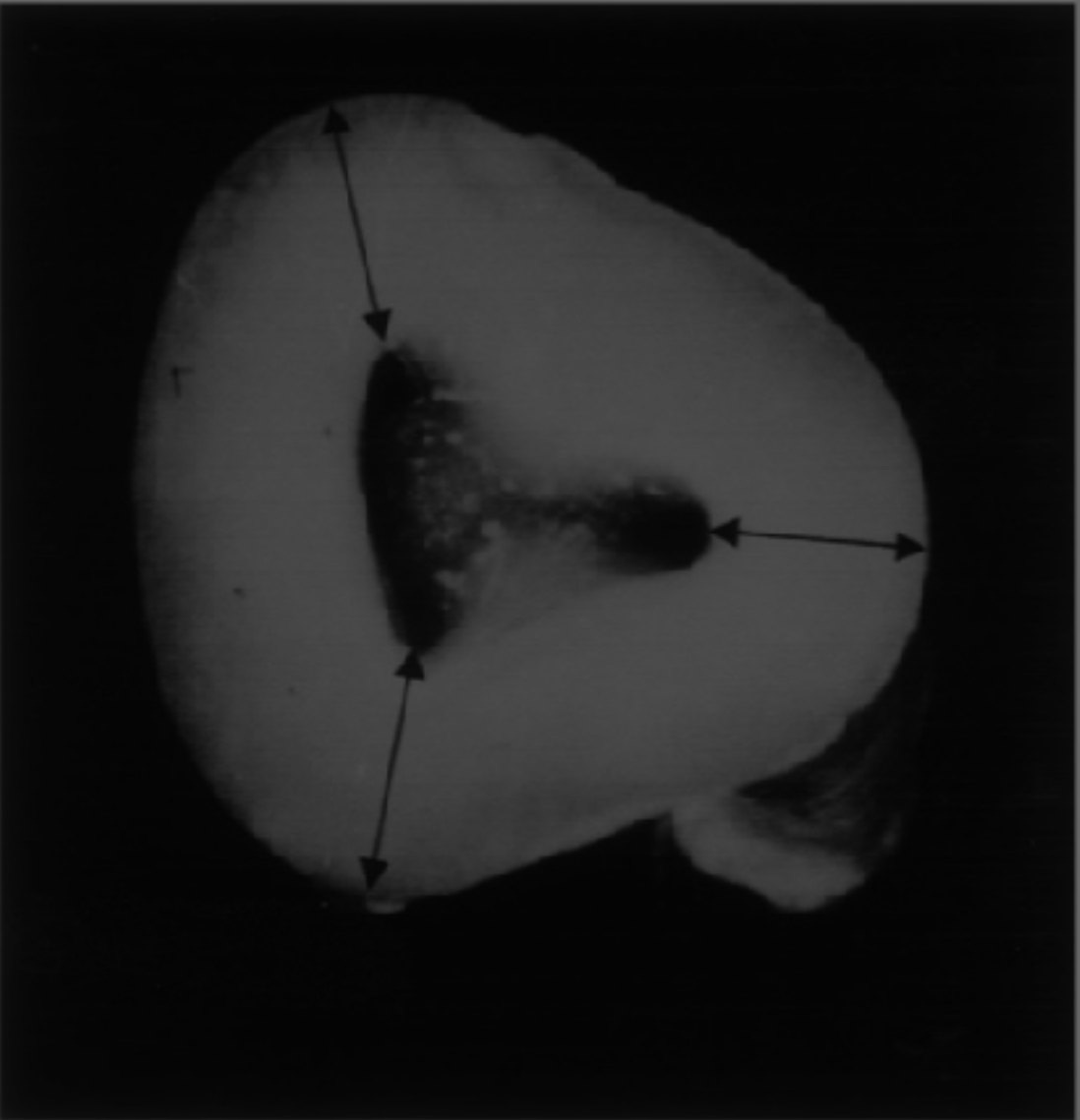


FIG 3. Cut specimen of a mandibular molar showing the equality of the distance of the pulp chamber walls from the external root surface (arrows).

LEGGI DEGLI ORIFIZI CANALARI:

PRIMA LEGGE DI SIMMETRIA

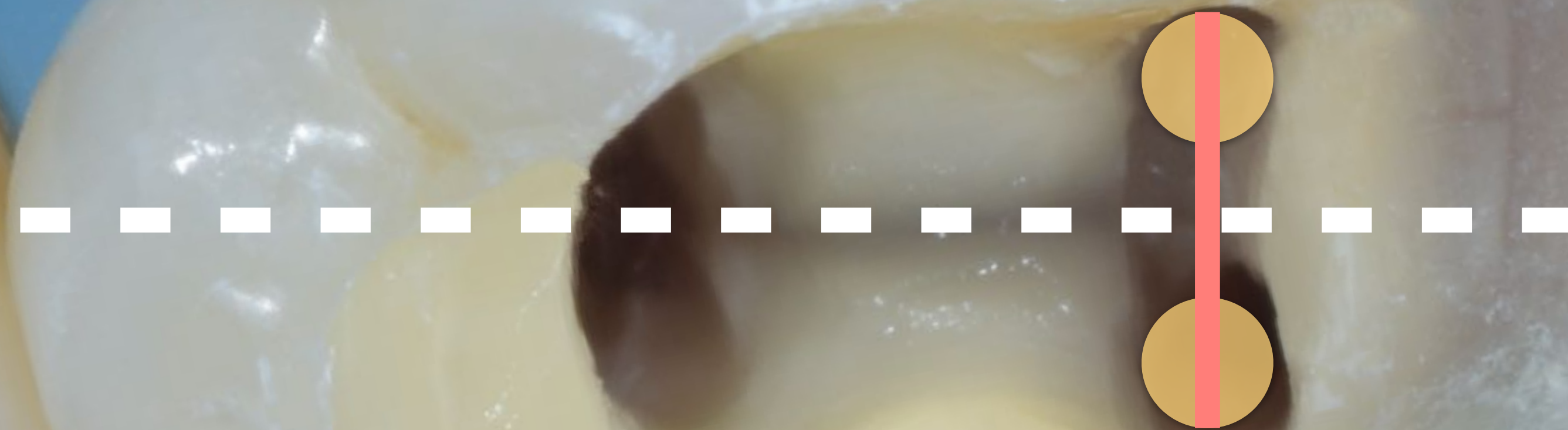
SECONDA LEGGE DI SIMMETRIA

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PRIMA LEGGE: **E**QUIDISTANZA

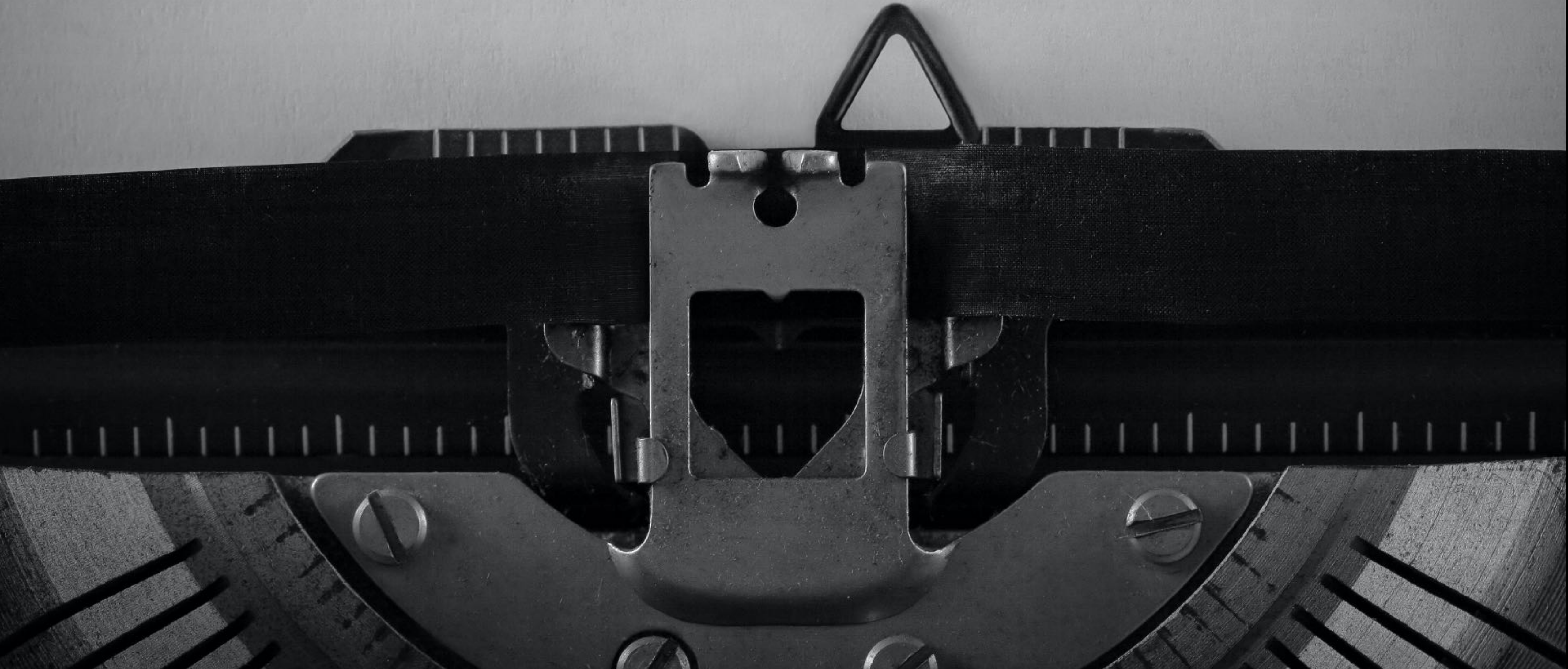


SECONDA LEGGE: **P**ERPENDICOLARITA'

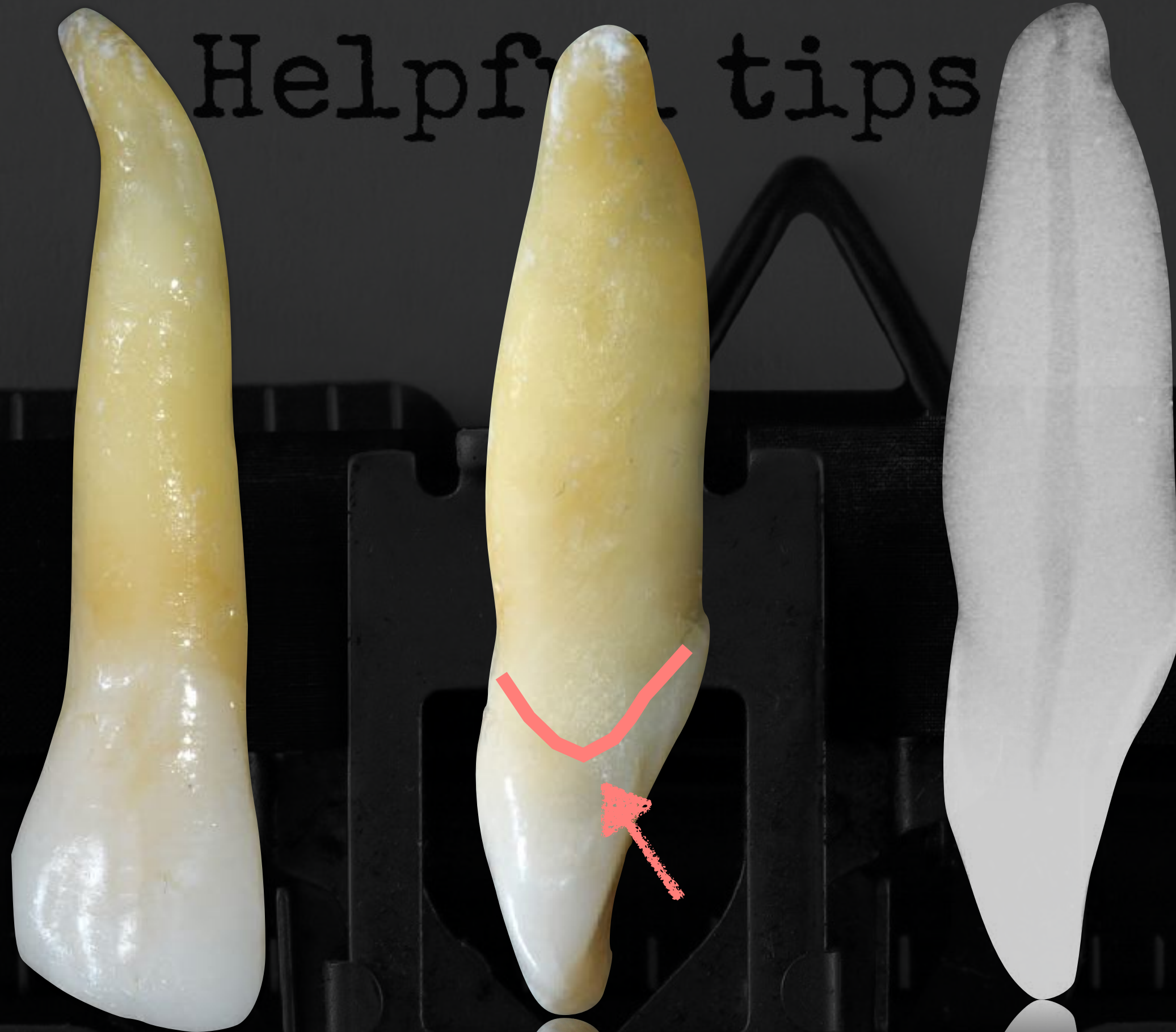
I CANALI SONO NEL PUNTO DI INCROCIO TRA LE PARETI E
UNITI DALLE LINEE DI FUSIONI DEL PAVIMENTO



Helpful tips



Helpful tips

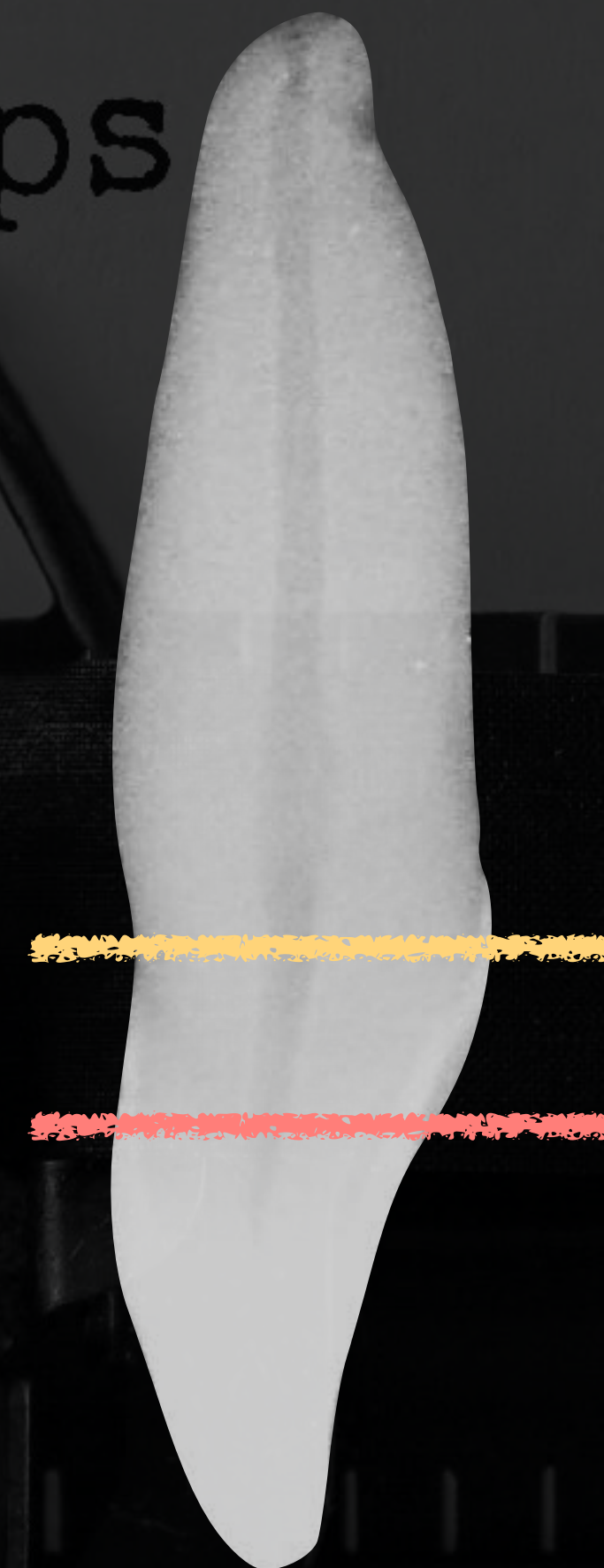


Helpful tips

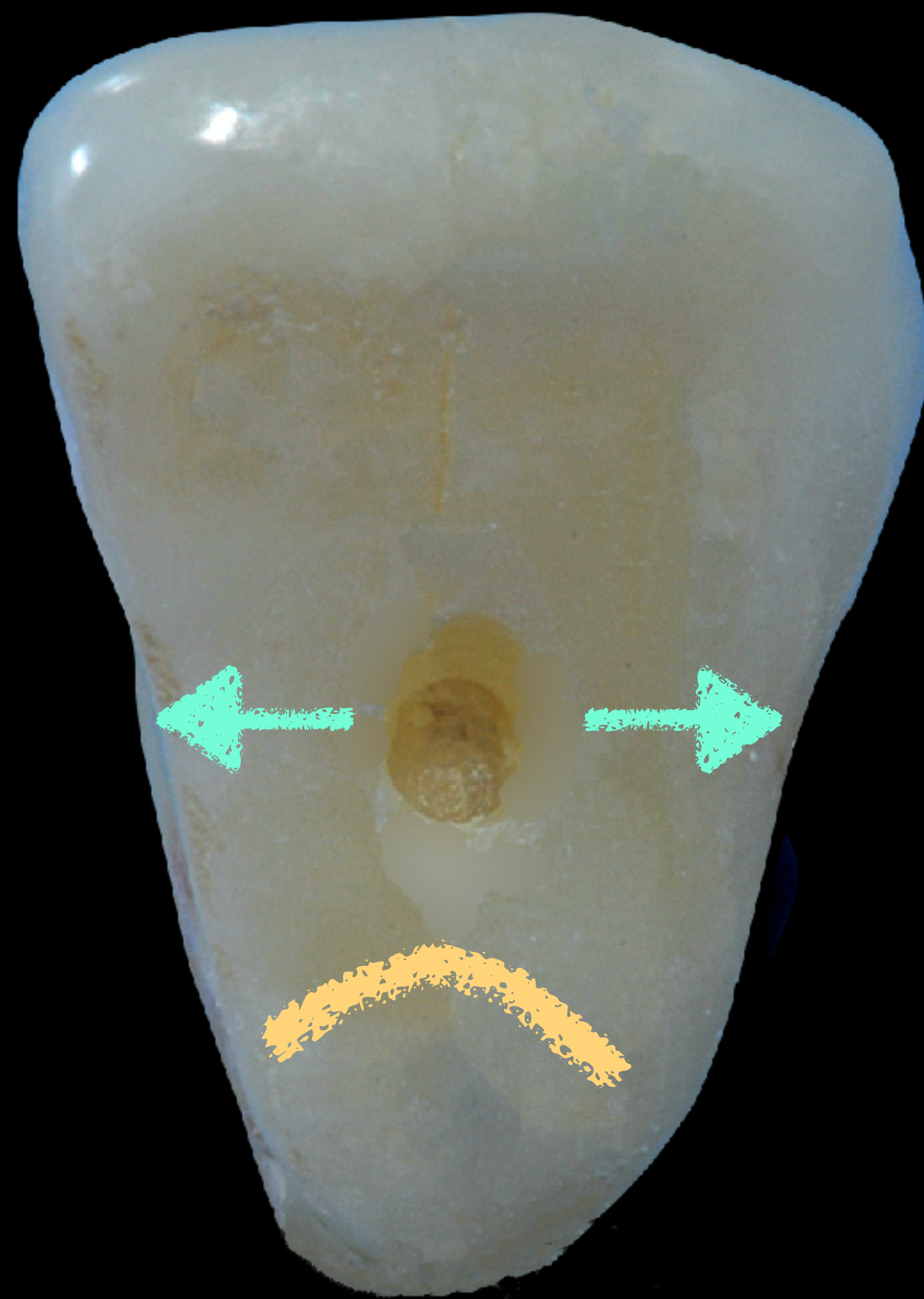
Piani perpendicolari all'asse lungo del dente

Limite **APICALE** della CEJ : **PAVIMENTO**

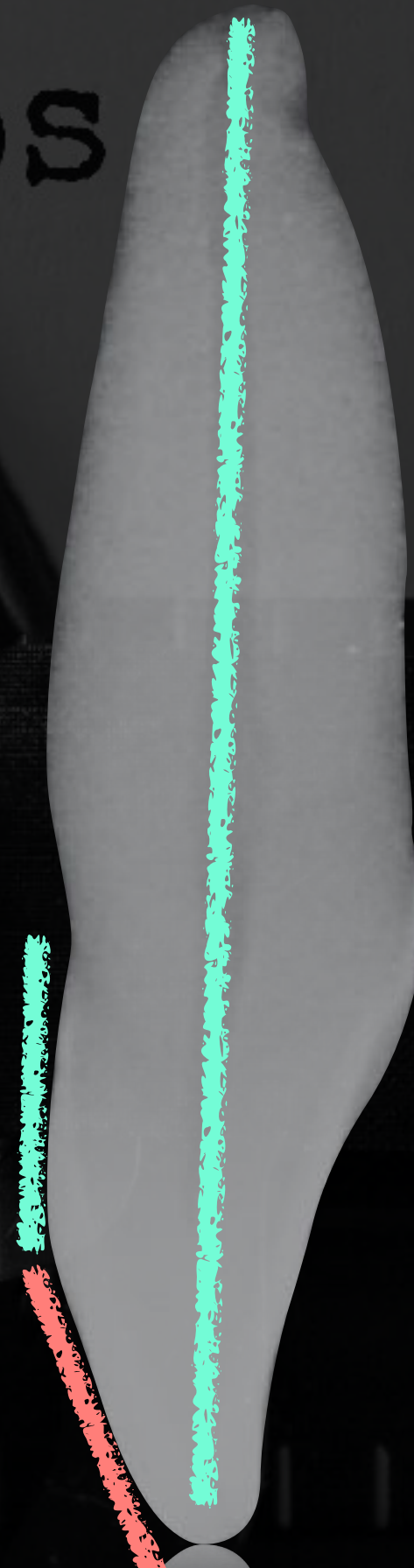
Limite **CORONALE** della CEJ : **TETTO**



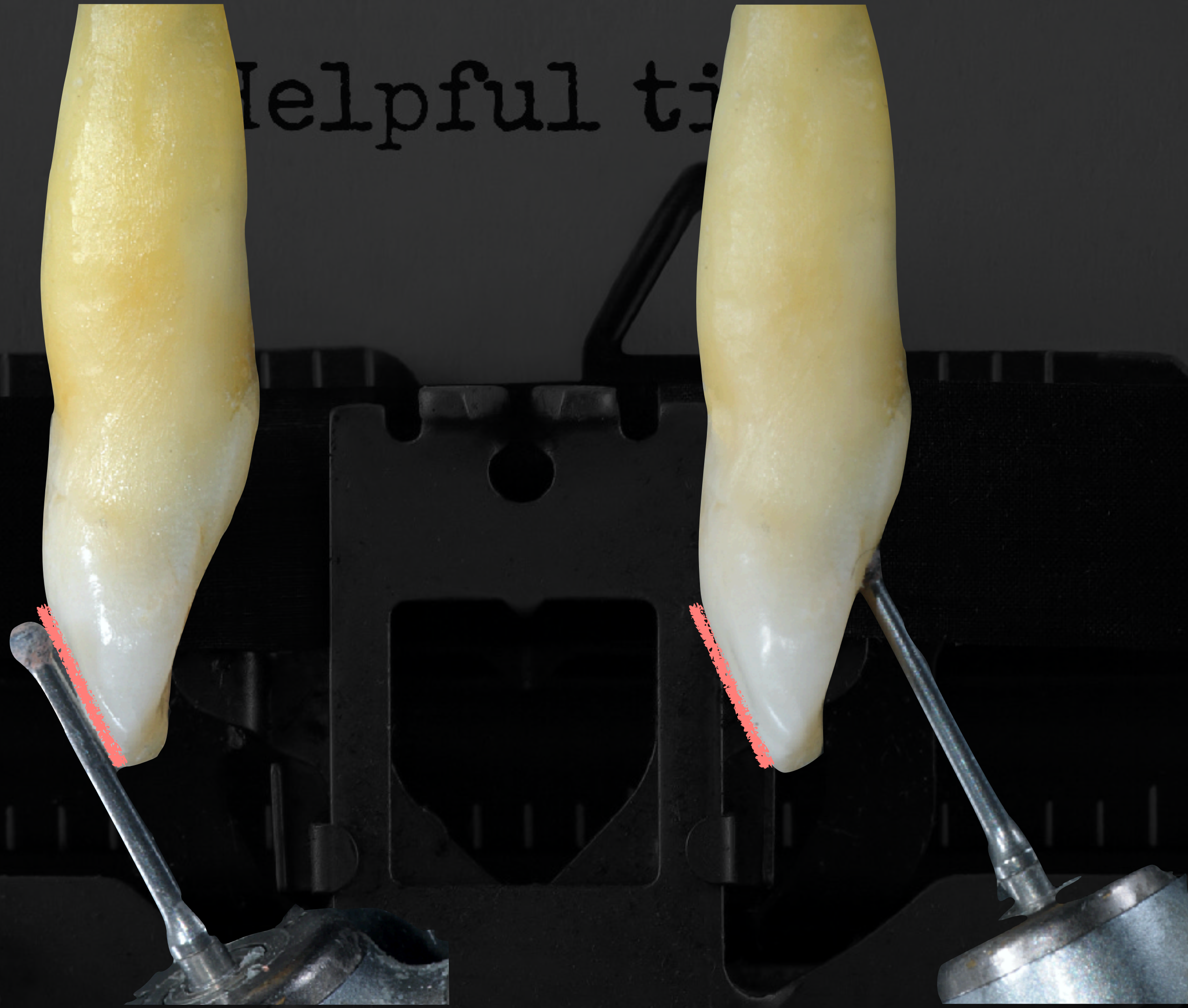
Deutsch AS: “Pulp chamber morphology:
basic research leads to clinical technique”
Dent Today 2005 Mar; 24(3): 124, 126-7



Helpful tips



Helpful ti



Helpful tip





Helpful tips



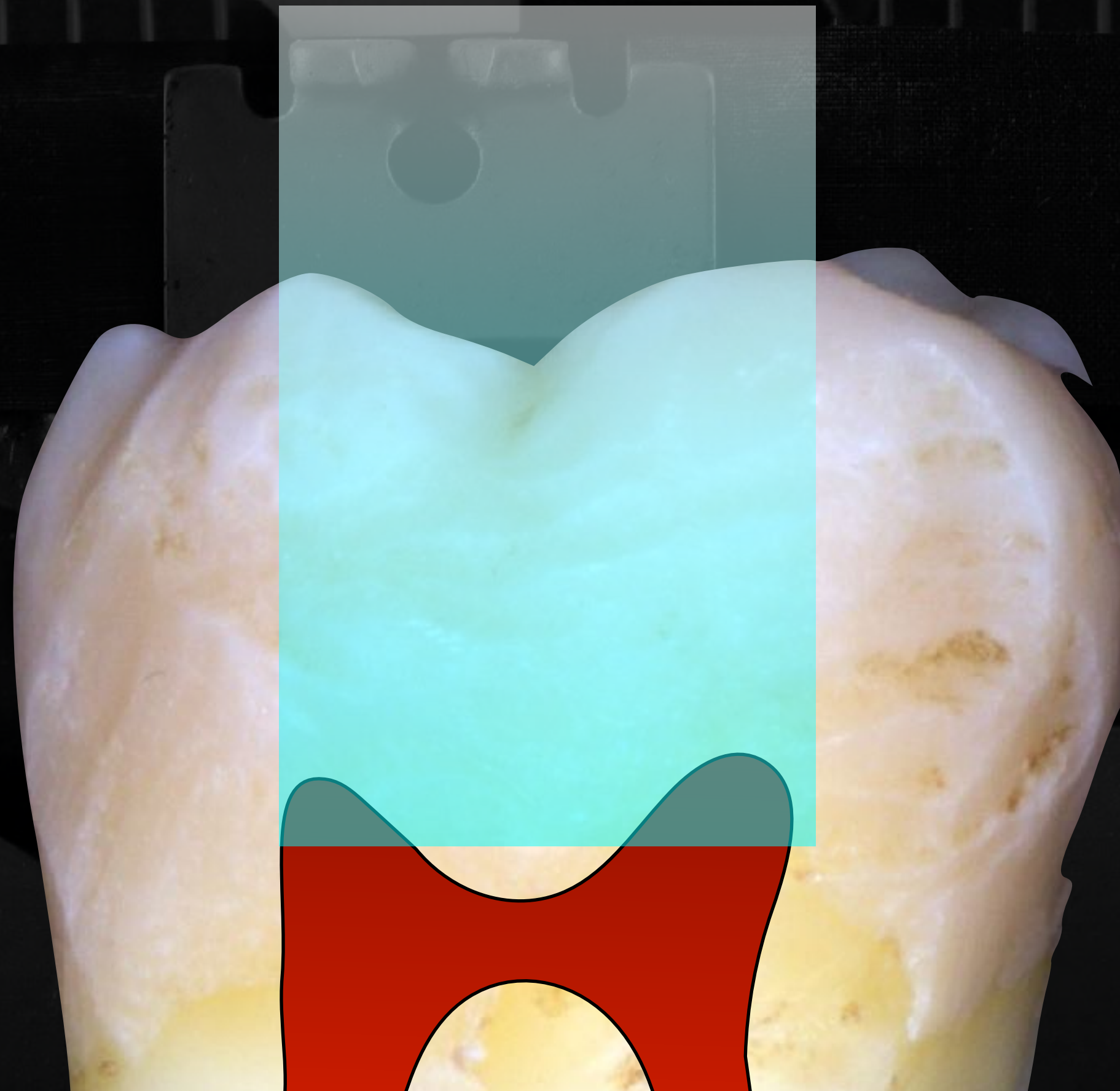
PAVIMENTO – FORCAZIONE: CIRCA 3MM

TETTO – CUSPIDE: CIRCA 6,5 MM

ALTEZZA CAMERA PULPARE: 1– 2,5MM



NELLA DISCESA IN APERTURA STIAMO CENTRALI A
LIVELLO DELLA G.A.C. E SCEGLIAMO LA
CORRISPONDENZA CON I CORNETTI E NON CON LA
FORCA

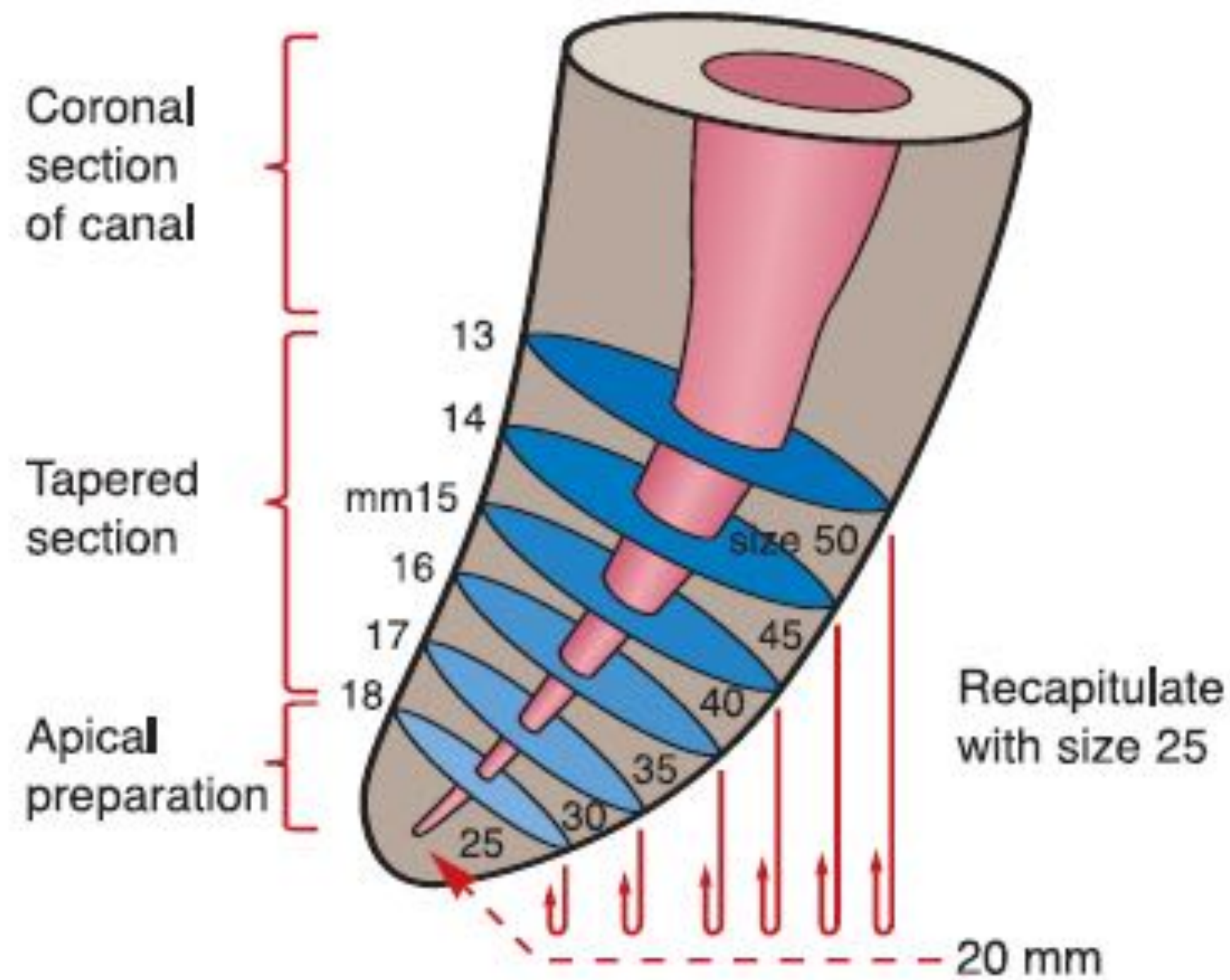


THINK ABOUT..

ERRORI IN APERTURA O
STRUMENTI RIGIDI A GRANDI
CONICITA' POSSONO
AUMENTARE I RISCHI



SAGOMATURA DEI CANALI



LA SAGOMATURA NECESSITA UNA GEOMETRIA CON UNA CONICITA' PROGRESSIVA IN CUI L'APICE RISULTA ESSERE IL PUNTO PIÙ STRETTO DEL SISTEMA

Schilder 1974

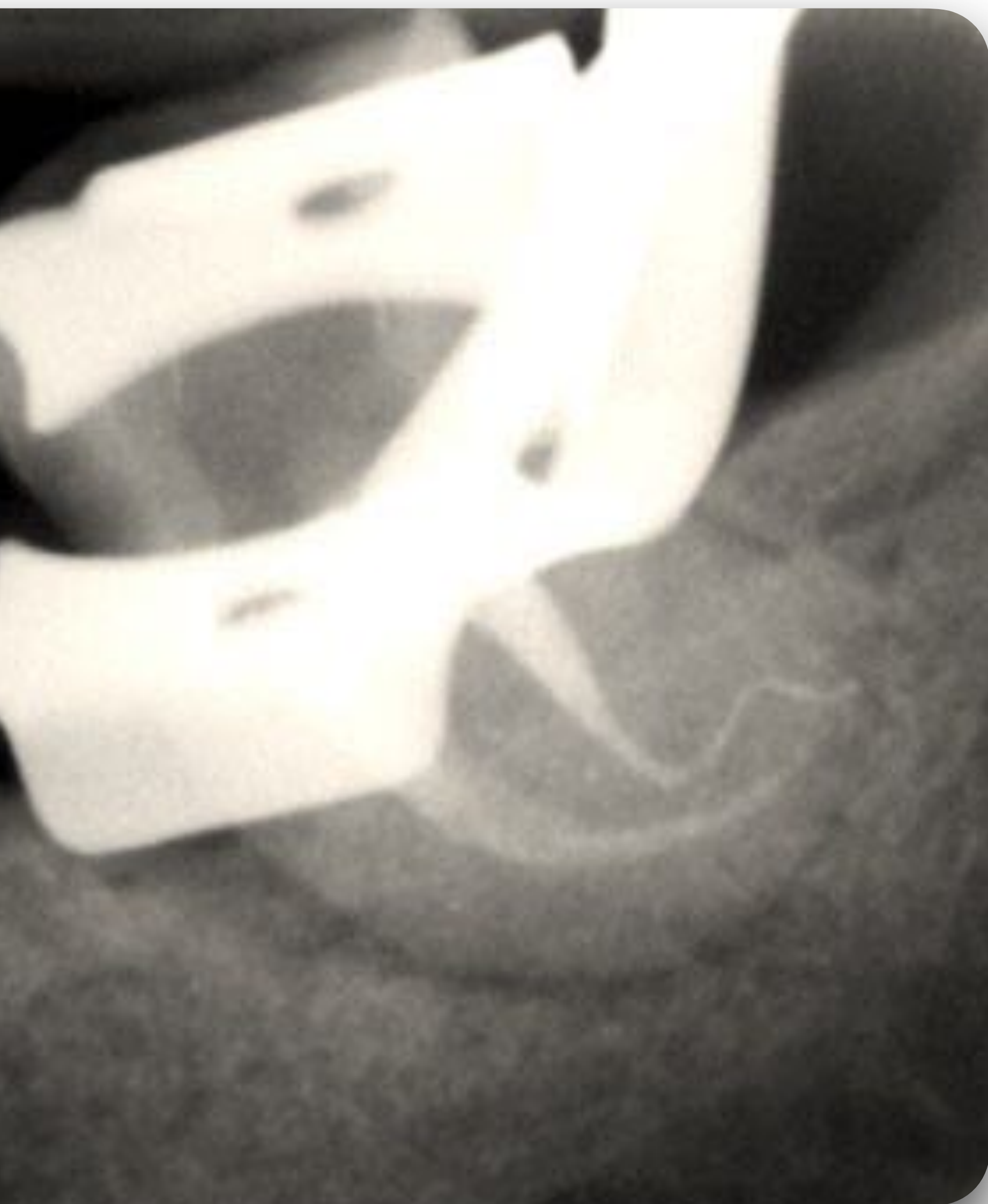
IL NOSTRO OBIETTIVO È DETERGERE
E SIGILLARE LO SPAZIO
ENDODONTICO.

LE TECNICHE E STRATEGIE POSSO
ESSERE DIFFERENTI MA CON LO
STESSO OBIETTIVO.

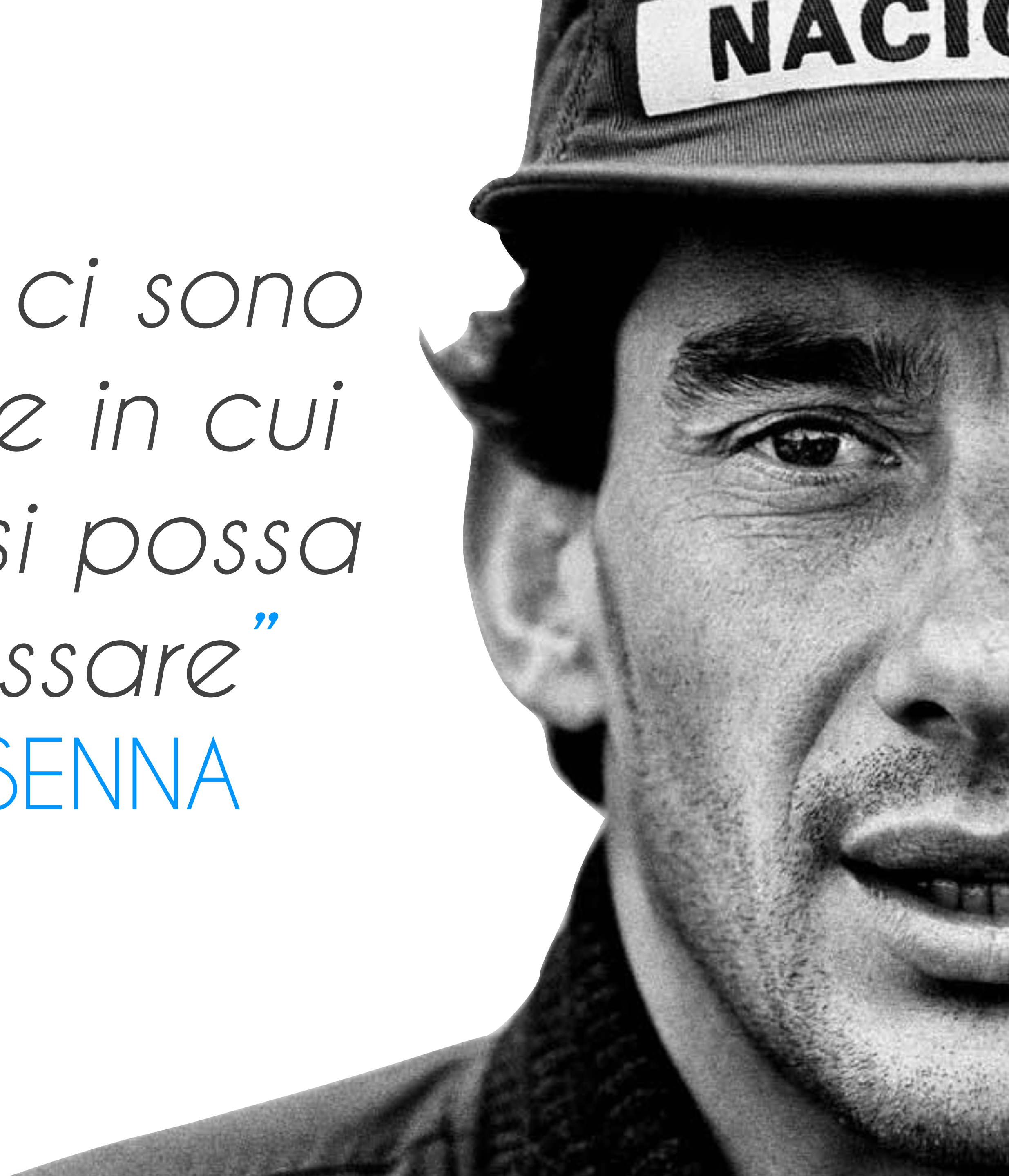
i tempi cambiano..

“I denti che presentano canali con curvatura maggiore di 45 gradi, non possono essere trattati con successo senza dover ricorrere alla chirurgia”

GROSSMAN
1967



*“Non ci sono
curve in cui
non si possa
passare”*
A. SENNA



TECNOLOGIA



- CBCT
- NITI TRATTATI TERMICAMENTE
- INGRANDIMENTO
- PROTOCOLLI DI ISOLAMENTO
- RIVELATORE APICALE ELETTRONICO
- CEMENTI BIO CERAMICI
- PROTOCOLLI DI IRRIGAZIONE ATTIVA
- PUNTE SONICHE ED ULTRASONICHE

MANNING S. 2000 - JOHN V. 2007

STRUMENTAZIONE

STRUMENTI ESPANSIVI

TRATTAMENTI TERMICI

DETERSIONE

PROTOCOLLI DI
DETERSIONE ATTIVA

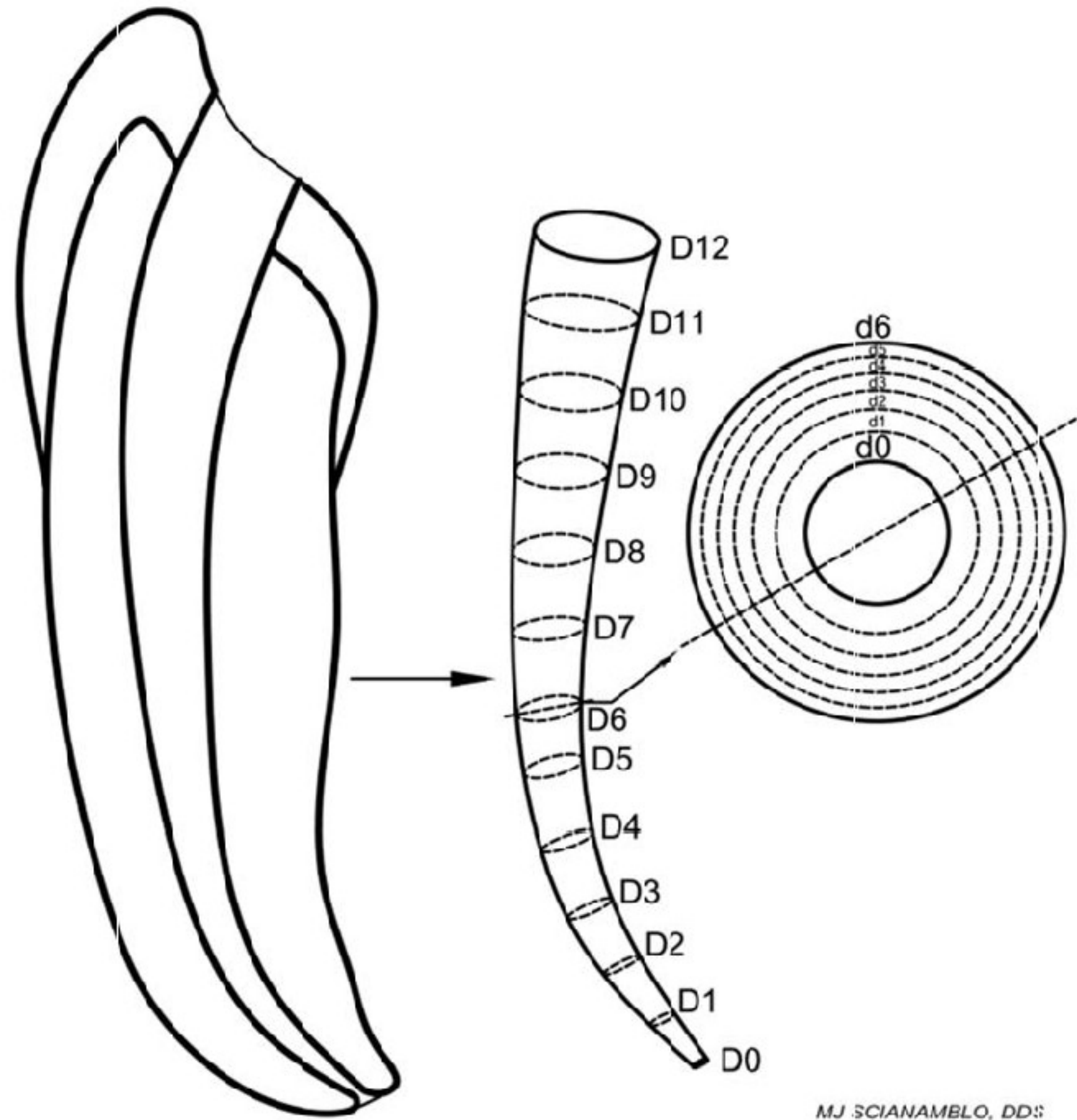
OTTURAZIONE

CEMENTI

BIOCERAMICI



OBIETTIVI MECCANICI



- * CONICITA CONTINUA DA CORONA AD APICE
- * PRESERVARE LE CURVATURE DEL CANALE
- * PRESERVARE IL DIAMETRO APICALE

FILE MANUALI



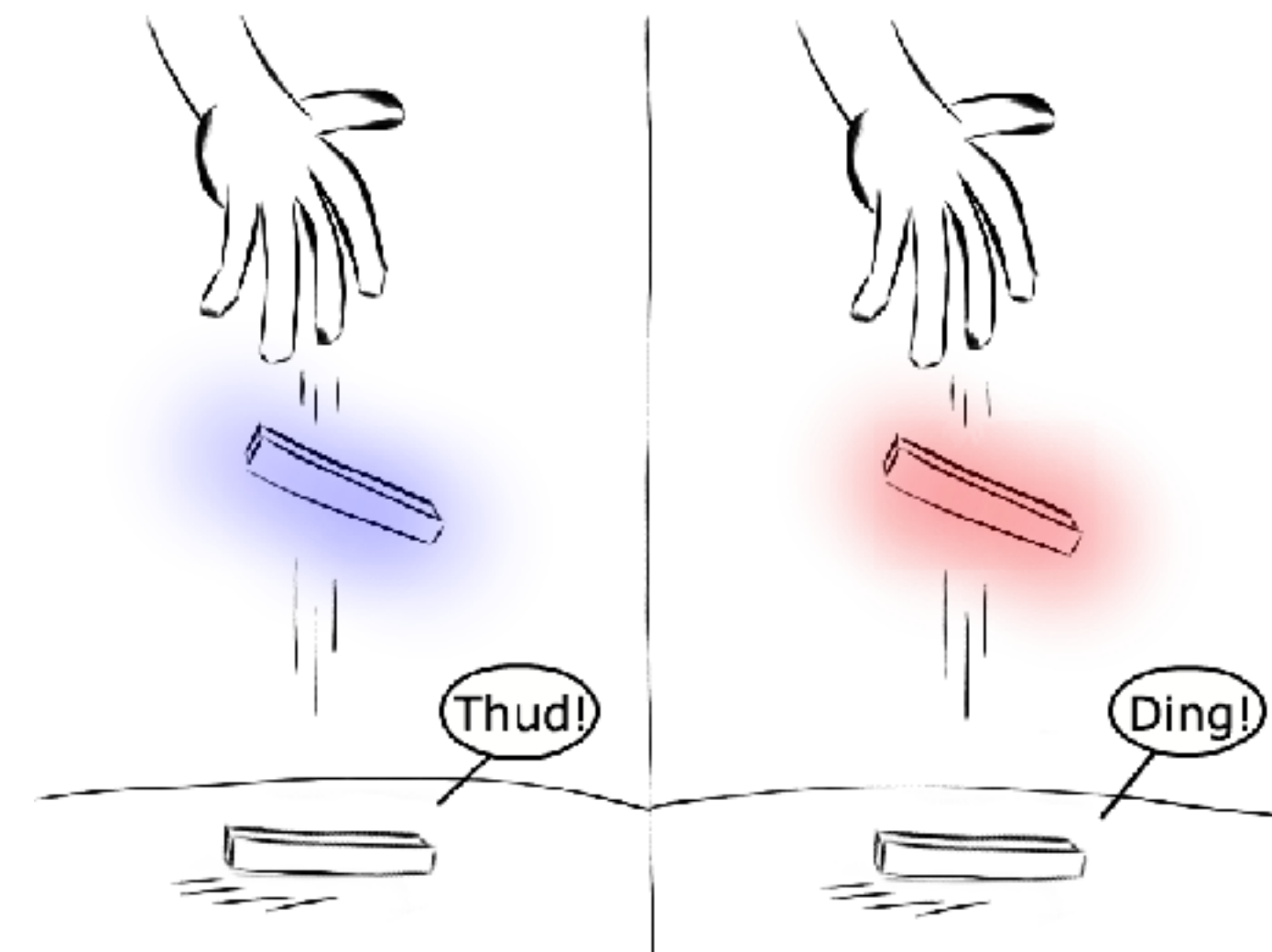
FILE ROTANTI





Nitinol

IN UNA RICERCA PER LEGHE POTENZIALMENTE UTILI PER CARATTERISTICHE FISICHE, TRA 60 LEGHE NE SELEZIONA 12. TRA QUESTI IL NITINOL



Nickel Titanium Naval Ordnance Laboratory

WILLIAM J BUEHLER -1963- US NAVY POLARIS PROJECT

LEGA NI-TI

55-45

COMPOSTO BINARIO
INTERMETALLICO ED EQUIATOMICO



1988

WALIA ET AL. JOE

MC SPADDEN, JOHNSON E SENIA AIUTANO
NELLA DIFFUSIONE DEL NITI

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

Harmeet Walia, BDS, MSc, MS, William A. Brantley, BS, MS, PhD, and Herold 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 step 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). Weiss (4) has suggested that clinicians might remove the tips of instruments at chairside to make intermediate sizes (1-3). Weiss (4) has suggested that clinicians might remove the tips of instruments at chairside to make intermediate sizes (1-3).

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, all of these 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 conventional (10) Nitinol 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 the American Dental Association specification no. 28 (11). All specimens were subjected to bending or twisting at a point 3

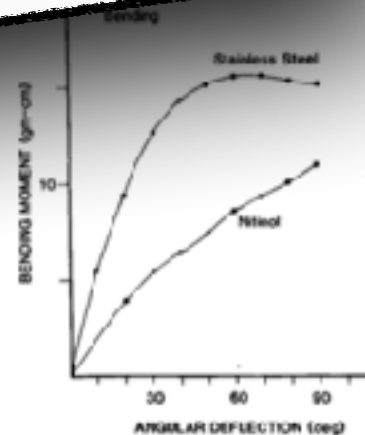


Fig. 5. Cantilever bending test results for the size #15 Nitinol and stainless steel files. The data points in this figure and in Figs. 6 and 7 correspond to average moment values for groups of five instruments at the indicated bend or twist angles.

the reading of bending or torsional moments less than 0.05 inch-oz (3.50 gm-cm). Consequently, the passive position (zero moment value) and the corresponding location for zero angular deflection cannot be determined directly in an experiment. For convenience, all of the graphical plots have been drawn to intersect the origin. This extrapolation appears to be more satisfactory for the bending plots (Fig. 5) and clockwise torsion plots (Fig. 6) than for the counterclockwise torsion plots (Fig. 7).

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

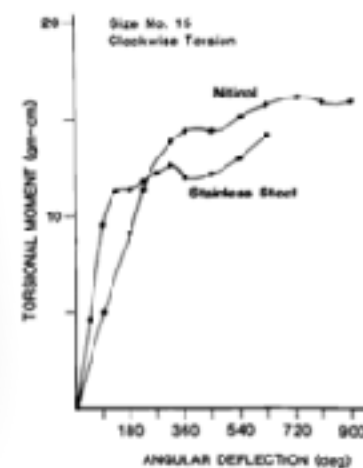


Fig. 6. Clockwise torsion test results for the size #15 Nitinol and stainless steel files.

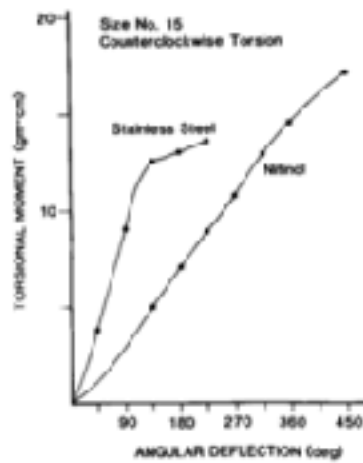
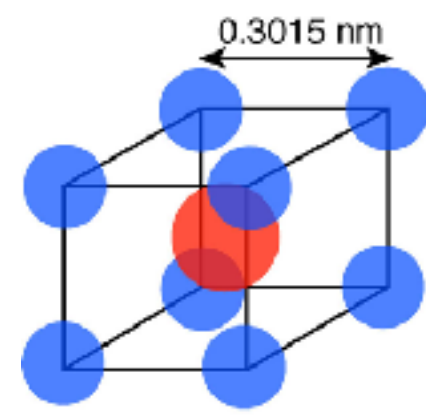


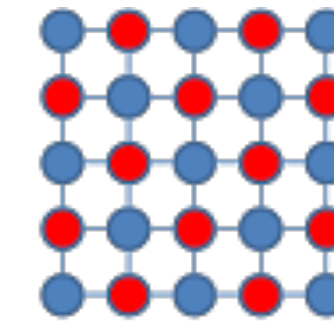
Fig. 7. Counterclockwise torsion test results for the size #15 Nitinol and stainless steel files. The two initial data points for the Nitinol files could not be determined with the torque meter, and the two plots have been drawn to intersect the origin. Both of these considerations are less pronounced in Figs. 5 and 6.

FILE ROTANTI IN NITI

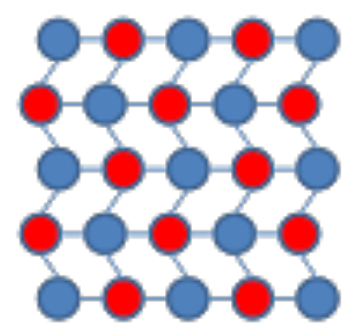
- *PRESERVARE L'ANATOMIA
- *RIMANERE CENTRATO NEL CANALE
- *EFFICIENZA DI TAGLIO
- *NUMERO RIDOTTO DI PASSAGGI /
SEQUENZA BREVE
- *RESISTENTE



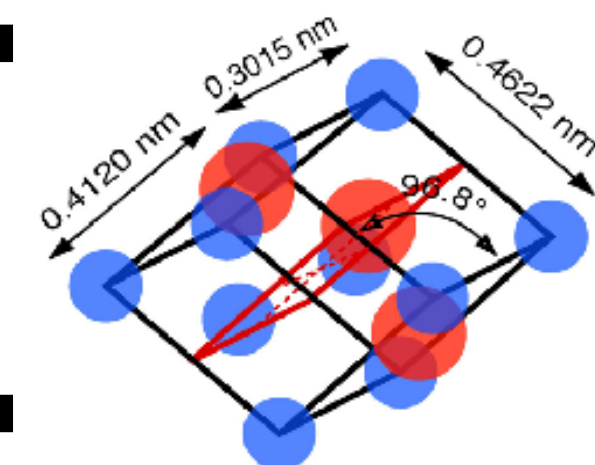
AUSTENITE



LA LEGA PUO AVERE DUE CONFORMAZIONI ATOMICHE :
L'**AUSTENITE** E LA FORMA PIU "RIGIDA E STABILE "A
RETICOLO CUBICO. LA **MARTENSITE** E LA FORMA MENO
STABILE E PIU PLASTICA A RETICOLO ESAGONALE
COMPATTO.

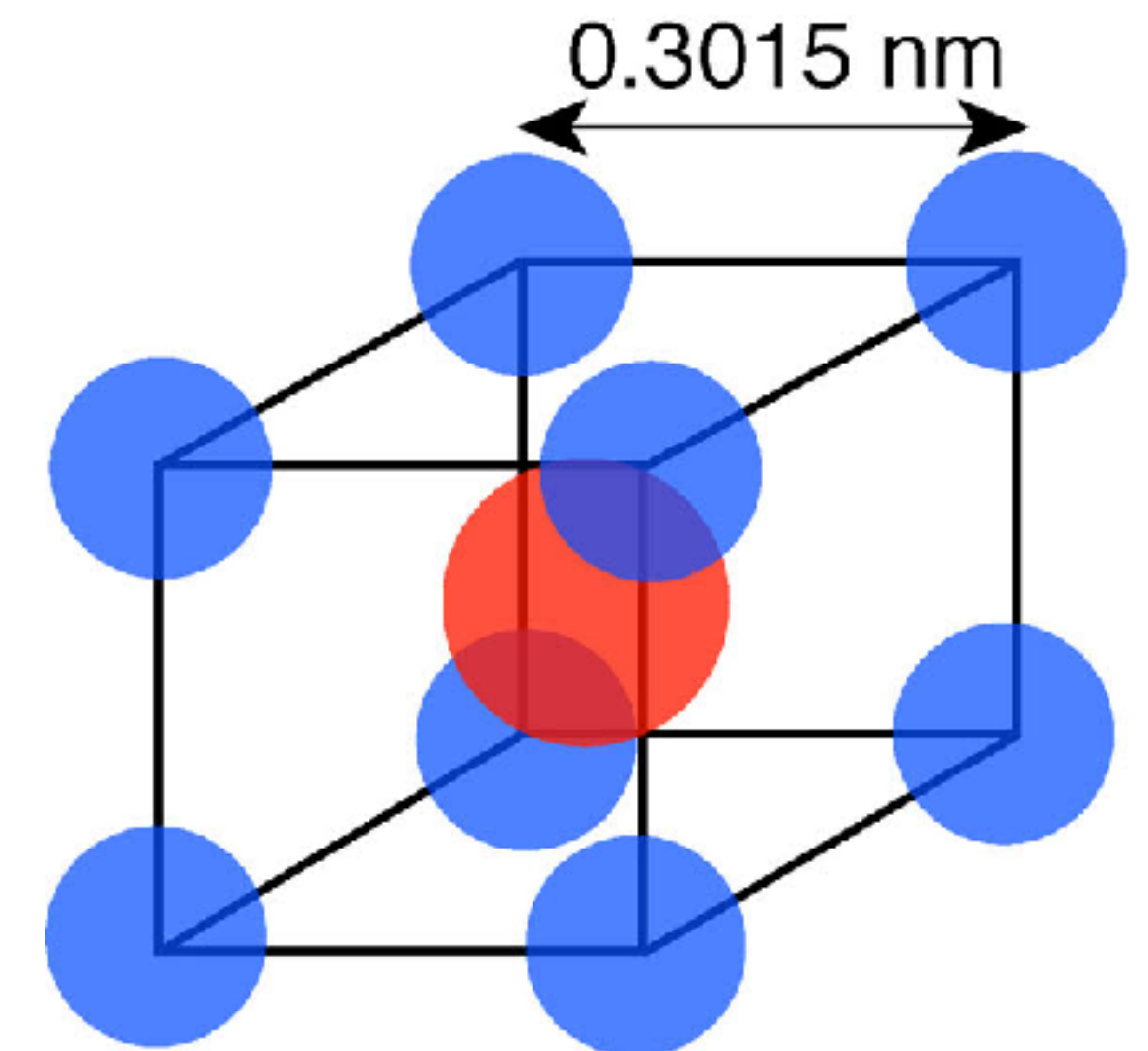


MARTENSITE



AUSTENITE

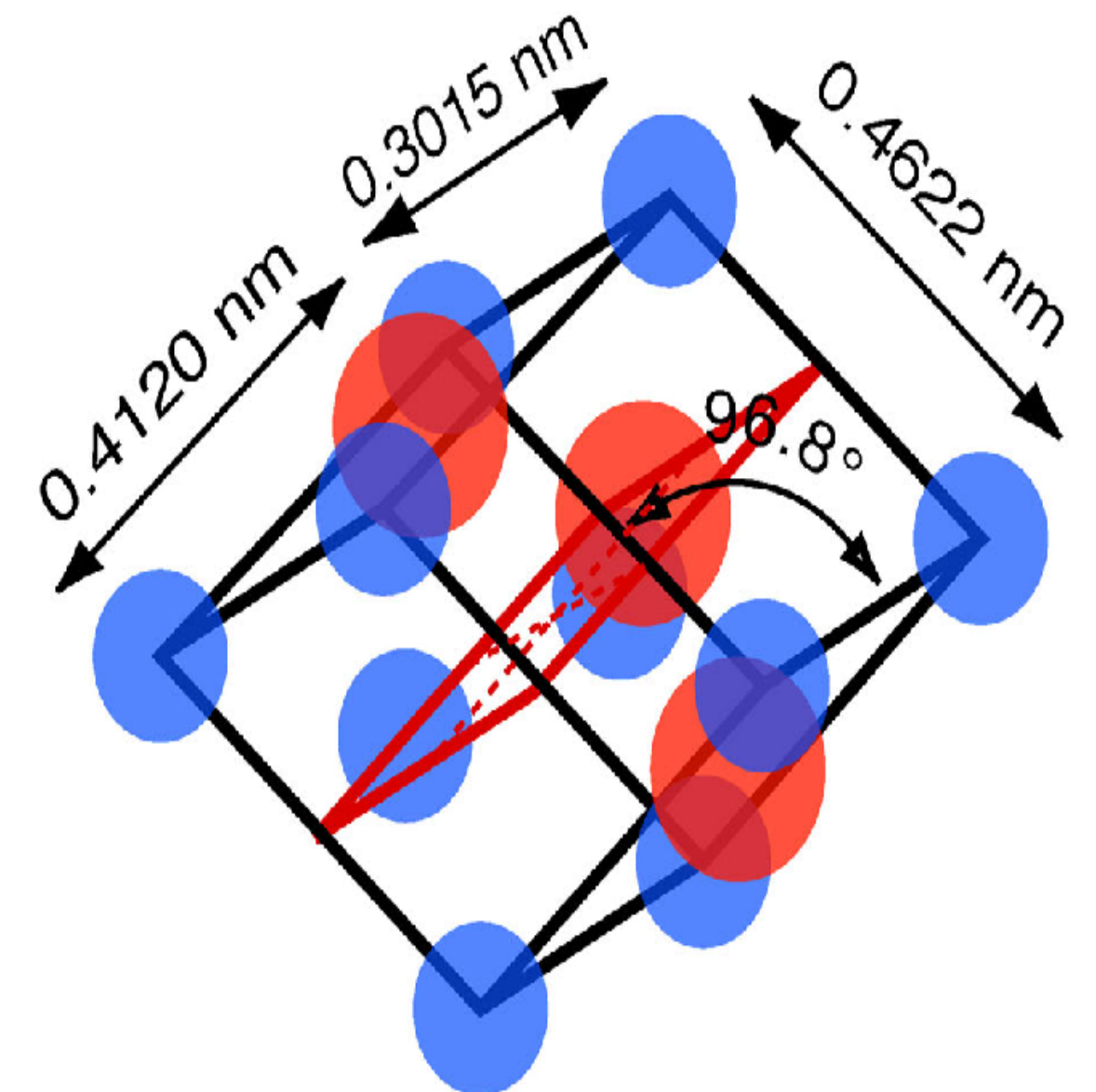
- ☑ RITORNO ELASTICO
- ☑ “RIGIDITA”
- ☑ SUPERELASTICITA



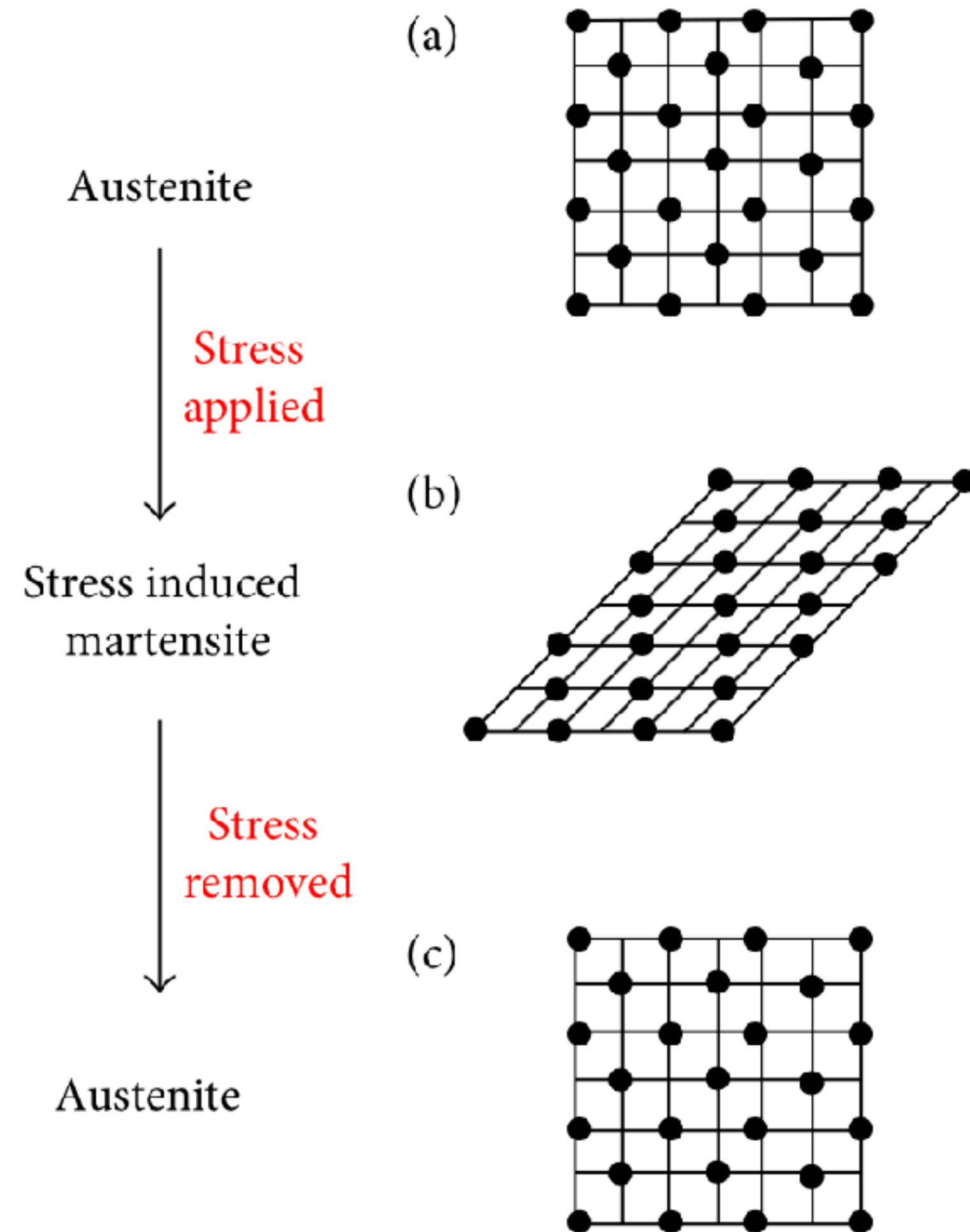
MARTENSITE

☑ MEMORIA DI FORMA

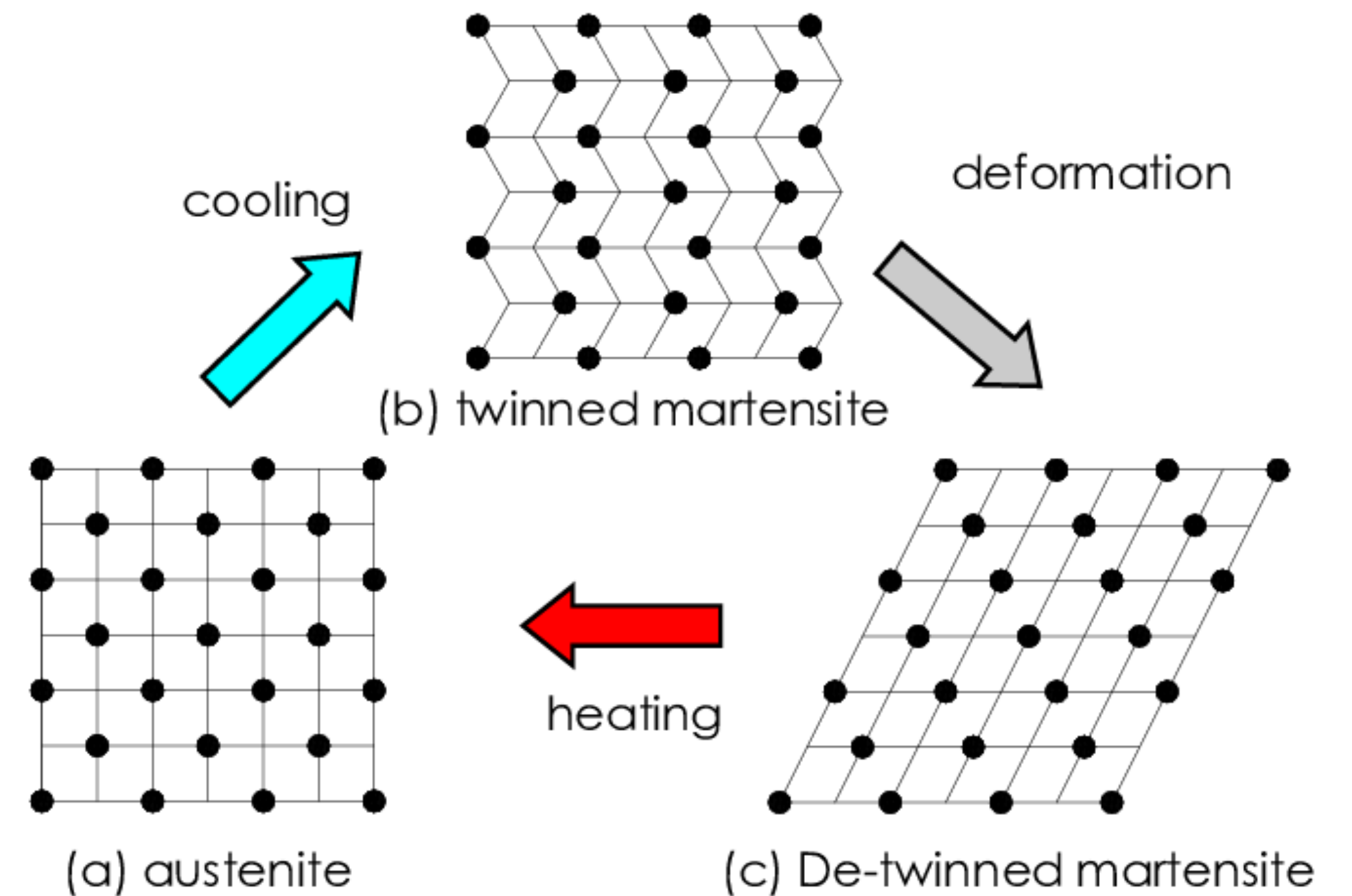
☑ “DUTTILITA”



TRANSIZIONE AUSTENITE- MARTENSITE INDOTTA DA STRESS

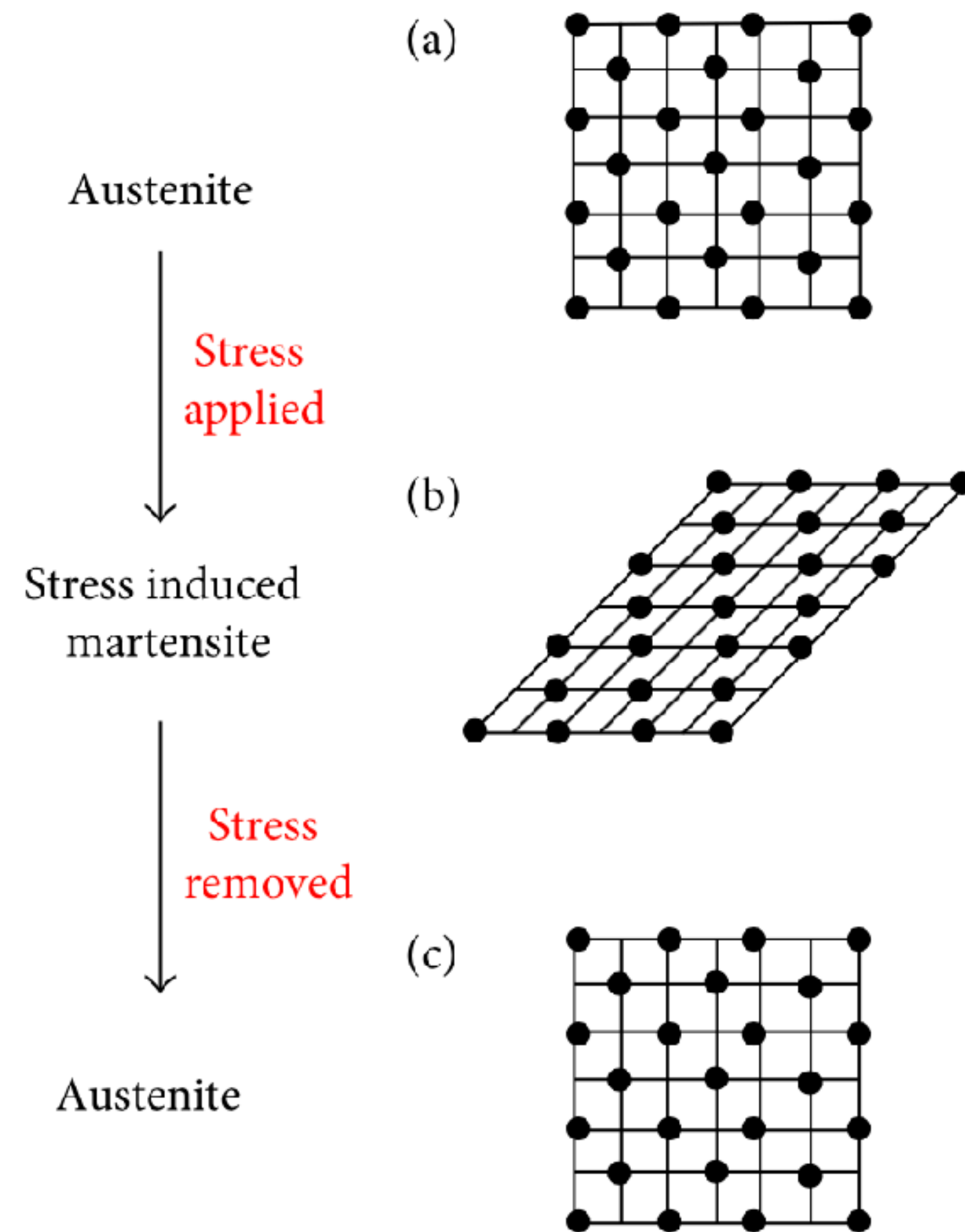


TRANSIZIONE AUSTENITE- MARTENSITE INDOTTA DALLA TEMPERATURA (TIM)



SUPERELASTICITÀ' O PSEUDOELASTICITA'

TRANSIZIONE AUSTENITE-MARTENSITE INDOTTA DA STRESS (SIM)



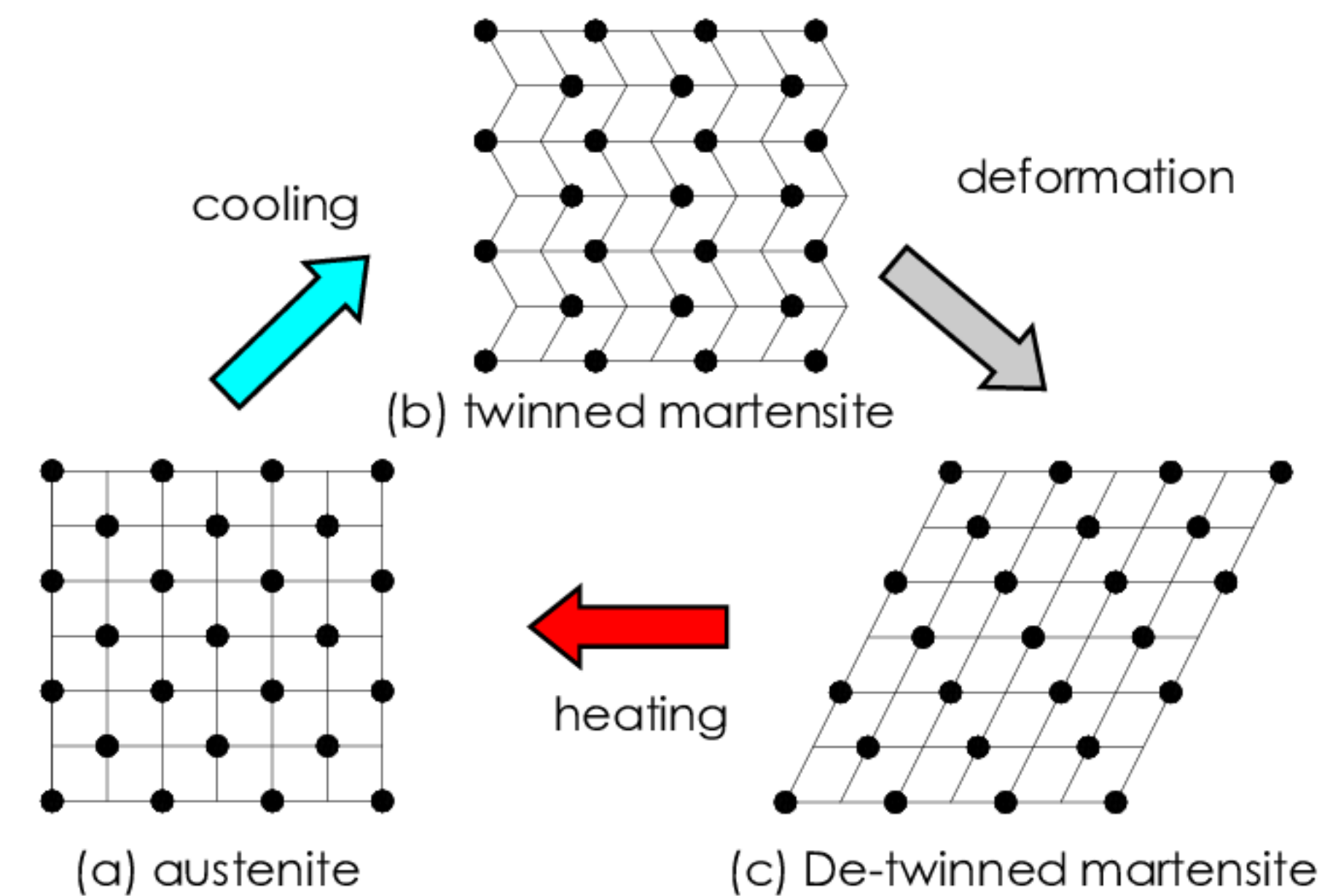
- LA TEMPERATURA ALLA QUALE AVVIENE LA TRANSIZIONE E MAGGIORE DELLA A_F (LEGA COMPLETAMENTE IN FASE AUTENTICA)
- IL CARICO DETERMINA UNA TRANSIZIONE DA AUSTENITE A MARTENSITE INDOTTA DA STRESS (SIM)
- LA LEGA PUO SUBIRE **AMPIE DEFORMAZIONI REVERSIBILI** IN CAMPO ELASTICO, SOTTO **CARICO COSTANTE**, PER UN CAMBIAMENTO DELLA STRUTTURA CRISTALLINA (8%)
- ALLA RIMOZIONE DELLO STRESS LA MARTENSITE, INSTABILE AD UNA TEMPERATURA AMBIENTALE SUPERIORE AD A_F , RITORNA ALLA FASE AUTENTICA RILASCIANDO ENERGIA CON **UN MOVIMENTO RAPIDISSIMO**

TRANSIZIONE AUSTENITE- MARTENSITE

INDOTTA DALLA TEMPERATURA (TIM)

- QUANDO LA LEGA NI-TI VENE 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

MEMORIA DI FORMA



IN STUDIO..

A photograph of a modern dental clinic. The room has light blue walls and a tiled floor. In the foreground, there is a dental chair with blue and white upholstery. To the right, there is a large whiteboard mounted on the wall, and a dental X-ray machine is visible in the background. A dental desk with drawers and a sink is also present.

NORMALMENTE LA TEMPERATURA DI
TRANSIZIONE E' PIU BASSA DI QUELLA
AMBIENTE.

A TEMPERATURA AMBIENTE GLI
STRUMENTI IN NITI SONO IN
FASE AUSTENITICA



LA LEGA **AUSTENITICA** SARA DURA, RIGIDA E CON
MAGGIORI PROPRIETA DI ESERCITARE LA
SUPERELASTICITA.

LA LEGA **MARTENSITICA** D'ALTRA PARTE SARA
MORBIDA, DUTTILE E FACILMENTE DEFORMABILE E
CON PROPRIETA DI MEMORIA DI FORMA.

Resistenza alla fatica ciclica

INVERSAMENTE PROPORZIONALE AL QUADRATO
DELLA SEZIONE TRASVERSA DEL FILE

RIG 810

NELLA GESTIONE DELL'ANATOMIA, UNA DELLE MAGGIORI DIFFICOLTÀ DEI FILES INNITI È IL RITORNO ELASTICO

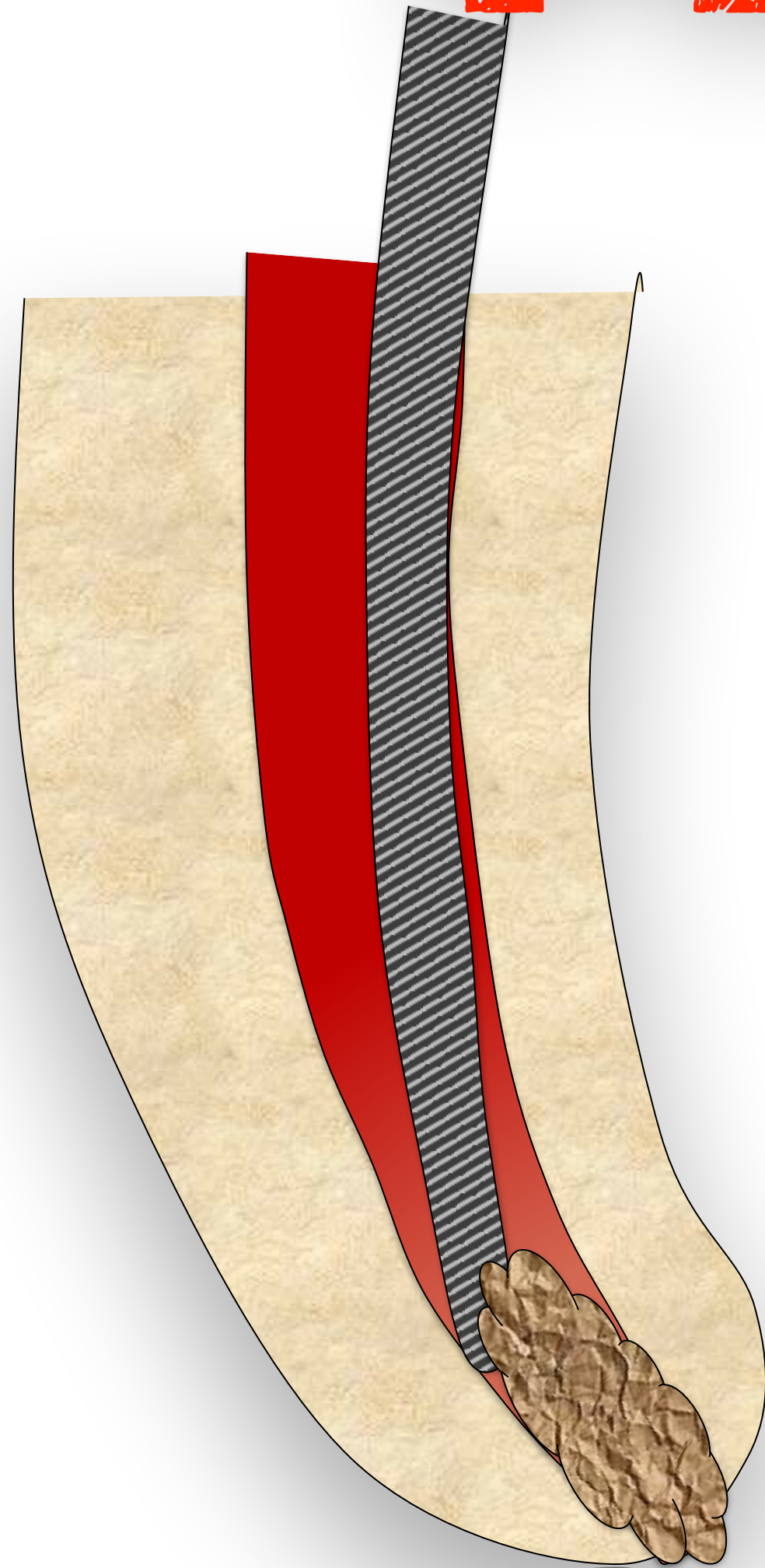


“ROOT CANALS, AS HAS BEEN STATED, HAVE NATURAL CURVES. (...) FILES PLACED IN SUCH CANALS WILL BE DEFLECTED, THEREFORE, FROM THEIR LONG AXES WITH RESULTANT **INEQUALITY OF CUTTING EFFECTIVENESS** (...)

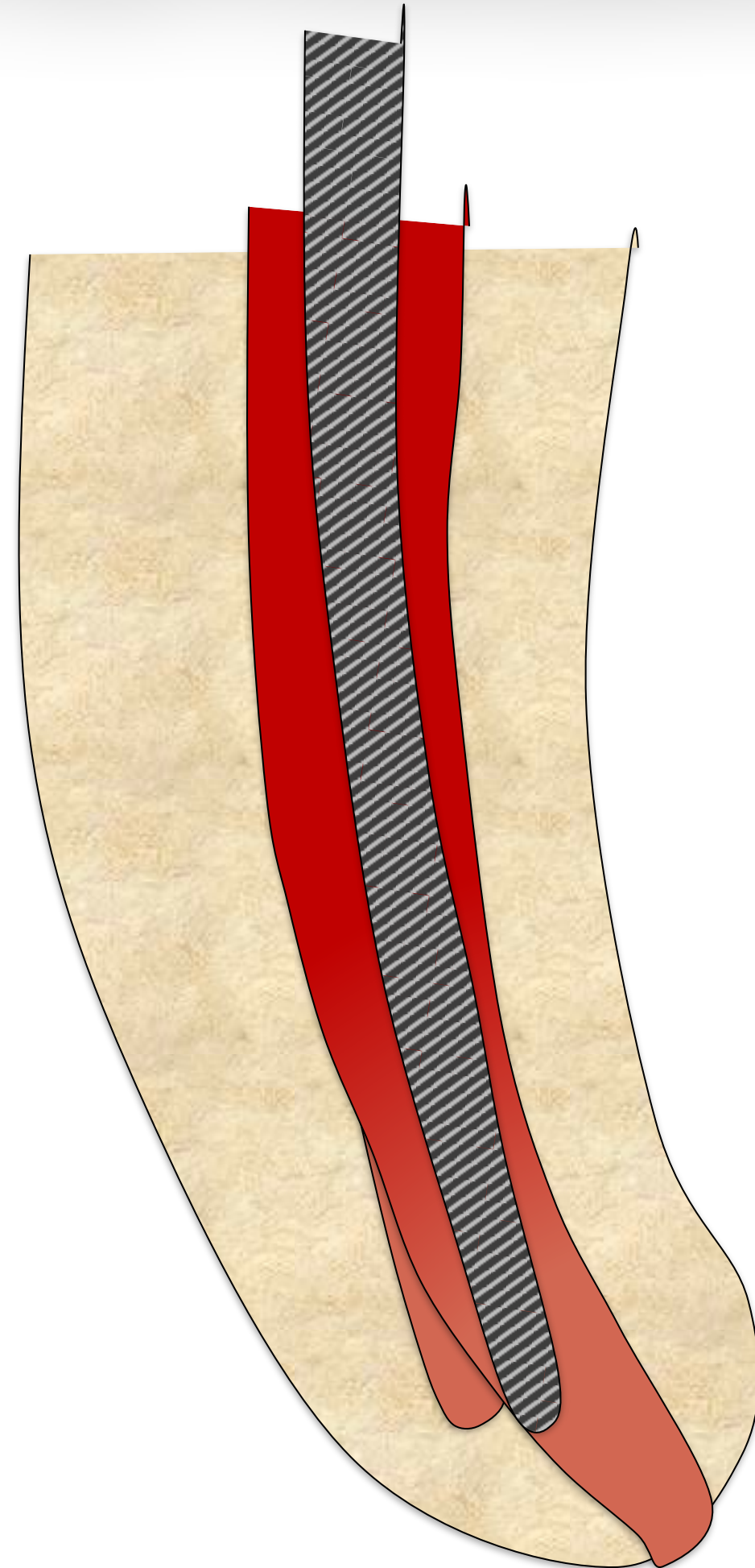
THIS DEFLECTION (...), AND THE ELASTIC MEMORY OF THE DEFLECTED METAL, PRODUCES GREATER CUTTING EFFICIENCY IN THE DIRECTION **OPPOSITE** TO THE CURVATURE OF THE INSTRUMENT”

SCHILDER, H. “CLEANING AND SHAPING THE ROOT CANAL” - DENT CLIN NORTH AM. 1974 APR; 18 (2): 269-96

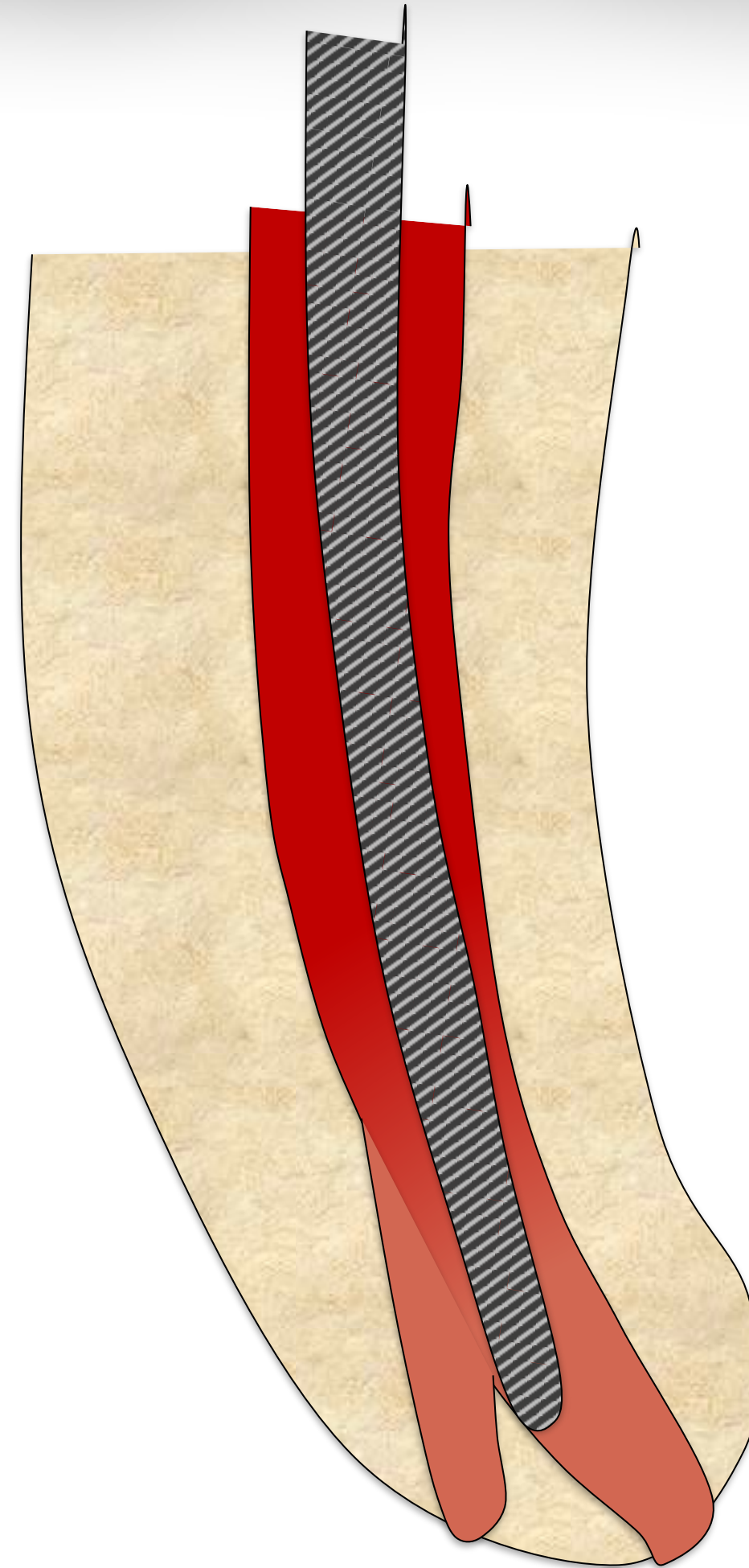
PROBLEMATICHE



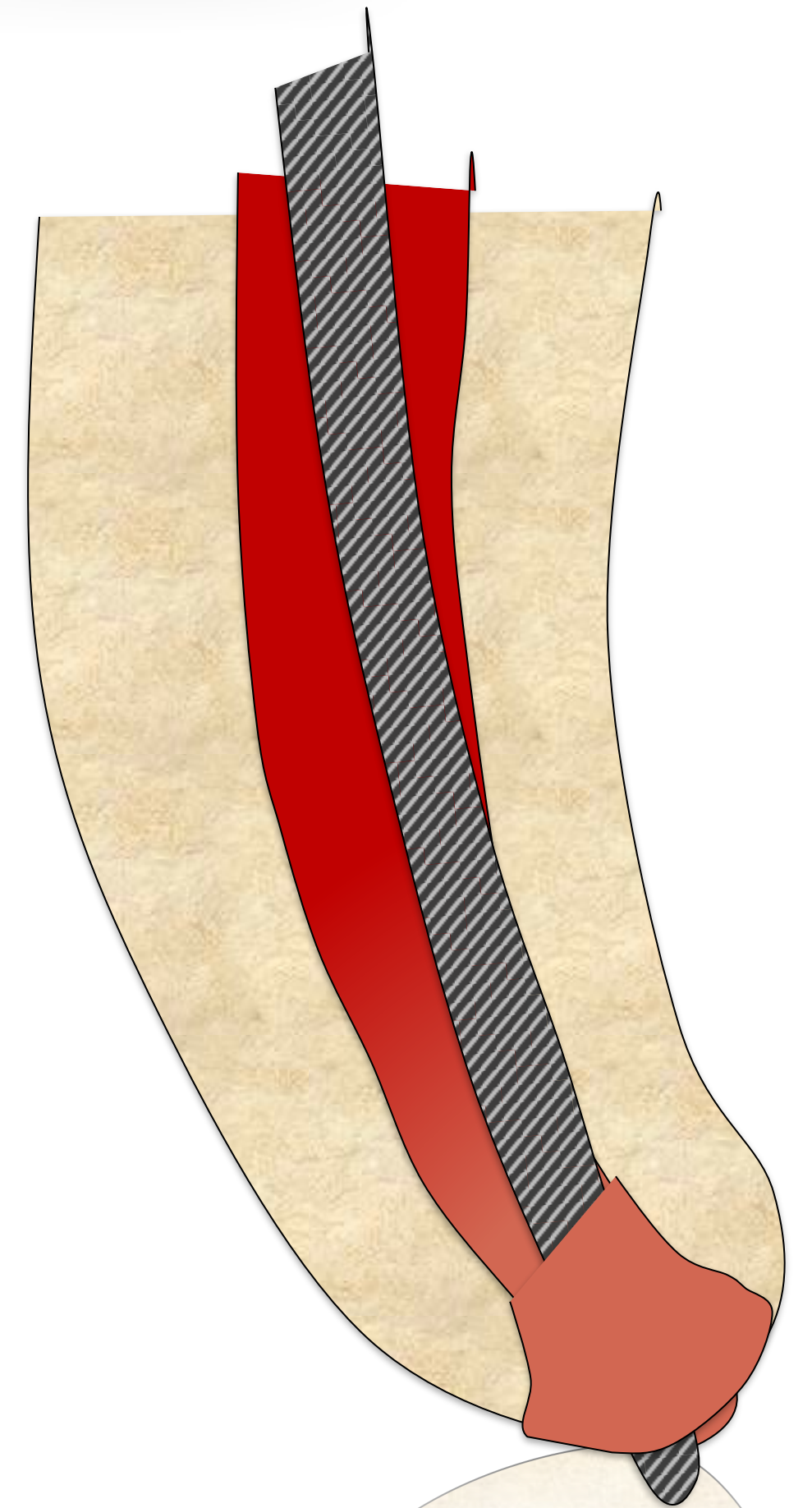
TAPPO



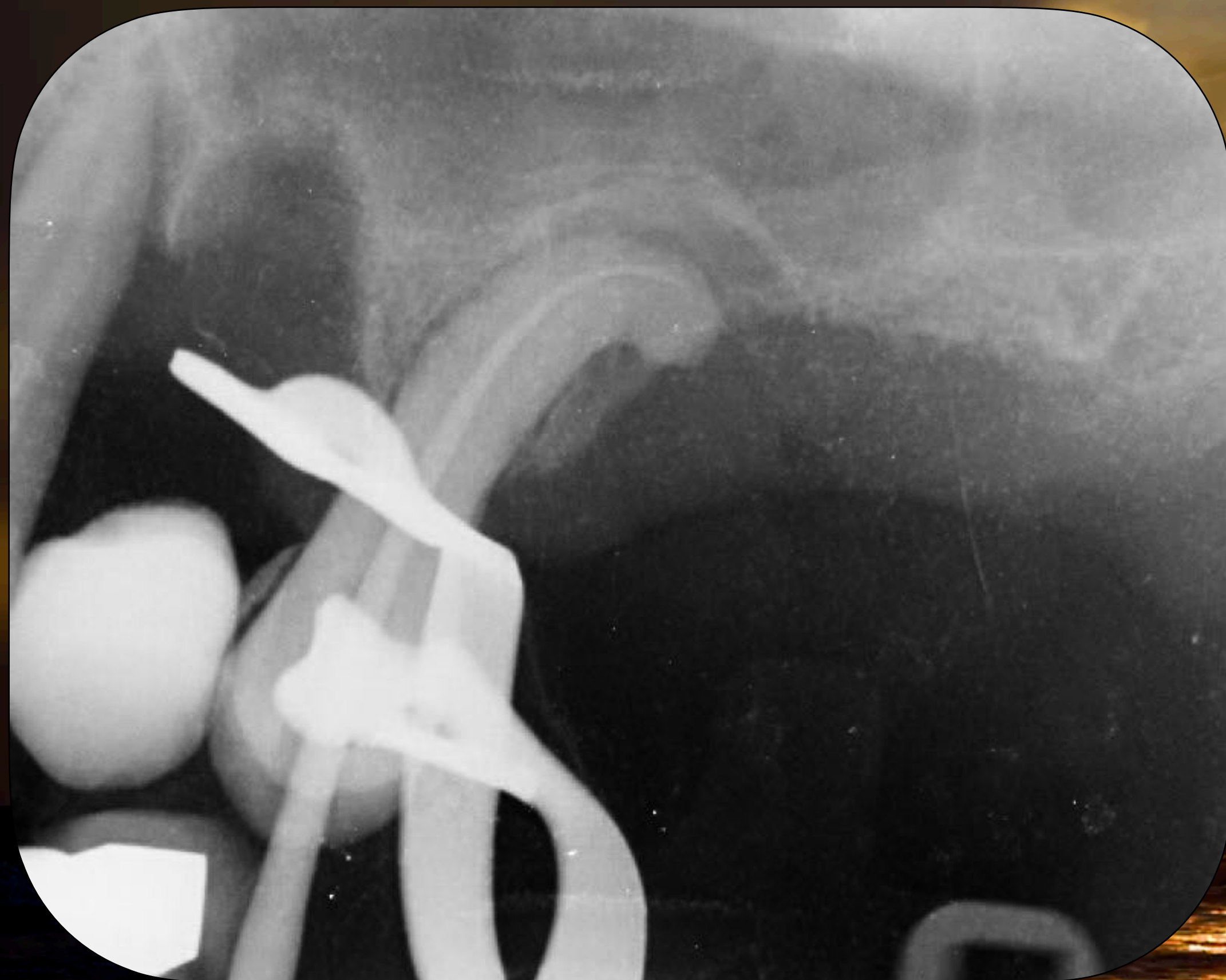
GRADINO



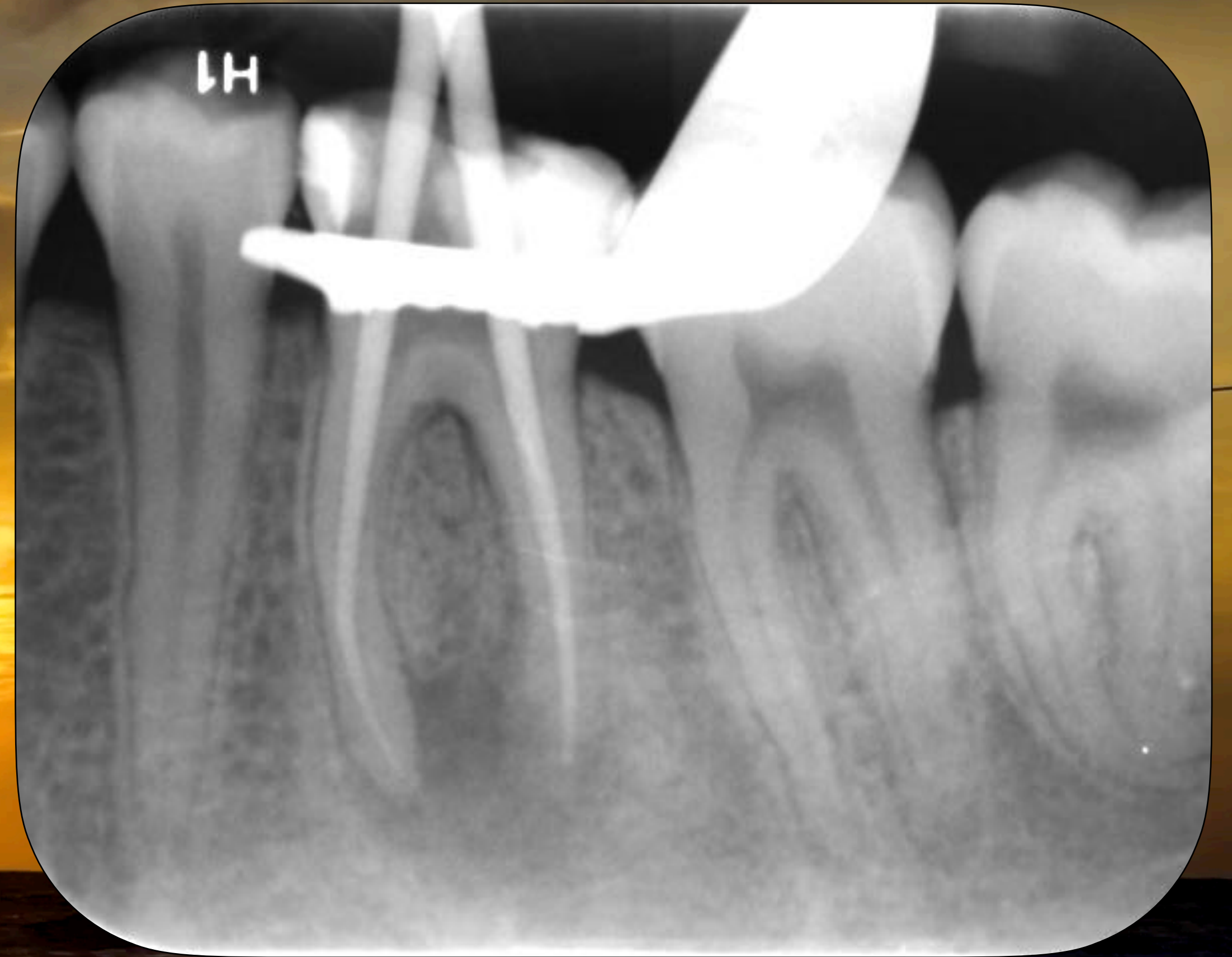
PERFORAZIONE



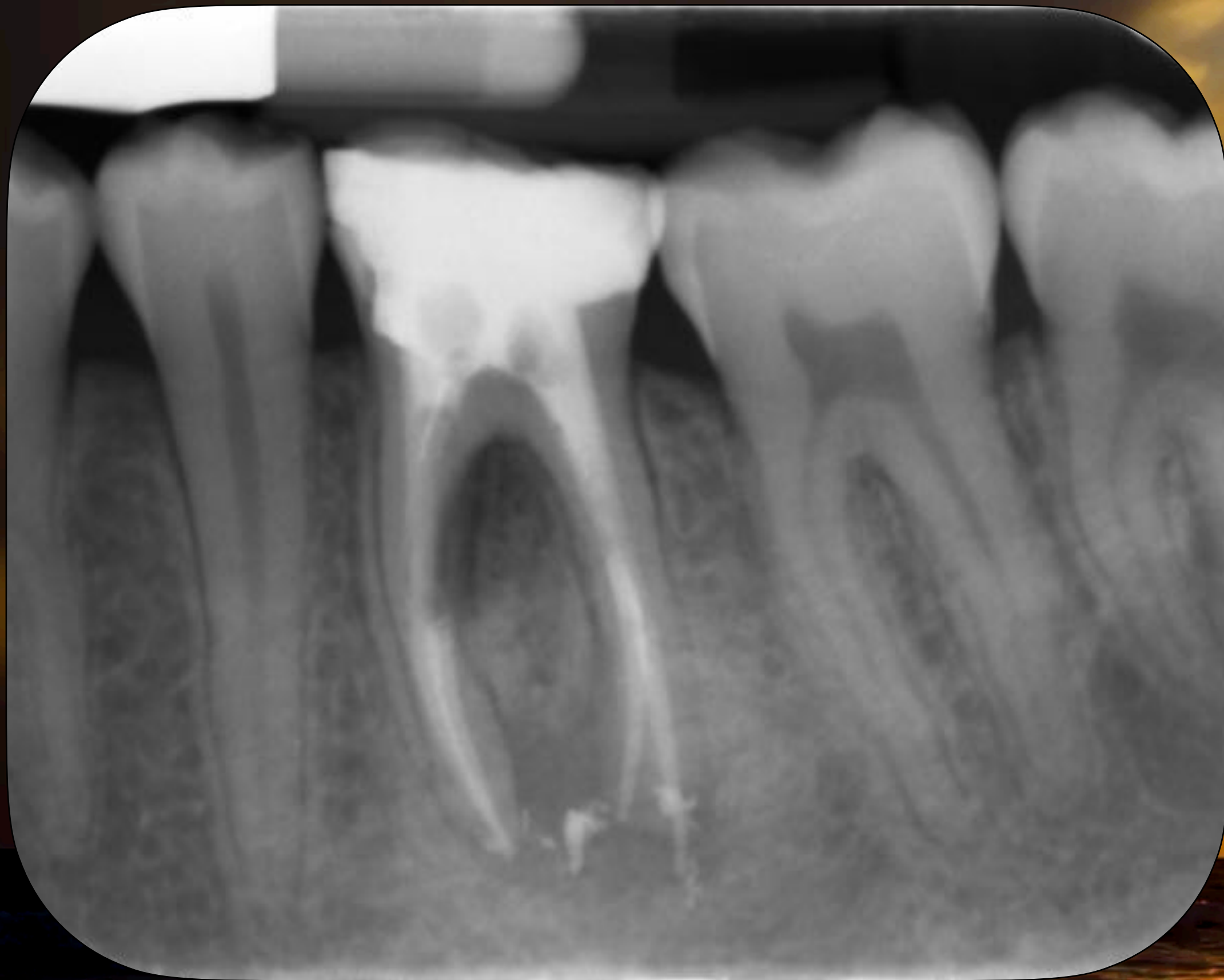
TRASPORTO



**AUMENTARE IL DIAMETRO AUMENTA I
RISCHI**



**LO STRUMENTO VUOLE TORNARE
NELLA SUA FORMA**



**LO STRUMENTO VUOLE TORNARE
NELLA SUA FORMA**

EVITARE FRATTURE E MIGLIORARE LA SACCOMATURA

DESIGN & ROTAZIONE

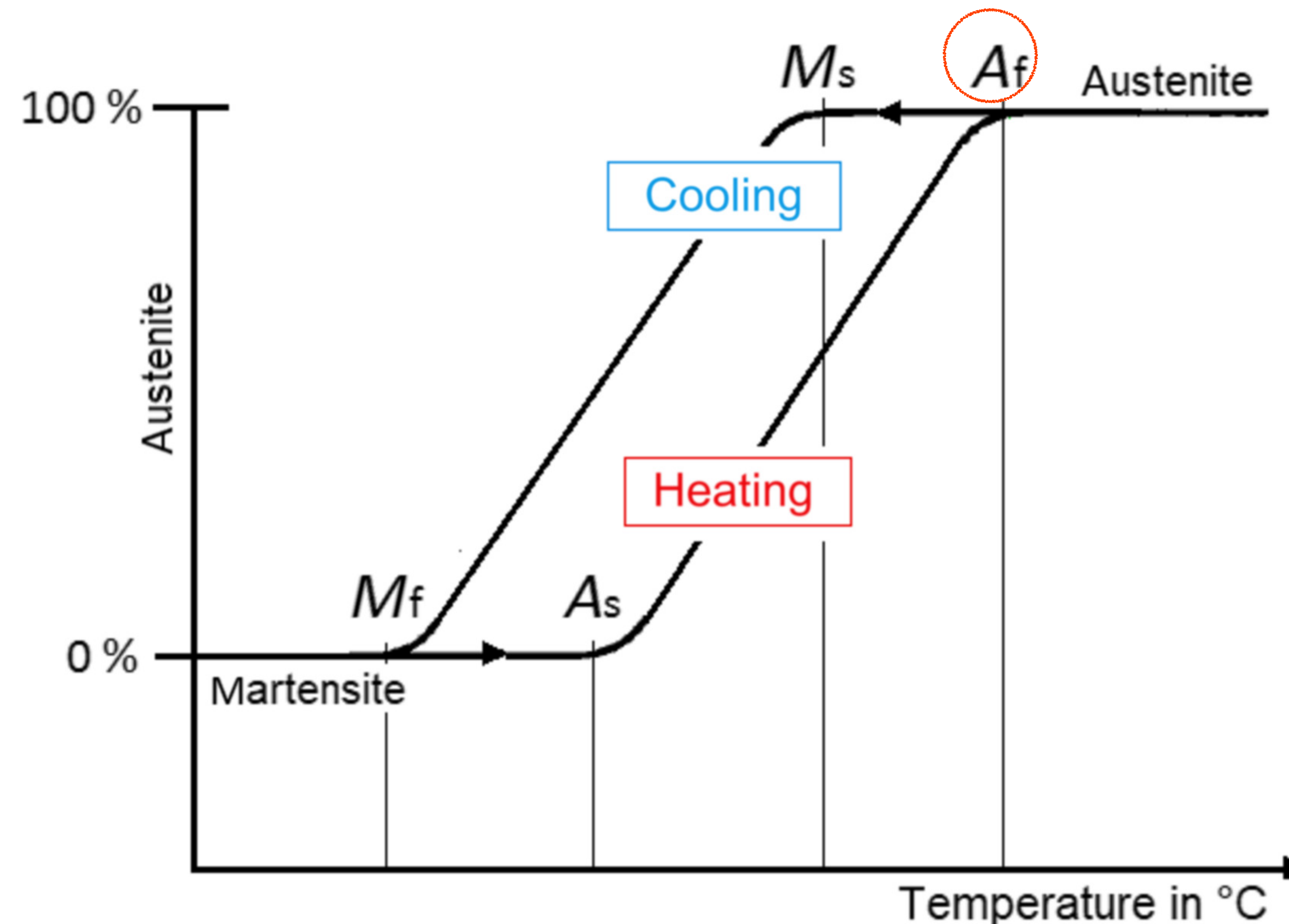
LEGA



2011

COLTENE CAMBIA IL DNA DEL NITI

COLTENE ATTRAVERSO UN TRATTAMENTO TERMICO DELLA LEGA HA MODIFICATO LA TEMPERATURA DI TRANSIZIONE



QUINDI ORA POSSO
SCEGLIERE LE
PERCENTUALI DI A E
M A T° AMBIENTE



IN STUDIO..

GRAZIE AL TRATTAMENTO TERMICO, A
TEMPERATURA AMBIENTE GLI
STRUMENTI SONO IN
FASE MARTENSITICA



HEAT TREATMENT T°

± 55°

Cm-Wire

Gold Wire

Blue Wire

R-phase

M-Wire

SE Ni-Ti

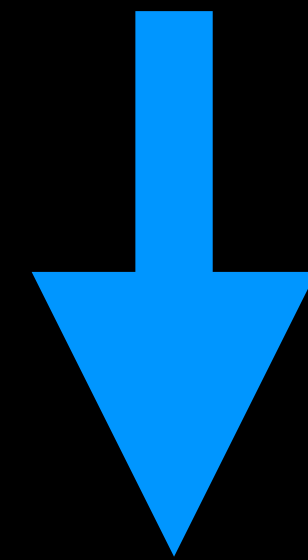
± 0°

Martensitic Phase (Low T°, Soft)

Austenitic Phase (High T°, Stiff)

SPOSTANDO LA TEMPERATURA
DI TRANSIZIONE, POSSO
MODIFICARE LA FASE IN CUI LO
STRUMENTO SARA' A
TEMPERATURA AMBIENTE

TEMPERATURA AMBIENTE



Martensite

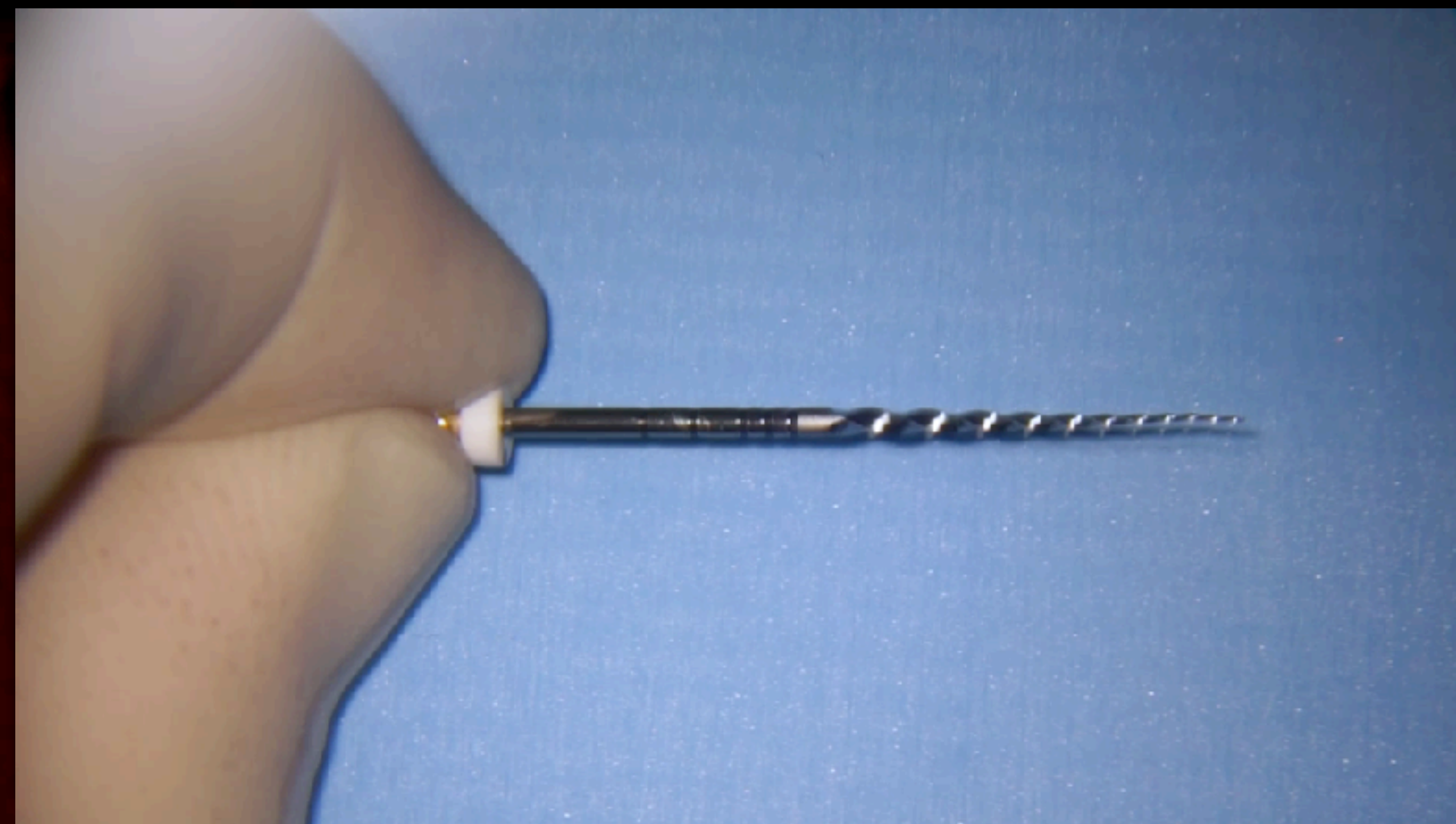


T

temperatura di transizione

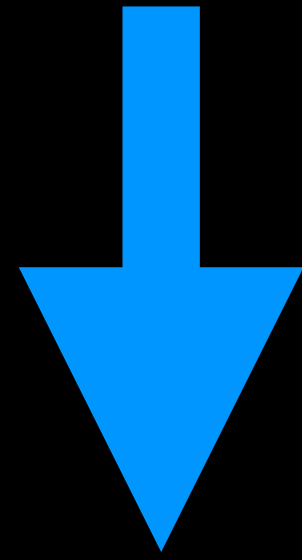


Austenite

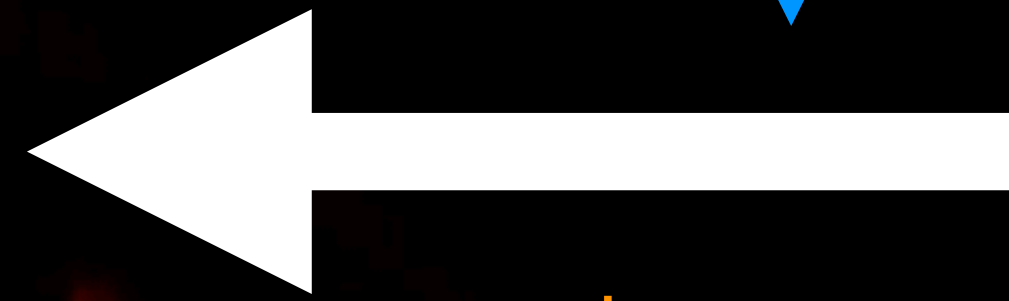


STRUMENTO NI TI STANDARD = 0°C

TEMPERATURA AMBIENTE



Martensite



T



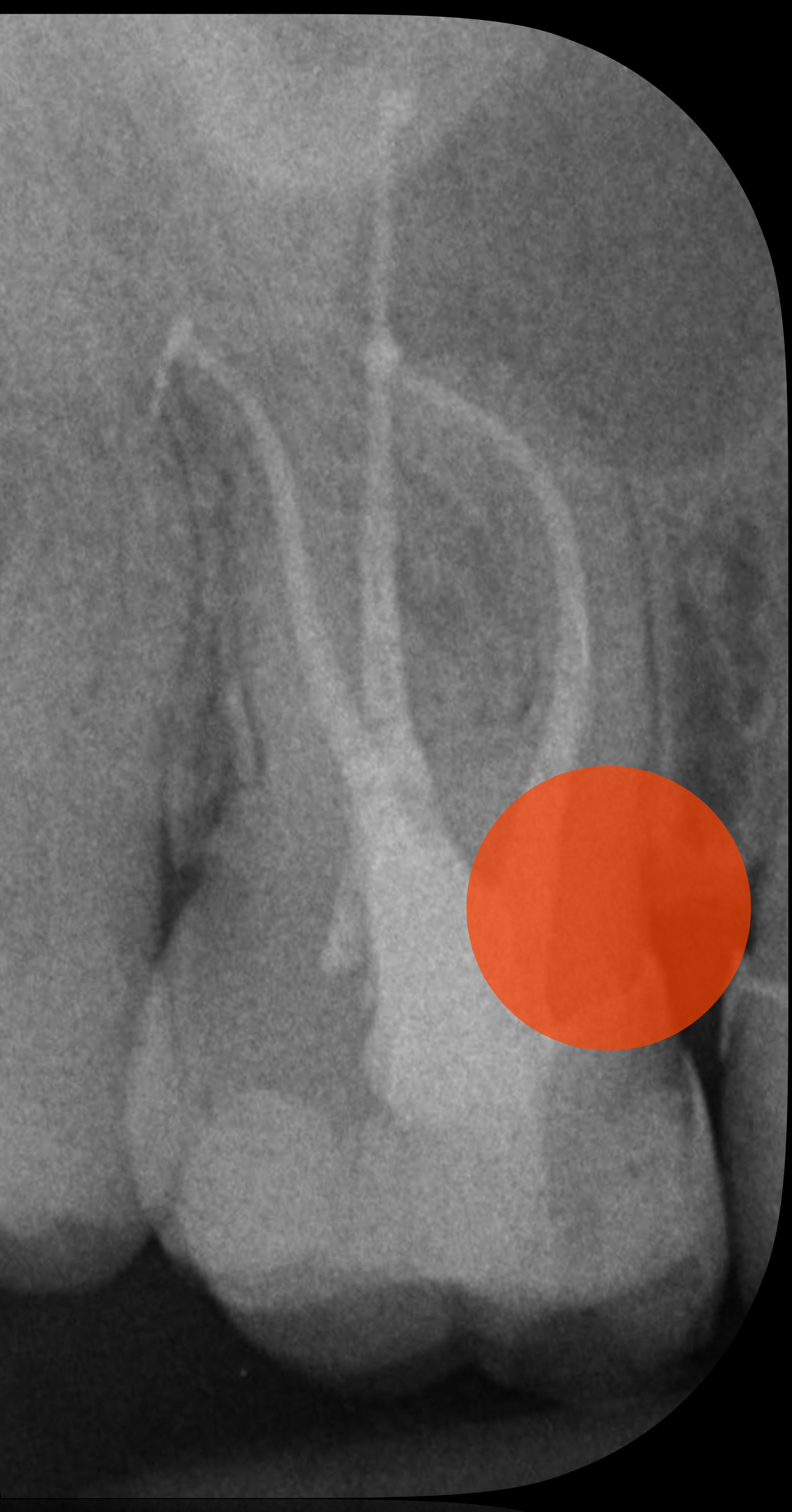
Austenite

temperatura di transizione



STABILMENTE IN FASE MARTENSITICA ALLA
TEMPERATURA DELL'AMBIENTE

STRUMENTO NI TRATTATO TERMICAMENTE

A grayscale periapical radiograph of a tooth. A red circle is drawn on the image, centered on the cervical area of the tooth, highlighting the pericervical region. The text is overlaid on the right side of the image.

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

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

AVIAD TAMSE

A most frustrating complication to root canal therapy is vertical root fracture (VRF) in an endodontically treated tooth. Prognosis most often is hopeless and differential diagnosis from other pathoses may be difficult. Nevertheless, proper diagnosis is critical to distinguish a fracture complication from clinical periodontal and endodontic diseases. This review emphasizes the importance of the correct diagnosis, describes the more typical clinical and radiographic features of this disorder, and summarizes the multifactorial etiology.

TAMSE 2006

“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 ALLA SACOMATURA

PRESERVARE LA MASSIMA QUANTITA DI TESSUTO
DENTALE DURANTE LA TERAPIA ENDODONTICA

ED “EVITARE” LA
FRATTURA DEGLI
STRUMENTI ROTANTI

SAFETY

FLESSIBILITA' E RESISTENZA

HYFLEX CM SEQUENCE



MEMORIA ELASTICA $\approx \varnothing$

MEMORIA DI FORMA CONTROLLATA

MIGLIORE RISPETTO ANATOMIA CANALARE

REVERSIBILITA' DELLA FORMA

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

Size 25/.04	45°			35°		
	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
NEY Y	329 ± 92	6.4 ± 0.3	79 ± 3	1213 ± 430	3.6 ± 0.6	71 ± 4
NEY Y CM	2629 ± 125	3.4 ± 0.7	43 ± 9	$3491 \pm 1,782$	2.2 ± 0.9	39 ± 6

INSTRUMENTS MADE FROM HT WIRE HAD A SIGNIFICANTLY HIGHER NUMBER OF REVOLUTIONS TO FRACTURE THAN THE CONVENTIONAL NI-TI WIRE FILES

Shaping ability of two nickel–titanium instruments activated by continuous rotation or adaptive motion: a micro-computed tomography study

**E. Pedullà, G. Plotino, N. M. Grande,
G. Avarotti, G. Gambarini, E. Rapisarda
& F. Mannocci**

ONLINE
FIRST

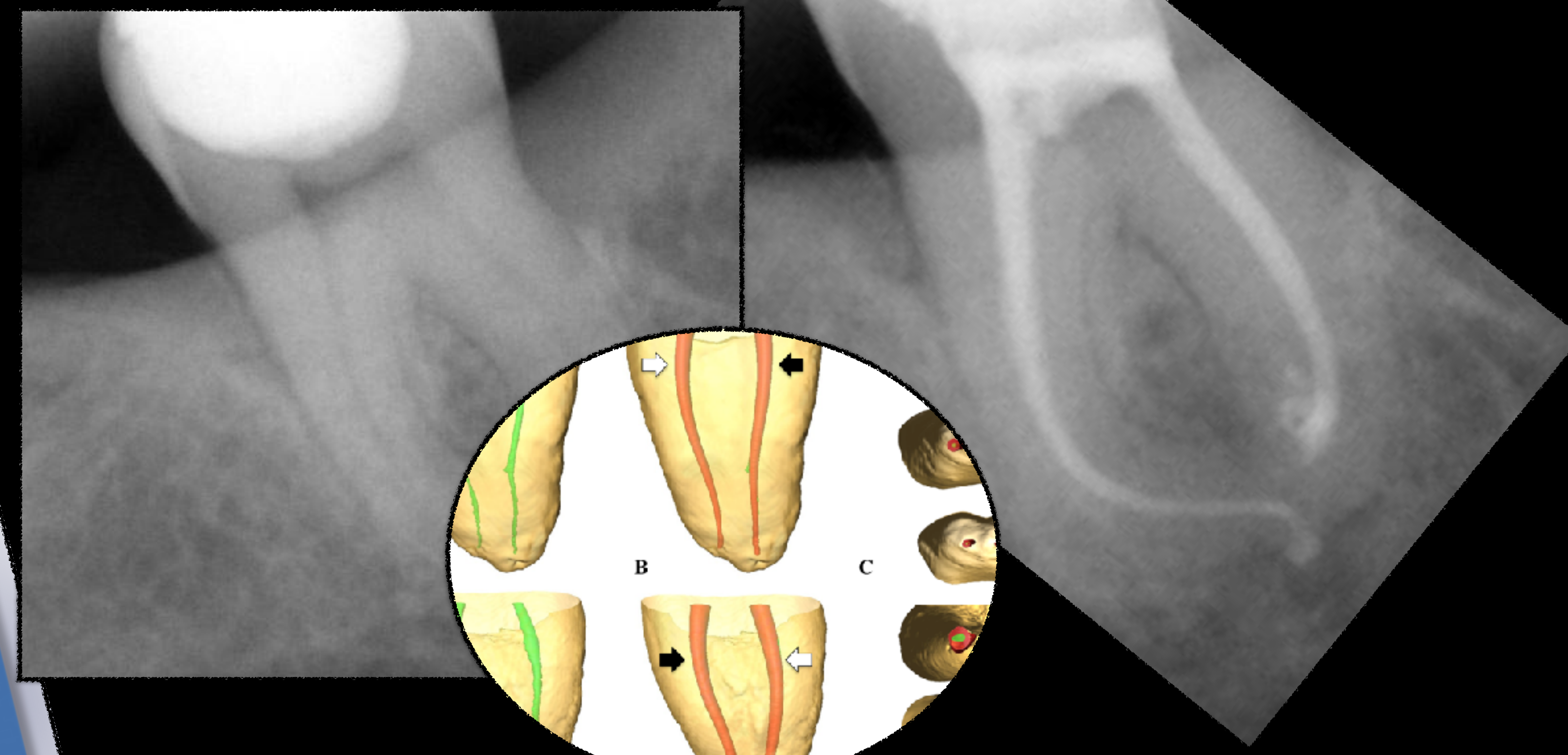
Clinical Oral Investigations

ISSN 1432-6981

Clin Oral Invest
DOI 10.1007/s00784-016-1732-4

Clinical Oral
Investigations

1
2016



..The use of Ni-ti files made by he-treated alloy could improve the qualities of root canal shaping rather than conventional Ni-ti instruments

2013

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

YA SHEN et AL

La *Maggioranza* dei nuovi file
introdotti nel mercato sono
Trattati termicamente



AUSTENITICO

ROOM
TEMPERATURE

MARTENSITICO

M-wire



R-phase



Max-wire Gold Blue



*CM
wire*



*CM
EDM*



INCREASING MARTENSITE = INCREASING FLEXIBILITY

Reciproc

Twisted File

XP endo
shaper

ProTaper
Gold

Vortex
Blue

HyFlex CMHyFlex EDM

HYFLEX EDM SEQUENCE

2015



EDM

ELECTICAL DISCHARGE
MACHINING

ELETTROROSIONE

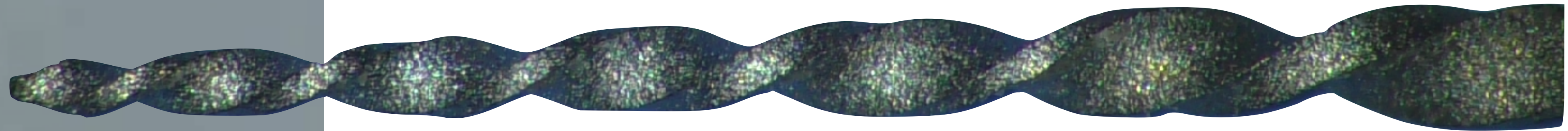


CM-wire machined by Electrical Discharge Machining

HyFlex CM (CM-wire)



CM treatment = Martensite = Deformable at room T°



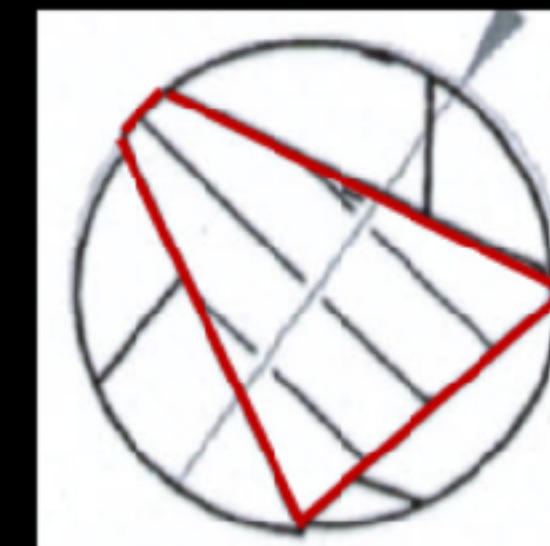
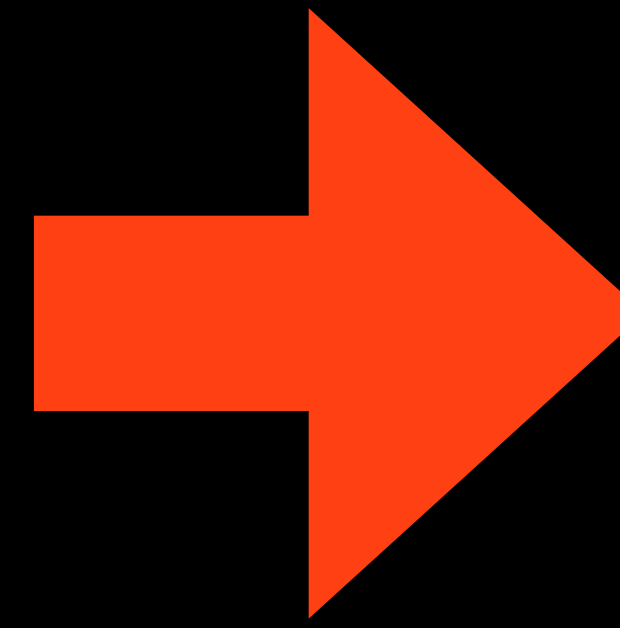
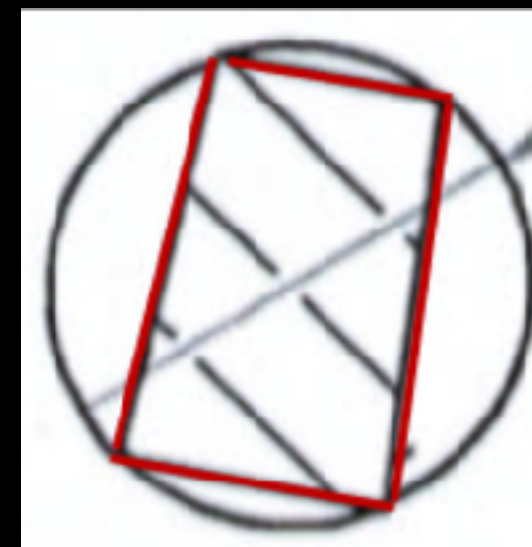
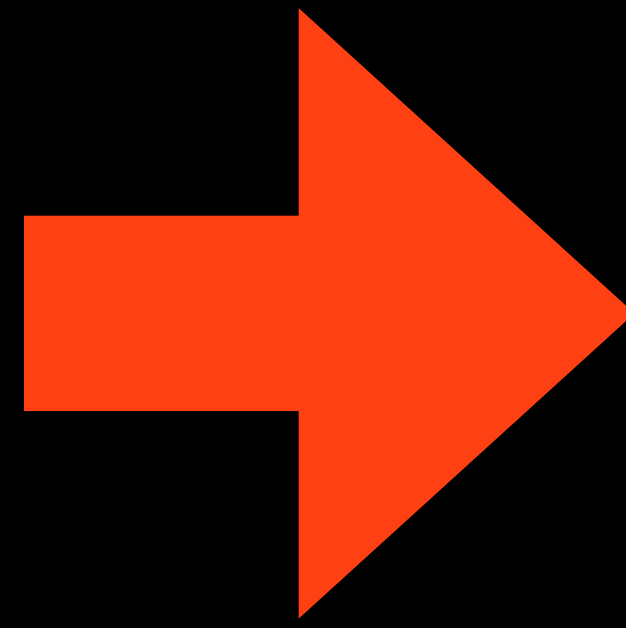
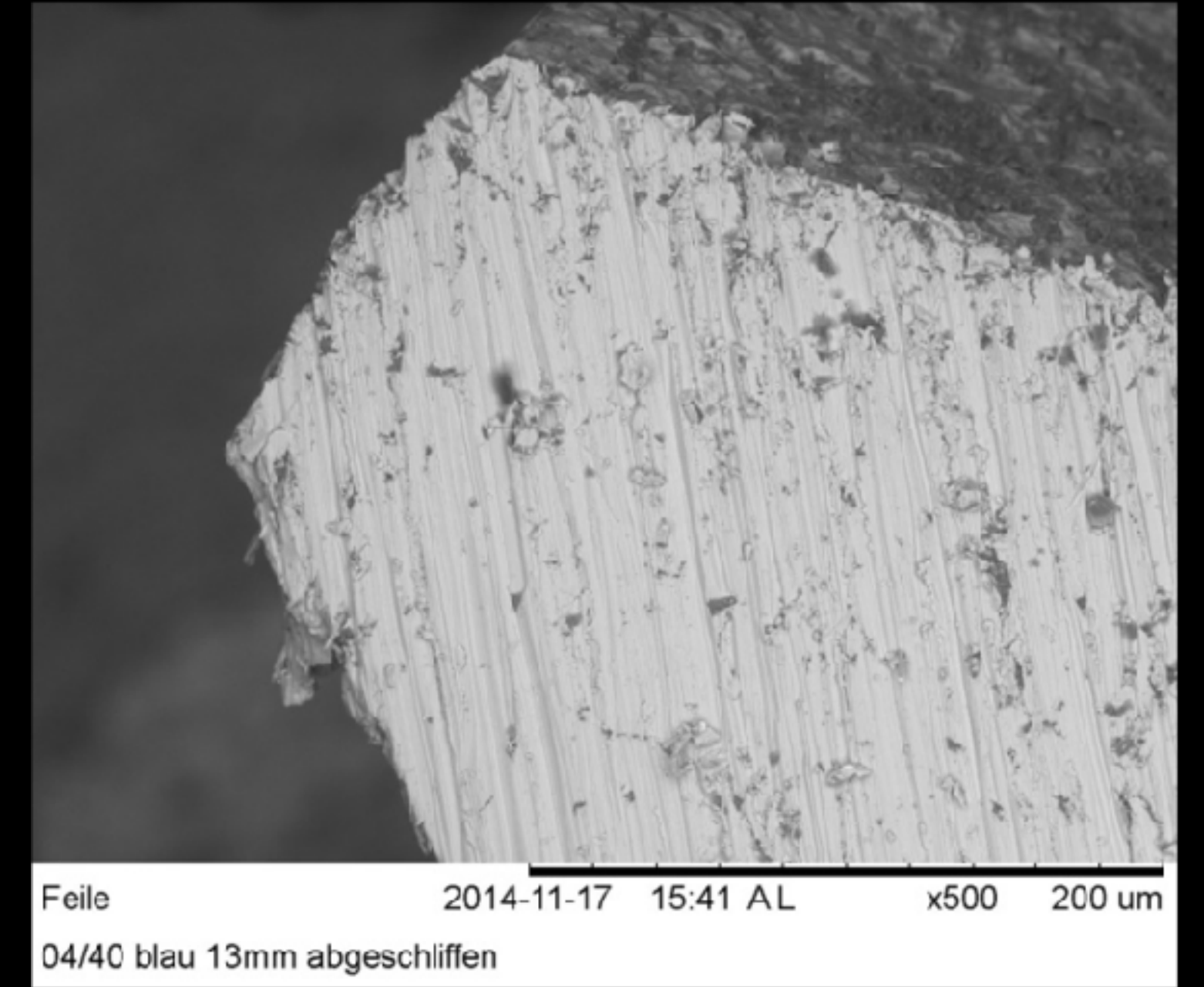
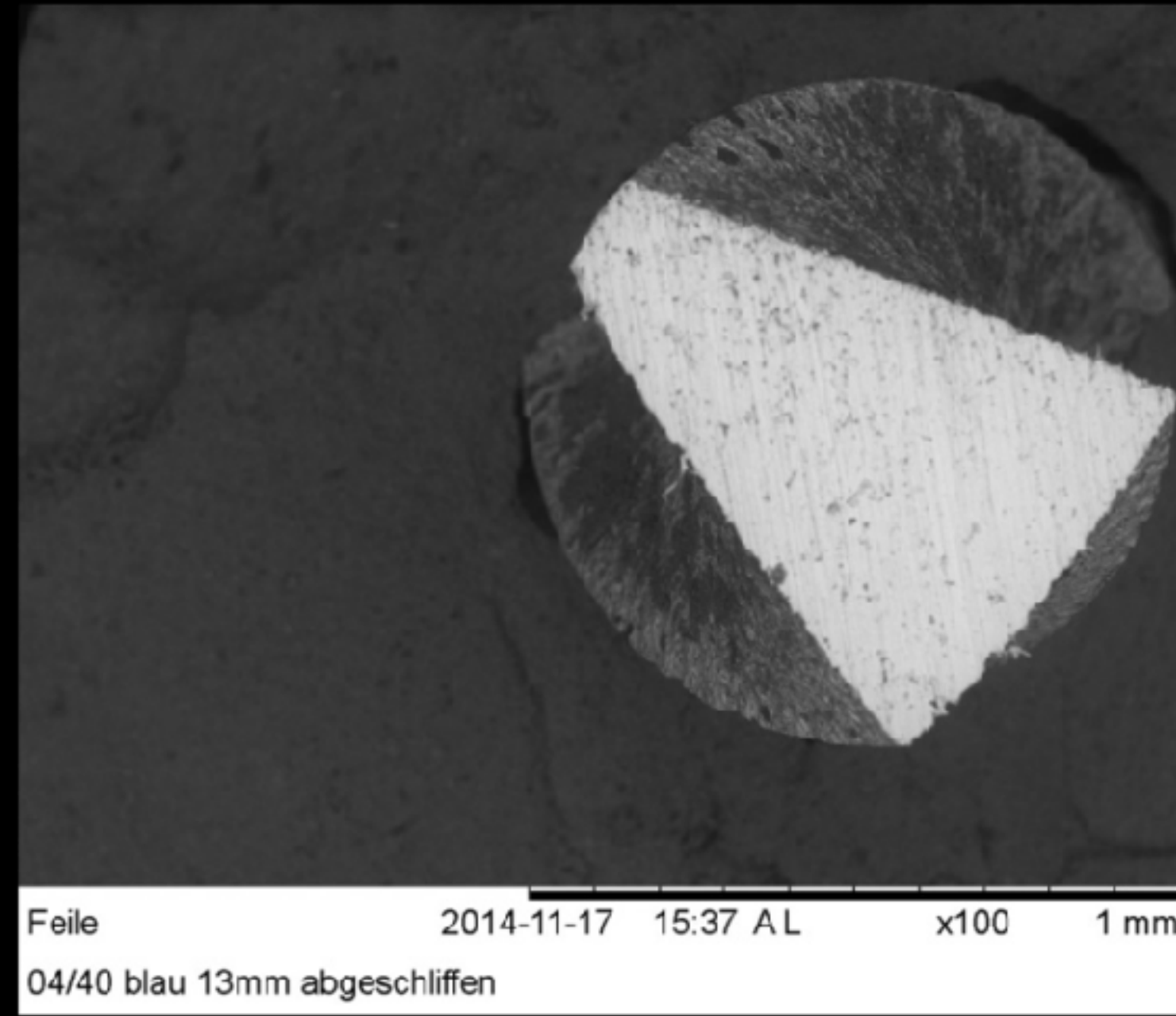
EDM (CM-wire)



Ni-Ti EDM files

The EDM manufacturing process as well as the CM-wire make the HyFlex EDM files more fracture resistant and improve the cutting efficiency.

parte lavorante individualizzata



CM vs EDM

SURFACE DIFFERENCES

ALTA DUREZZA DI SUPERFICIE
ALTA EFFICENZA DI TAGLIO

10kV X100 100µm 140546

10kV X500 50µm 140559

CM vs EDM

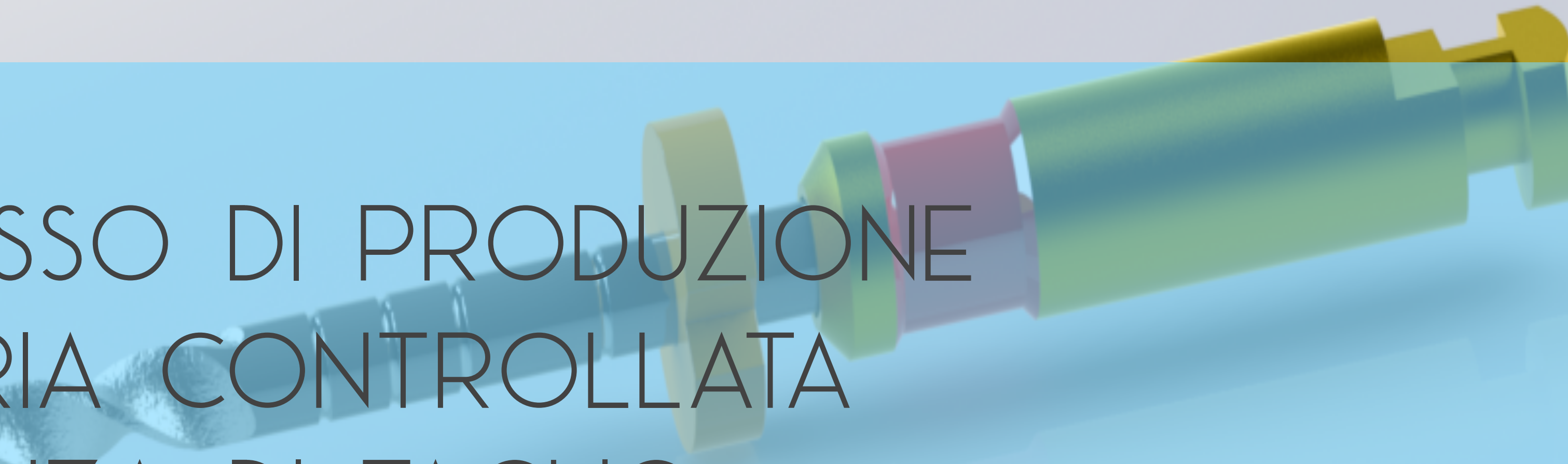
SURFACE DIFFERENCES

40.04 EDM 100 VOLTE PIU
RESISTENTE DEL 40.04 CM

10kV X100 100µm 140546

10kV X500 50µm 140559

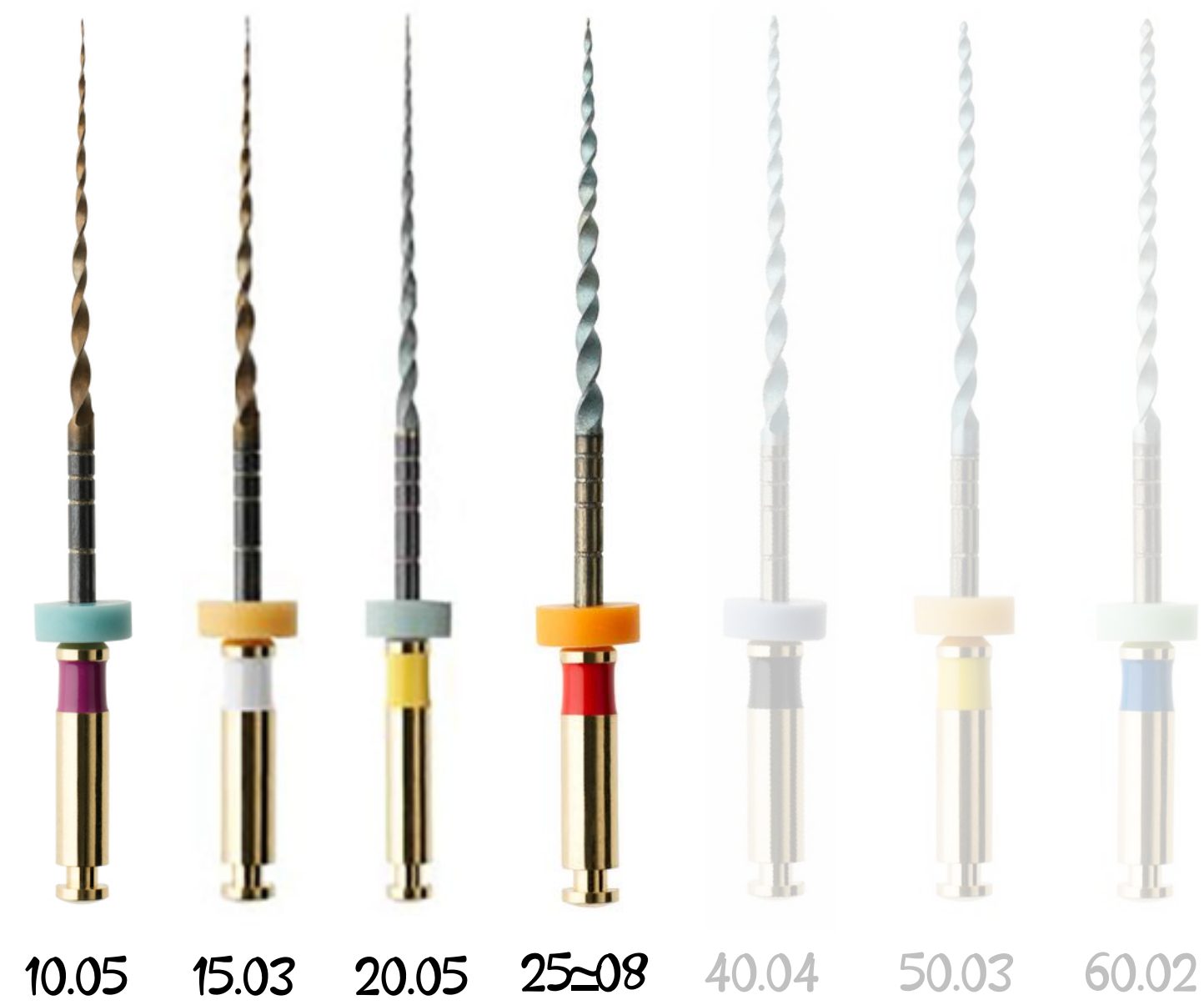
HYFLEX EDM



INNOVATIVO PROCESSO DI PRODUZIONE
EFFETTO DI MEMORIA CONTROLLATA
AUMENTATA EFFICIENZA DI TAGLIO
ELEVATISSIMA RESISTENZA ALLA ROTTURA
SUPERFICIE PIU DURA
NUMERO RIDOTTO DI LIME

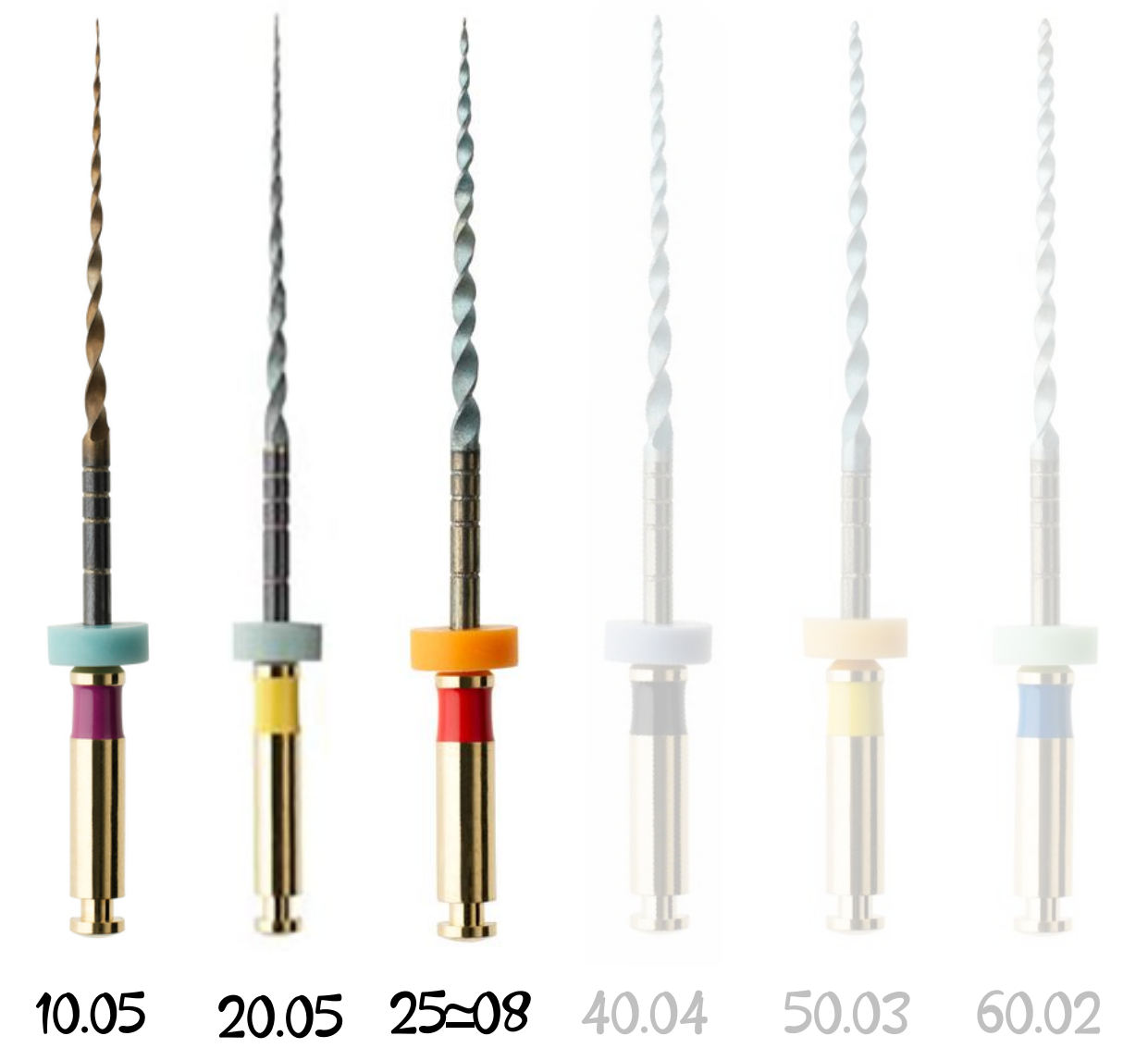
A person wearing a white button-down shirt has a yellow measuring tape draped around their waist. They are standing at a wooden workbench, where they are working on a black fabric pattern. Their hands are visible, one holding a piece of the pattern. The background is softly blurred, showing warm, bokeh-style lights. A semi-transparent blue horizontal band is overlaid across the middle of the image, containing the text.

più files significano
POSSIBILITA' DI PERSONALIZZARE LA
NOSTRA SACOMATURA



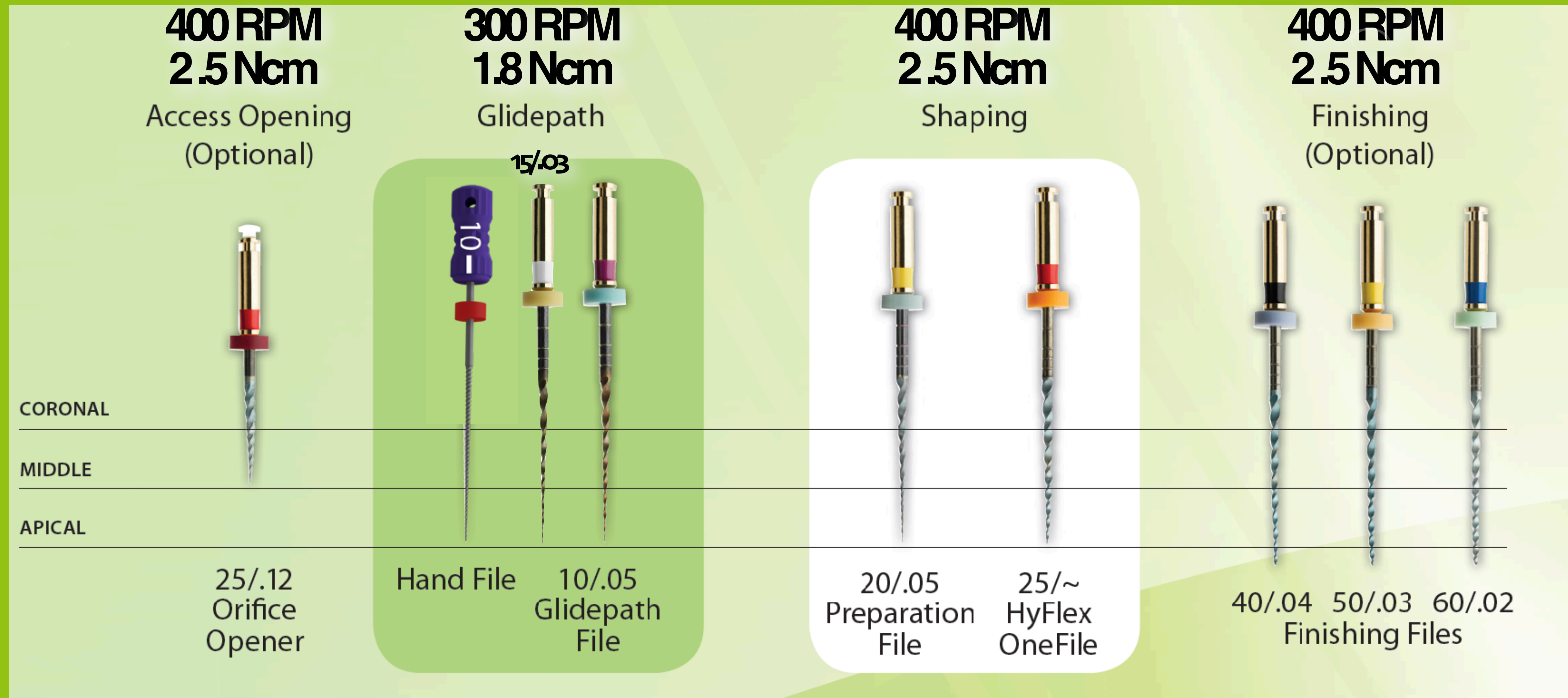
Simple Sequence

Max Curve Sequence



Medium Sequence

HyFlex EDM – Portfolio and settings

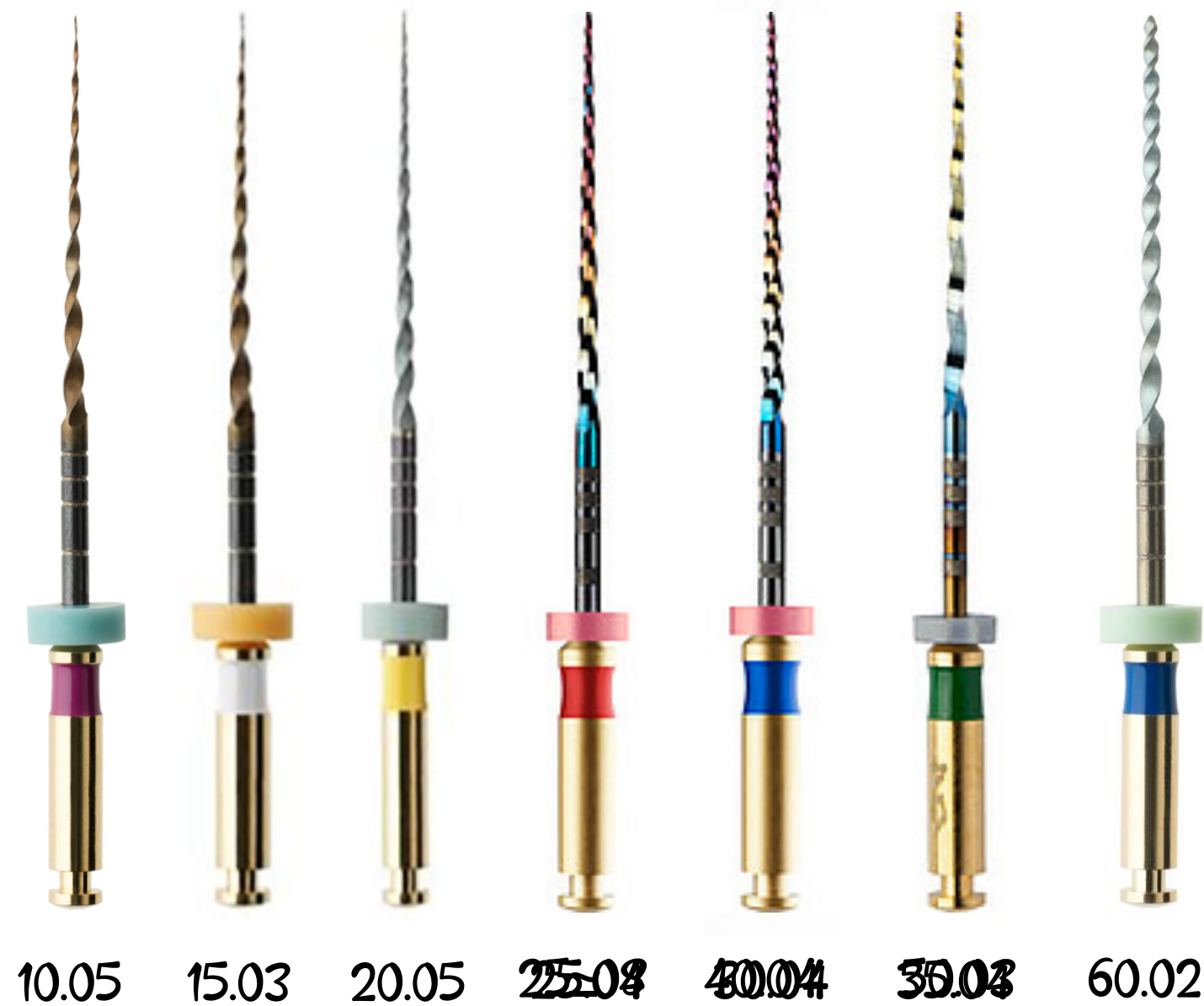


Length: 21 & 25 mm
Orifice Opener: 15 mm

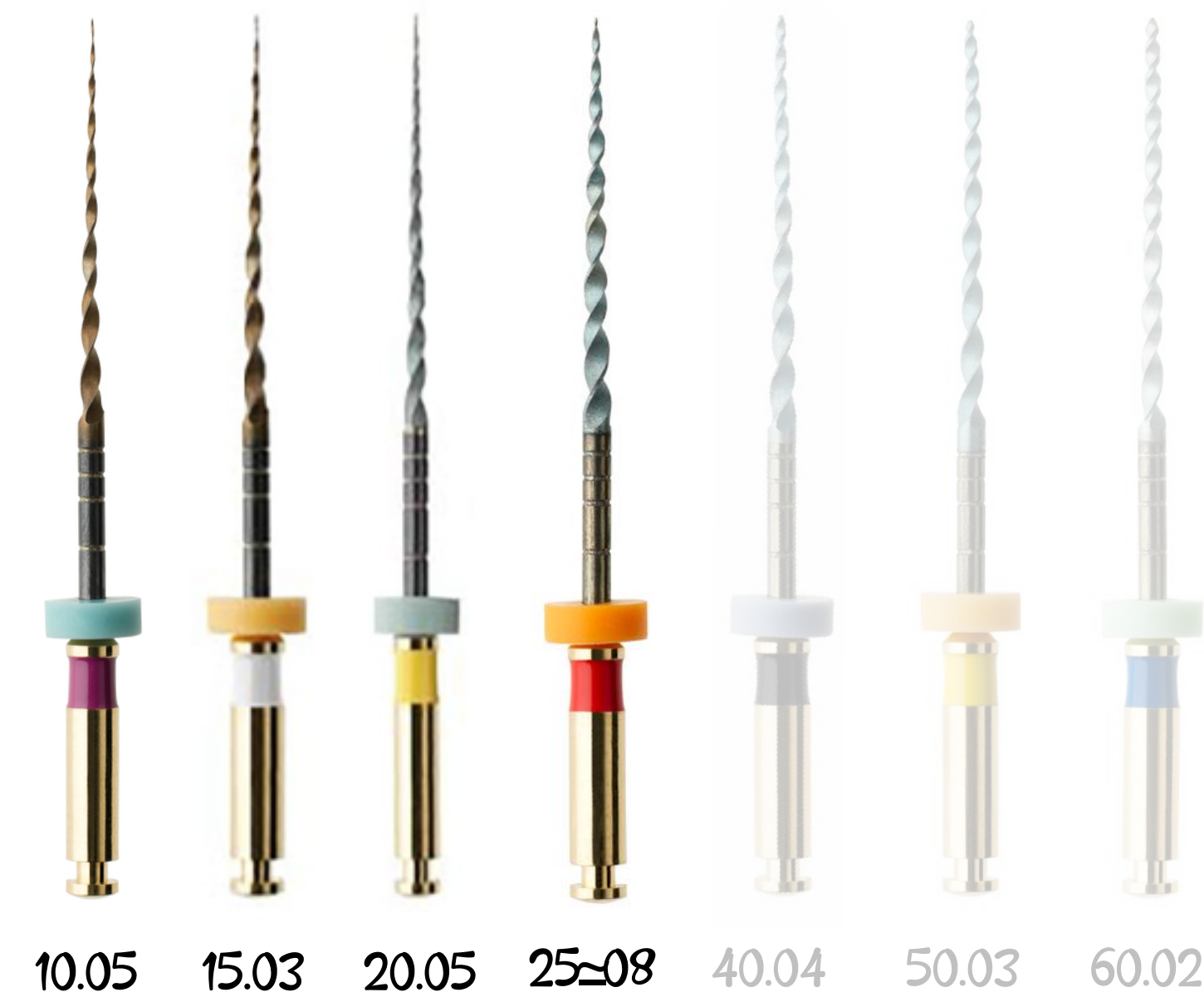
Reduced sequence
Variable taper

ShapeIT[®]

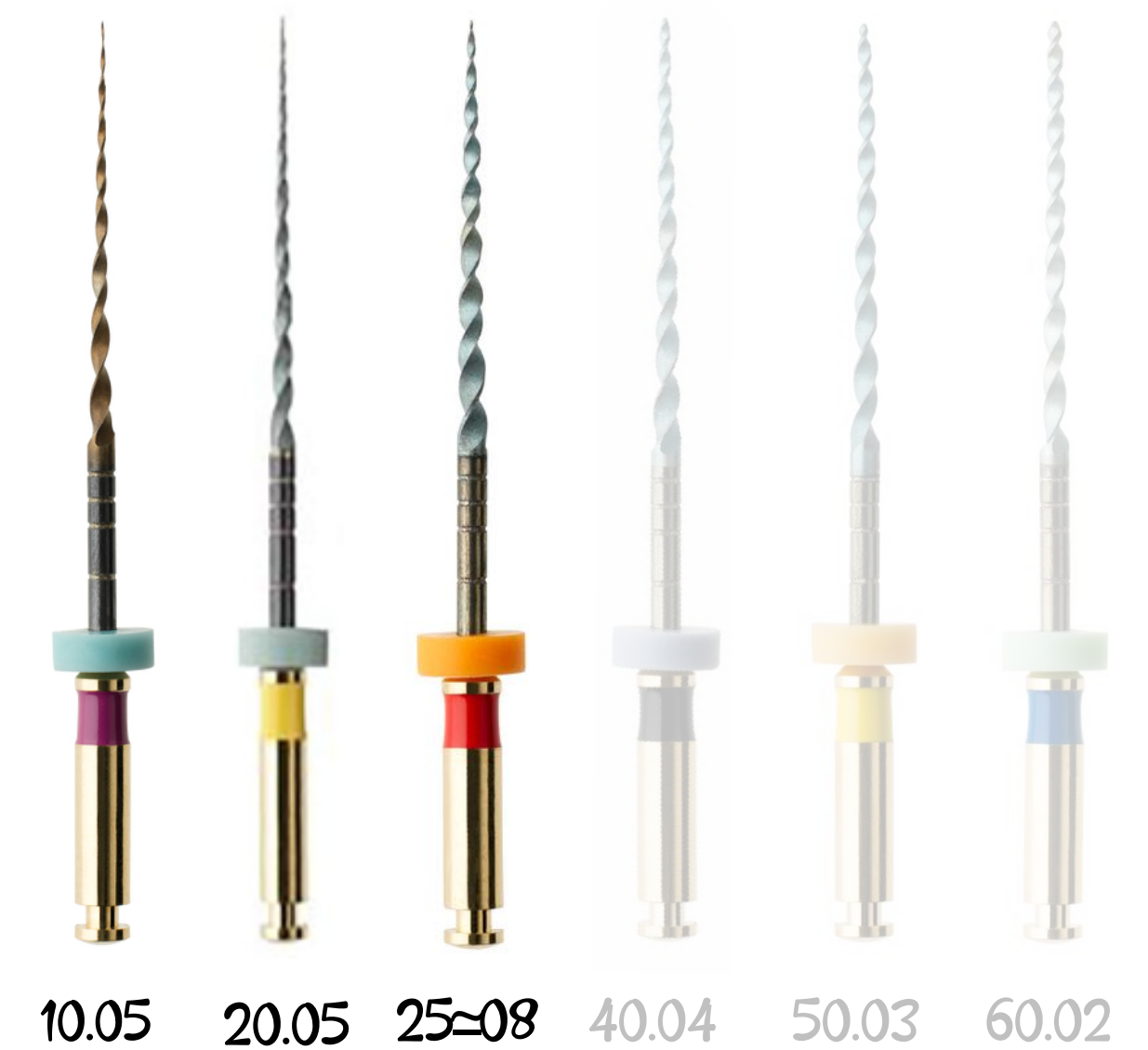
My sequence



simple sequence



Max curve sequence



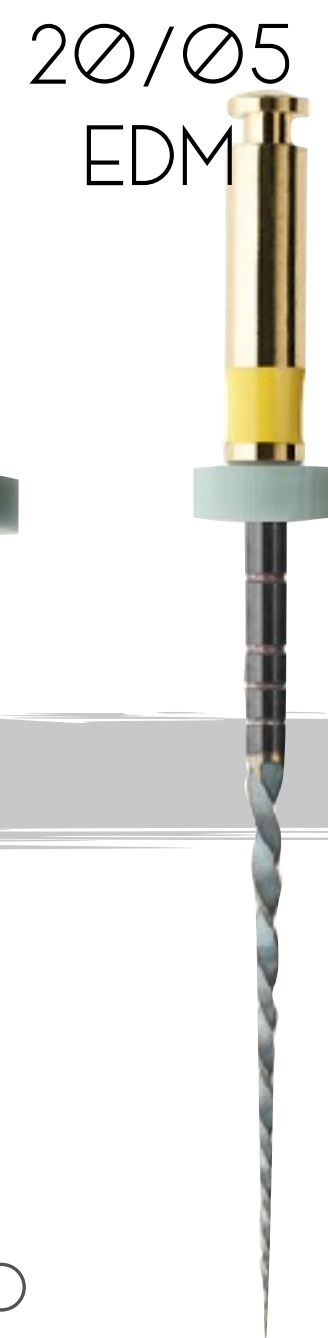
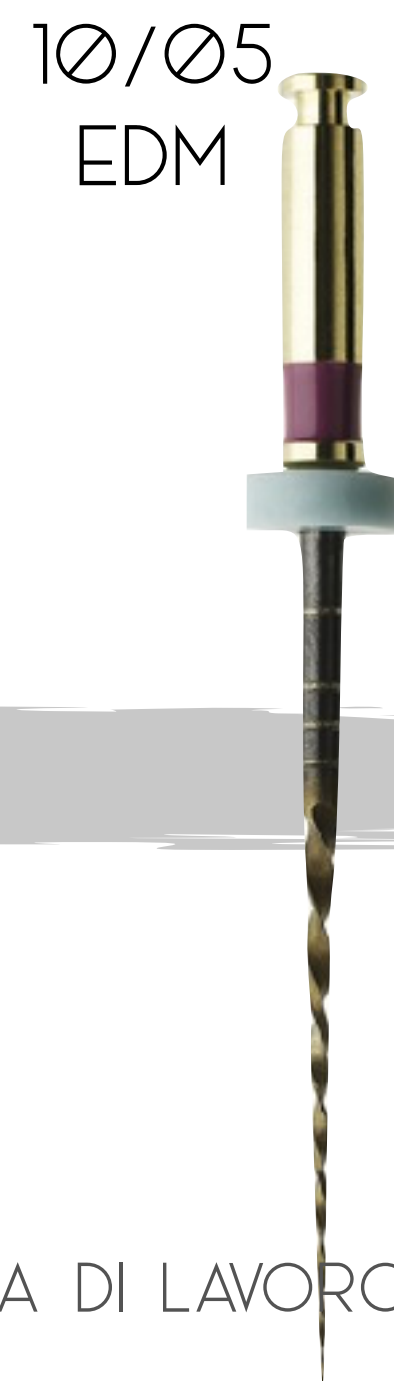
Medium sequence



PIU' CORTO DI L.L.



A LUNGHEZZA DI LAVORO



1

PREFLARING

2

SCOUTING

3

GLIDE PATH

4

SHAPING

5

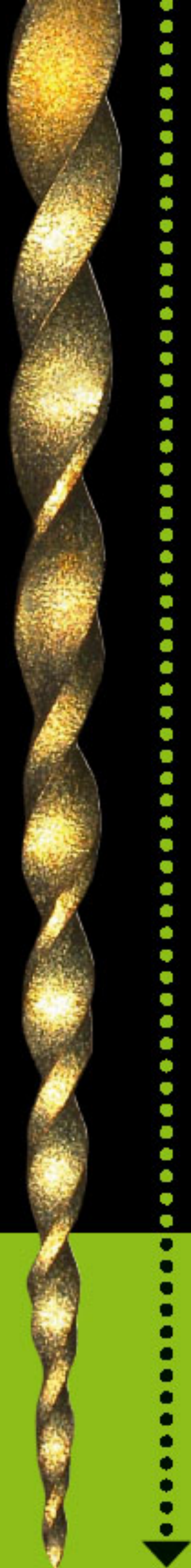
FINISHING

300RPM
18Ncm

300RPM
18Ncm

400RPM
2.5Ncm

400RPM
2.5Ncm



SEQUENCE
STEP BY STEP

ORIFICE
OPENER
(optional)
25 / .12

Glidepath File
10 / .05

HyFlex™
OneFile
25 / ~

FINISHING
FILES
(optional)
40 / .04
50 / .03
60 / .02

+

HyFlex™ CM refill file NiTi

Misura	Lunghezza
08/25	19 mm
04/15	21 mm / 25 mm / 31 mm
04/20	21 mm / 25 mm / 31 mm
04/25	21 mm / 25 mm / 31 mm
04/30	21 mm / 25 mm / 31 mm
04/35	21 mm / 25 mm
04/40	21 mm / 25 mm / 31 mm
04/45	21 mm / 25 mm
04/50	21 mm / 25 mm / 31 mm
04/60	21 mm / 25 mm / 31 mm
06/20	21 mm / 25 mm / 31 mm
06/25	21 mm / 25 mm
06/30	21 mm / 25 mm / 31 mm
06/35	21 mm / 25 mm
06/40	21 mm / 25 mm / 31 mm

= ENDO



40.4



50.3



60.2

New OGSF Sequence

HyFlex EDM



The diagram illustrates the OGSF sequence for HyFlex EDM. It features four vertical drill bits, each corresponding to a stage of the process: Opener, Glider, Shaper, and Finisher. The letters O, G, S, and F are prominently displayed in green, with the drill bits positioned behind them. The background is black with a green wireframe grid pattern. To the right of the drill bits, the text "Effortless and Smart" and "Predictability for success" is displayed in green, followed by a horizontal line. Below this, the text "Take control in your hands!" is written in large, bold, green letters.

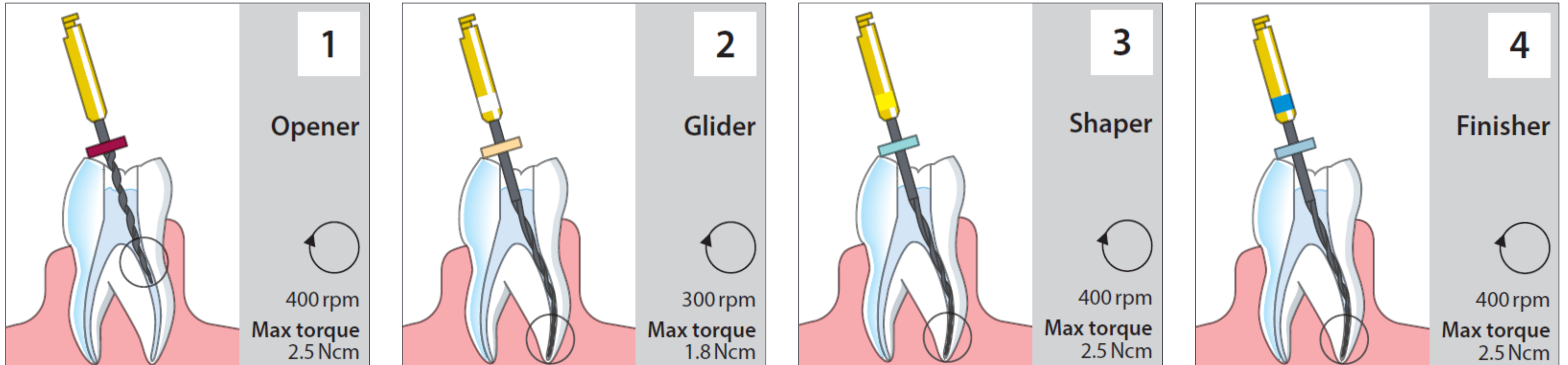
Opener Glider Shaper Finisher

Effortless and Smart
Predictability for success

**Take control
in your hands!**

New HyFlex EDM OGSF

Settings for HyFlex EDM OGSF



COLTENE HyFlex™



O_{pener}

EDM 18/11

G_{lider}

EDM 15/.03

S_{haper}

EDM 18/.045

F_{inisher}

EDM 30/.04

Additional finishers Finishing Files



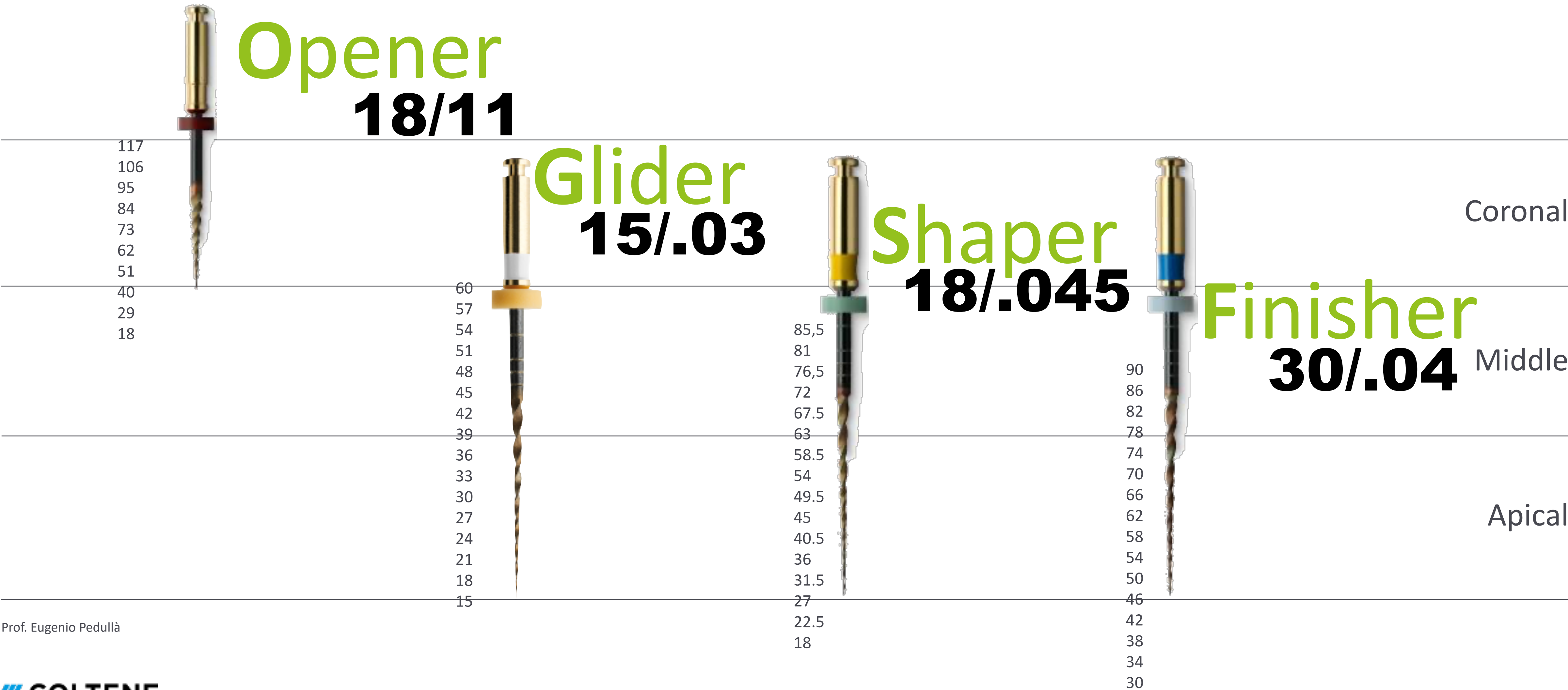
40/.04

50/.03

60/.02

New HyFlex EDM OGSF

Effortless and Smart – Perfect taper match



Prof. Eugenio Pedullà

FILE CON TRATTAMENTO TERMICO

Cyclic Fatigue

Torsional Stress

Rpm

250-300

TORQUE

FORCE 1,5-2,5 N/cm

LOW

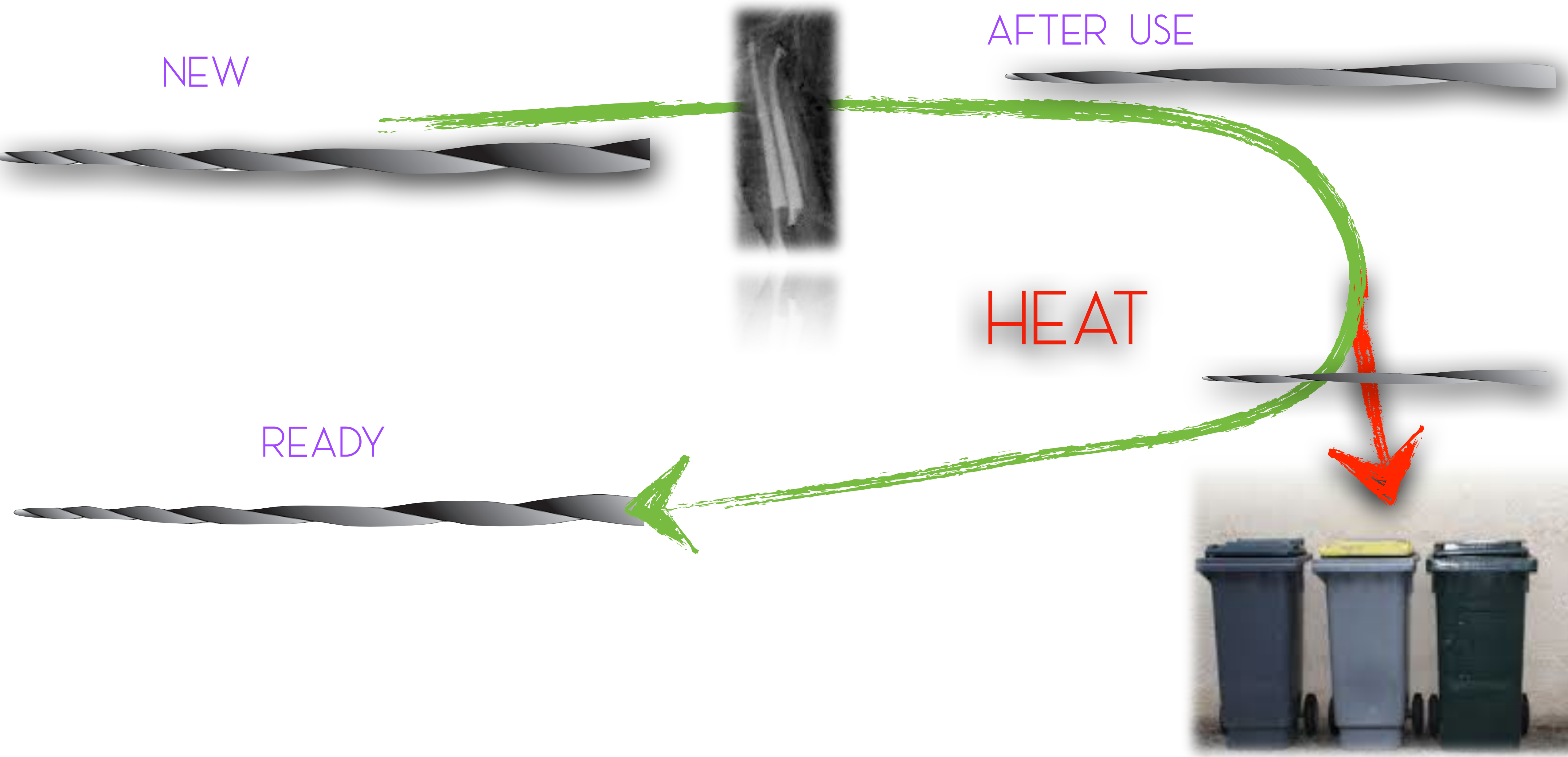


DESPIRALIZZAZIONE

EVITA L'IMPEGNO CANALARE DELLO
STRUMENTO

DEFORMAZIONE ELASTICA O PLASTICA?

HTNFTI VISUAL CHECKING

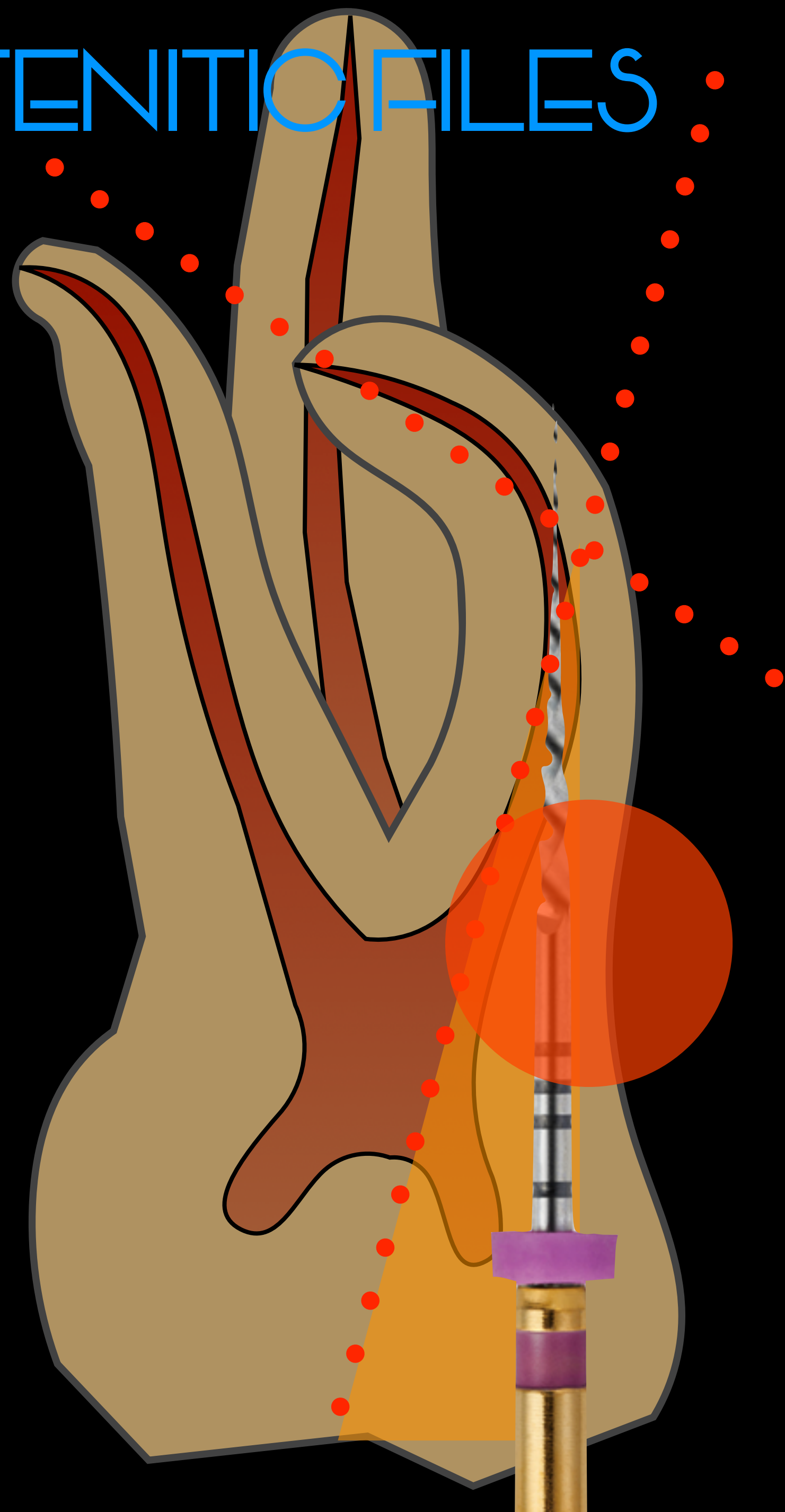


THE “HOT WATER” TRICK TO REGENERATE FILES

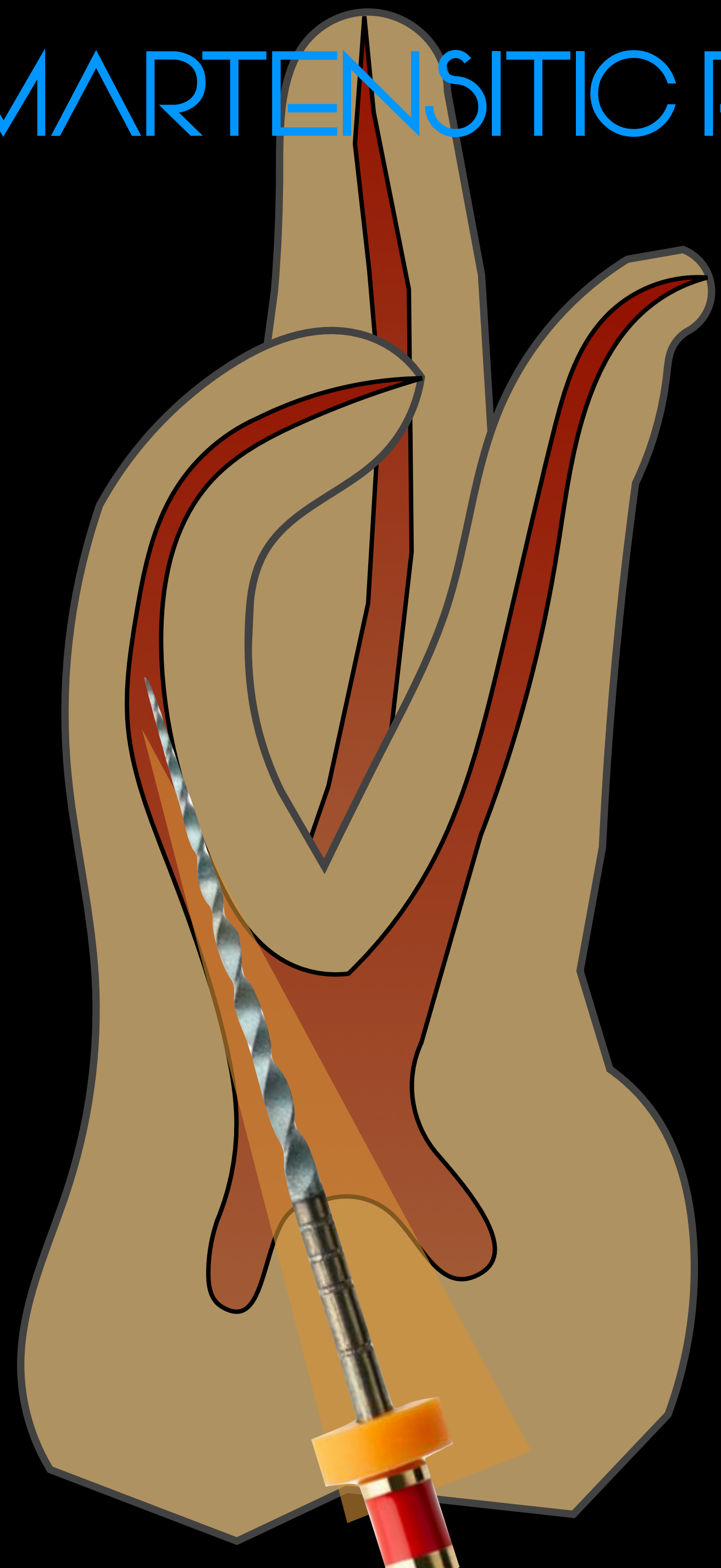


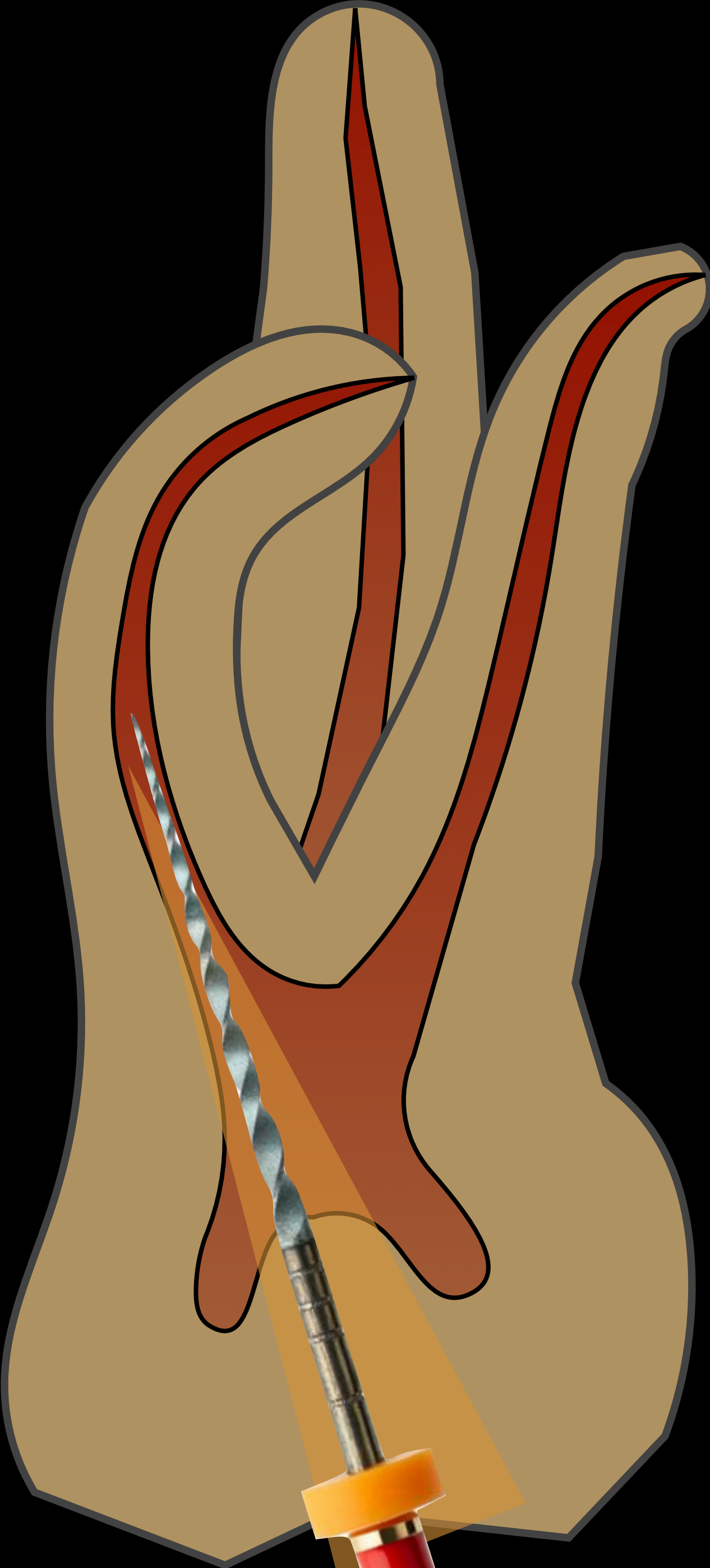
VISUAL CHECKING

AUSTENITIC FILES :



MARTENSITIC FILES





LA SAGOMATURA ESEGUITA CON STRUMENTI
MARTENSITICI CONSENTE UNA RIDUZIONE DELLA
CONCITA'

Peters 2015

LA SAGOMATURA CONVENZIONALE CON
STRUMENTI AUSTENITICI PORTA AD UN SACRIFICIO
MAGGIORE DI DENTINA PERICERVICALE RISPETTO A
AD UNA SAGOMATURA CON STRUMENTI CON
MEMORIA DI FORMA

Schen 2013 - Zupanc 2018

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

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

Schäfer E¹, 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 ≤ 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.

1163 ROOTS EXAMINED:
980 (84%) CURVED

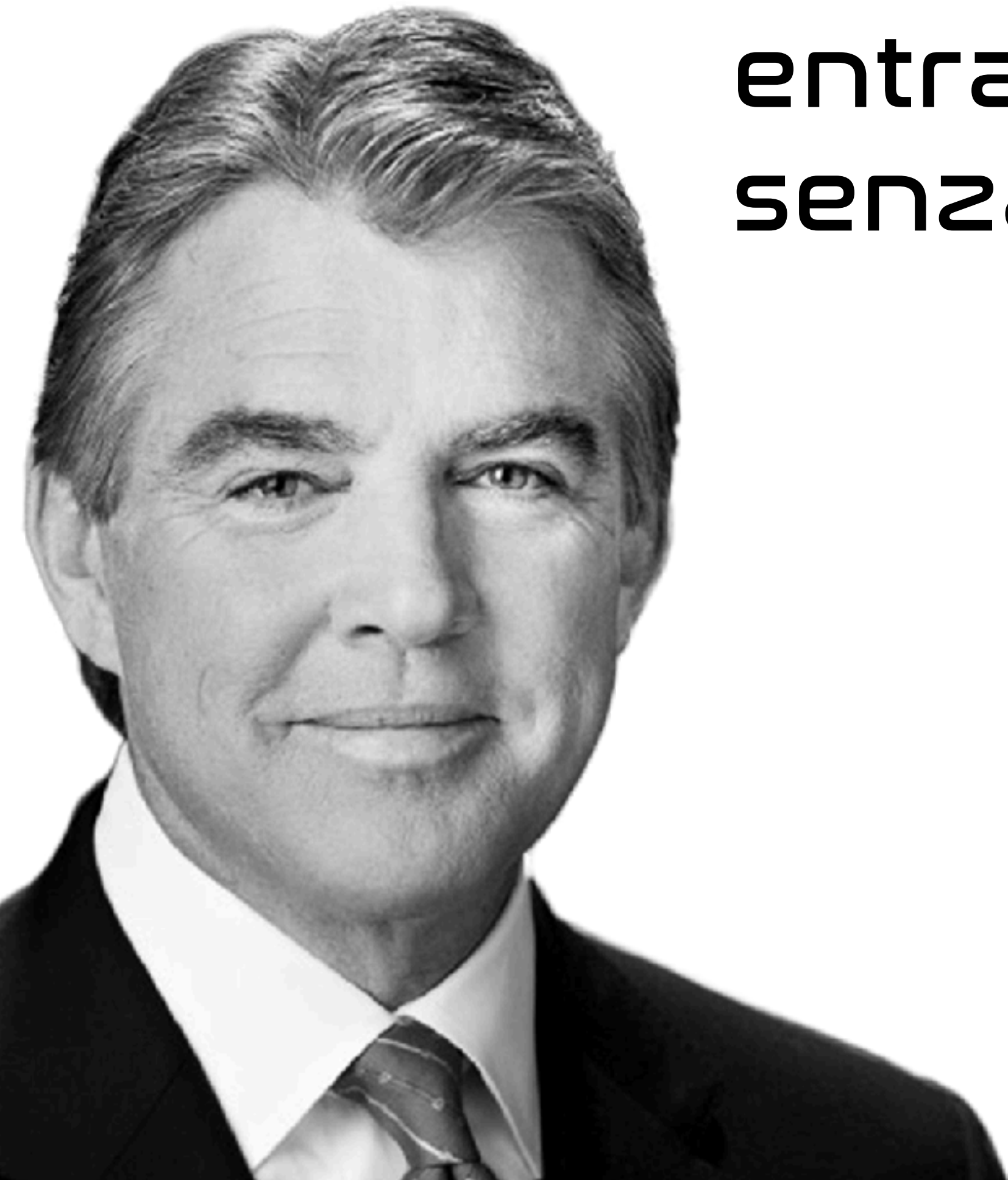
65% ANGLE $\leq 27^\circ$
30% ANGLE 27-35°
9% ANGLE $> 35^\circ$



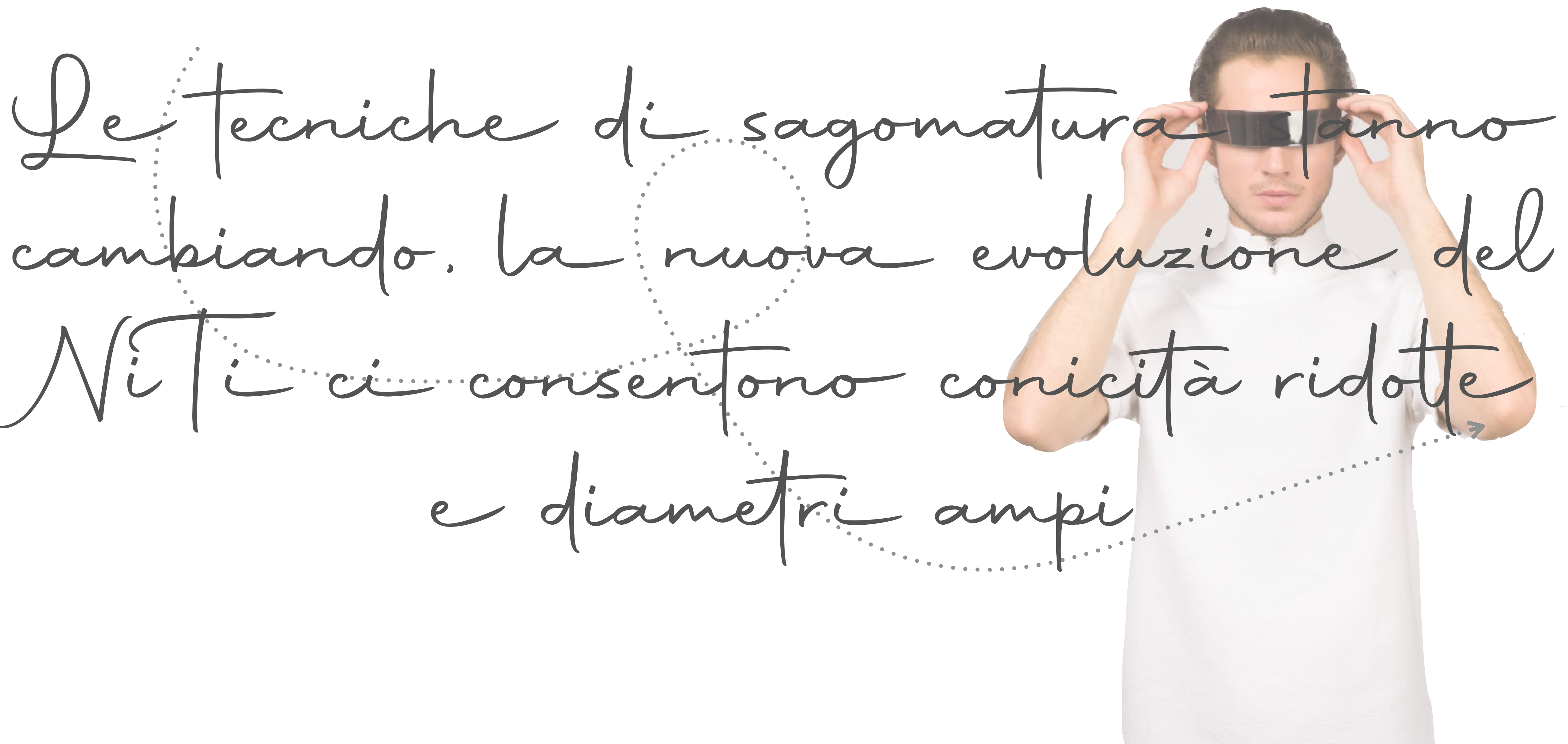
THINK
3D



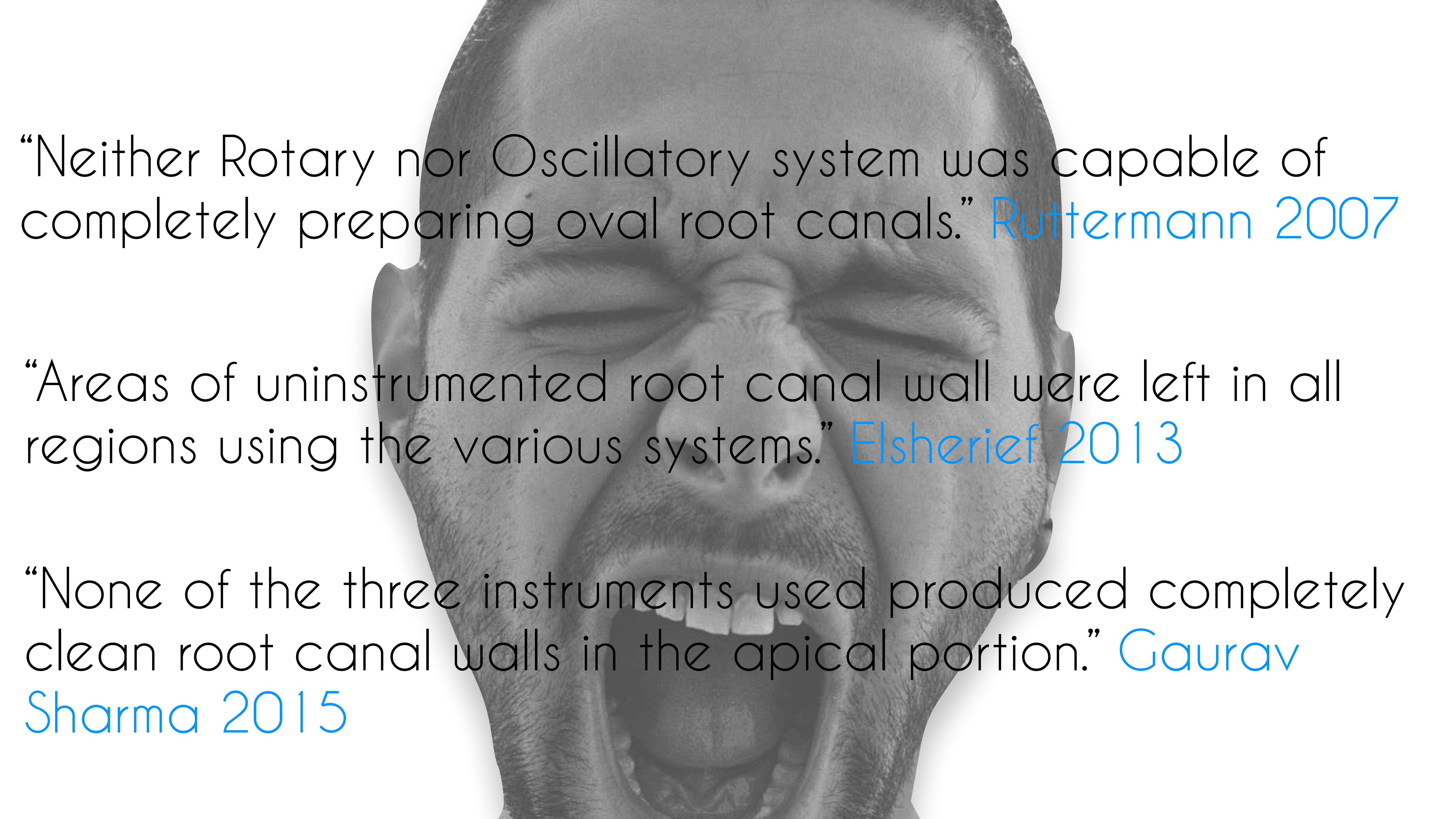
“Senza una corretta pre-visualizzazione tridimensionale del dente da trattare, si sta entrando in un campo minato senza una mappa”



Stephen Buchanan - DDS



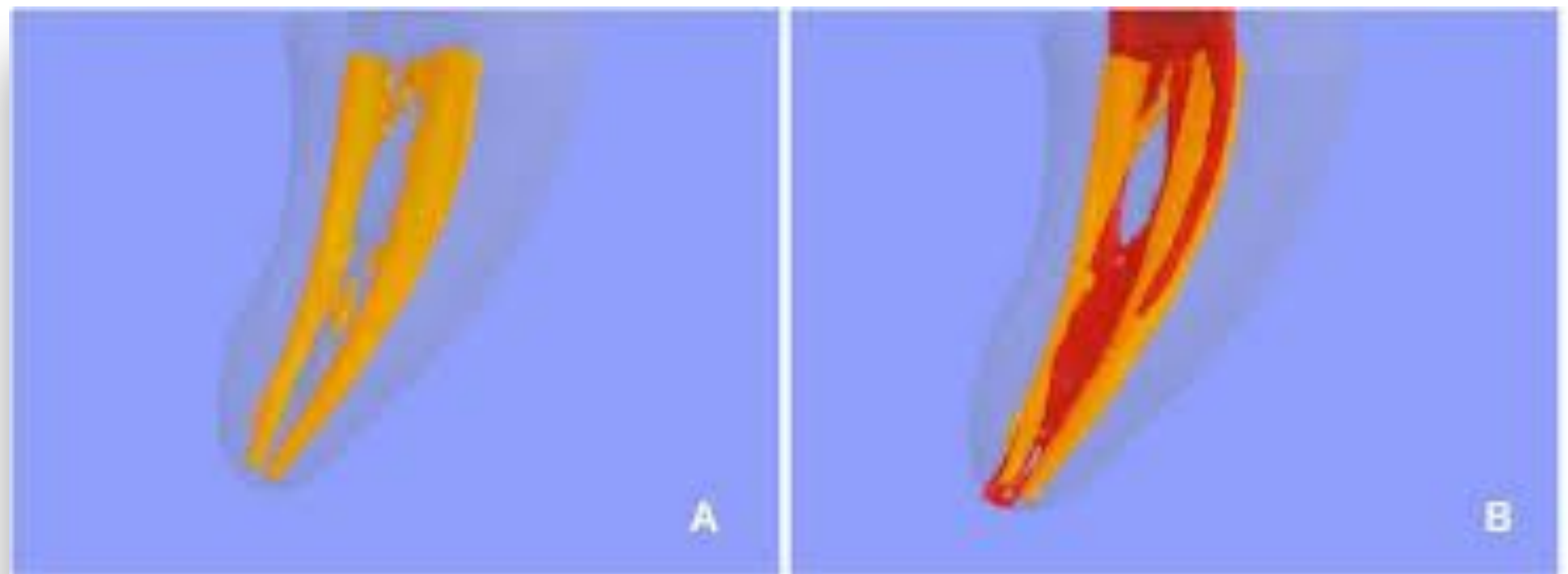
Le tecniche di sagomatura stanno
cambiando, la nuova evoluzione del
Niti ci consentono conicità ridotte
e diametri ampi



“Neither Rotary nor Oscillatory system was capable of completely preparing oval root canals.” [Ruttermann 2007](#)

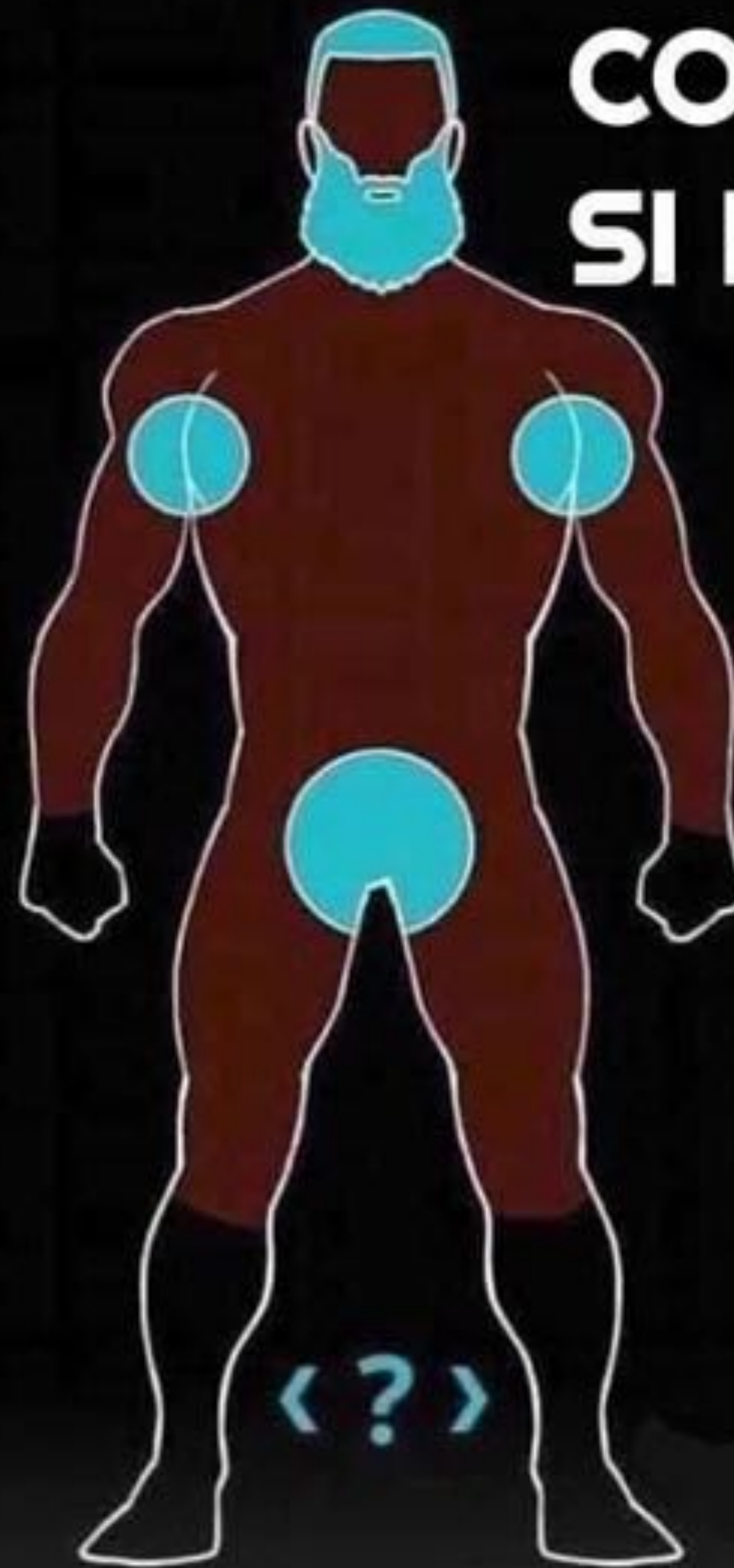
“Areas of uninstrumented root canal wall were left in all regions using the various systems.” [Elsherief 2013](#)

“None of the three instruments used produced completely clean root canal walls in the apical portion.” [Gaurav Sharma 2015](#)



TECNOLOGIE COME LA MICROCBCT
DIMOSTRANO UN RIDOTTO CONTATTO PARETI/
STRUMENTI MECCANICI

NESSUNA SISTEMATICA
OGGI IN COMMERCIO
ASSICURA UN
CONTATTO STRUMENTO/
PARETI COSTANTE NEL
CANALE DEL 100%. CI
SARANNO SEMPRE
PORZIONI DI CANALE
NON STRUMENTATE.



**COME UN UOMO
SI FA LA DOCCIA**

**SCRUB
PROFONDO**

**QUI CI PENSA
L'ACQUA DA SÈ**



DETERSIONE
MECCANICA

DETERSIONE
CHIMICA

S U C C E S S O
MICROBIOLOGICO

PERCHÈ I FINISHER SONO IMPORTANTI??

GЕОМАТRІА PREPARAZIONE CANALARE

DETERSIONE MECCANICA

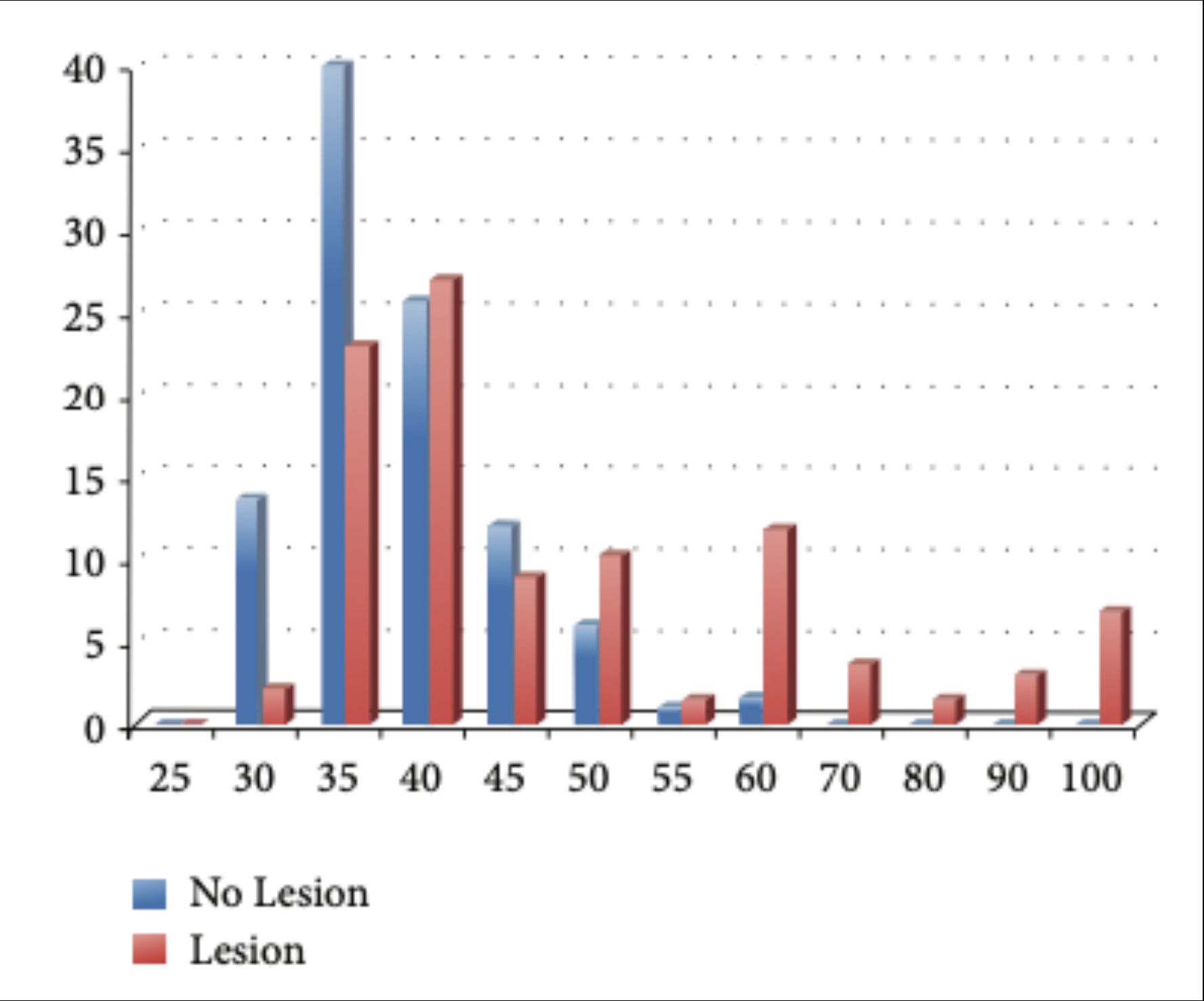
MIGLIORAMENTO
PERMEABILITA' APICALE



LA SAGOMATURA DEVE
TERMINARE CON UNA
CONICITA' PROGRESSIVA IN
CUI L'APICE E' IL PUNTO PIU'
STRETTO.

TABLE 1: Ratio of diameters in the apical part of root canal in teeth with and without periapical lesions: all presented as median and interquartile ranges.

Group	N	Median	Interquartile ranges 25%–75%	Significance
Teeth with lesion	135	40	36.25–60	A
Teeth without lesion	257	35	35–40	B



TERMINARE LA SAGOMATURA A 25/06 E' UN COMPROMESSO DETTATA DA LIMITI TECNOLOGICI MA NON DA VALUTAZIONI ANATOMICHE

LA MEDIA DEI DIAMETRI APICALI E' DI 40 NEI DENTI CON LESIONE E 35 NEI DENTI SENZA LESIONE



COME DECIDO IL DIAMETRO

L'OBIETTIVO E' CAPIRE LA DIMENSIONE DEL DIAMETRO APICALE.

DIFFICILMENTE POSSIAMO CONOSCERNE LA GEOMETRIA.
CERCHIAMO DI REGISTRARE LA SENSAZIONE MANUALE
DELL'IMPEGNO DELLO STRUMENTO SULLE PARETI DEL DIAMETRO
ALLA CORRETTA LUNGHEZZA DI LAVORO.

CERCHIAMO LA SENSAZIONE DI IMPEGNO

A close-up, partial view of a woman's face on the left side of the frame. Her eyes are closed, and her expression is neutral. The background is a solid, muted red color.

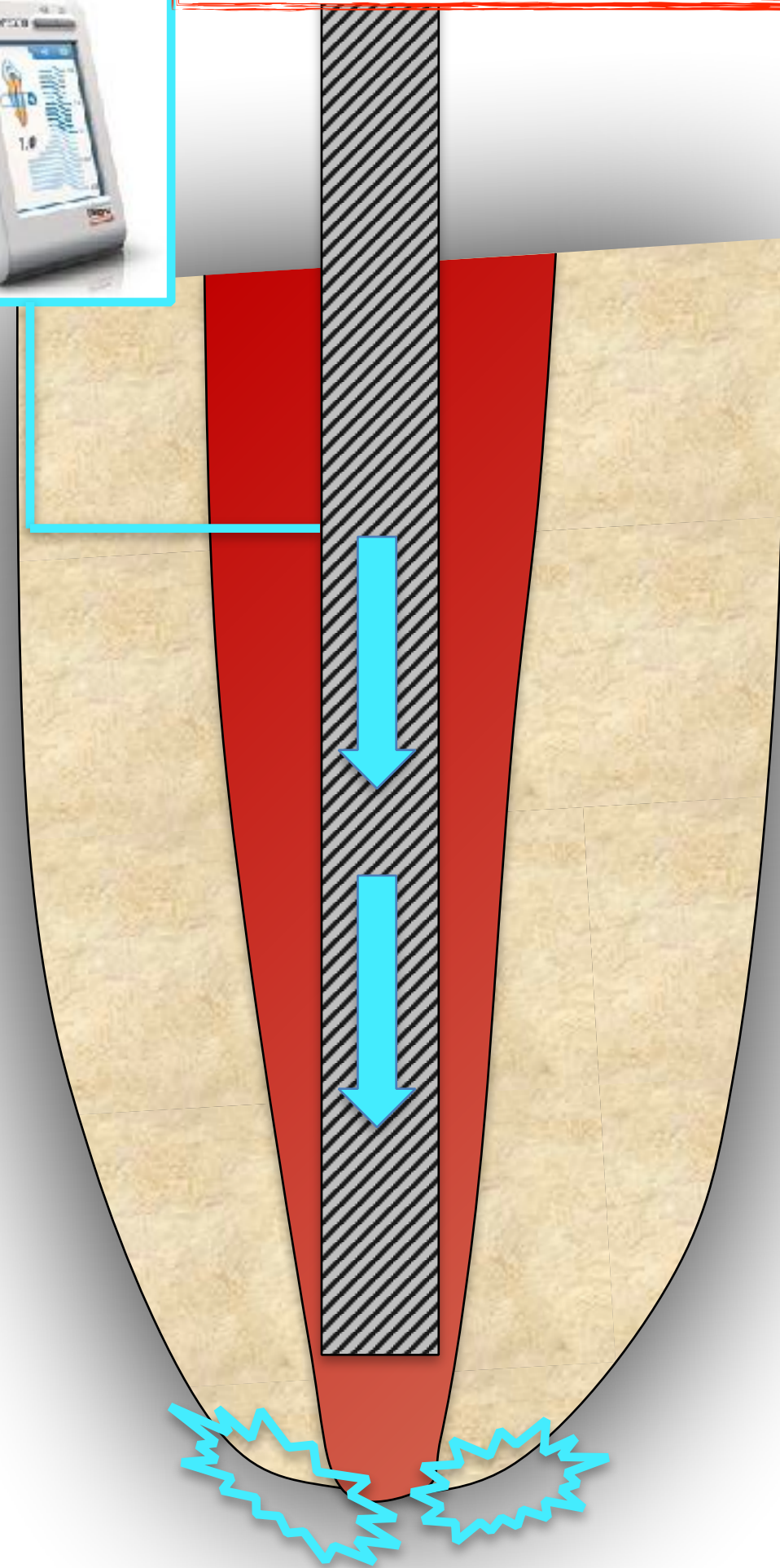
COME DECIDO IL DIAMETRO

ESISTONO PIU' TECNICHE.

ESISTONO STRUMENTI DEDICATI QUALI LIGHTSPEED O
NITIFLEX.

IN ALCUNI CASI PUO' ESSERE USATO UN K FILE

DETERMINAZIONE DIAMETRO APICALE



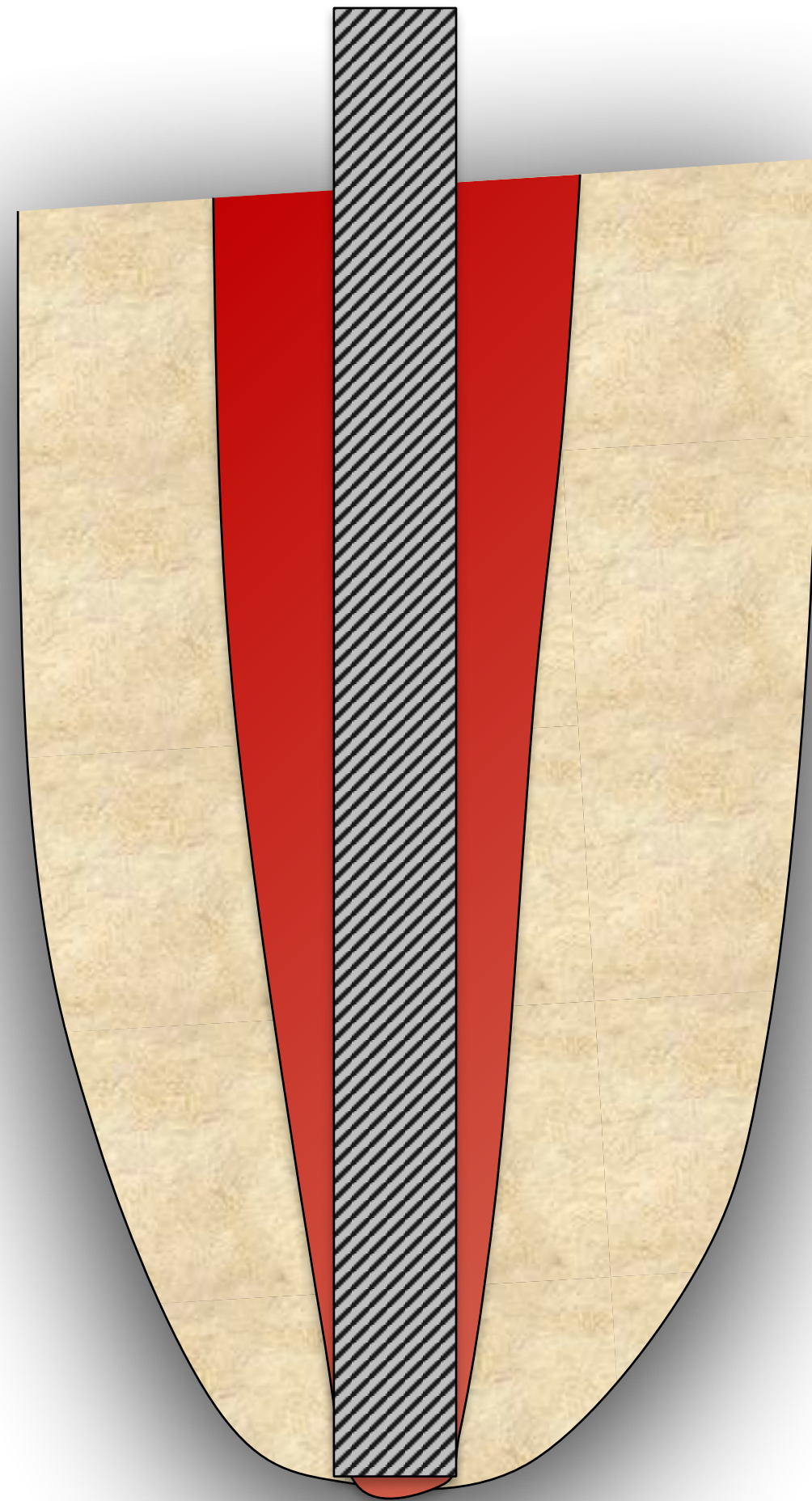
COME POSSO UTILIZZARE UN K FILE

Dobbiamo trovare lo strumento che si impegna nell'APICE ovvero lo strumento che si blocca a L.L.

Dobbiamo ricercare una sensazione manuale: lo strumento collegato al rivelatore mantiene la posizione a L.L. anche se spinto in senso apicale.

NON VA AVVITATO. VA SPINTO!

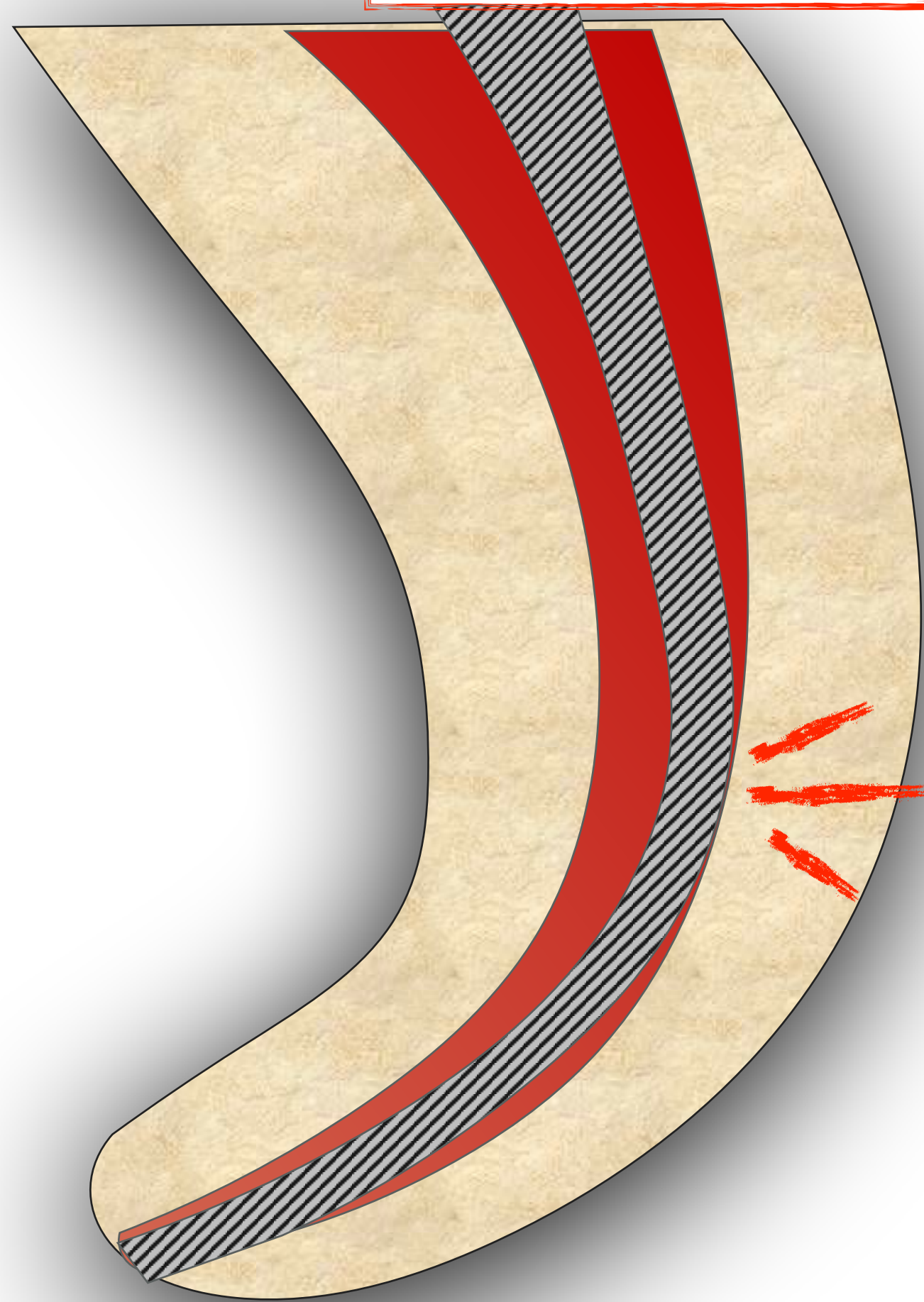
DETERMINAZIONE DIAMETRO APICALE



Ci vuole la massima precisione con canale ASCIUTTO.

Se abbiamo dubbi proviamo lo strumento successivo o precedente e controlliamo. Se non siamo certi possiamo strumentare un minimo l'apice e portarlo a una sensazione più certa. E' comunque un'approssimazione, testiamo con uno strumento a sezione circolare un apice che potrebbe essere ovale.

DETERMINAZIONE DIAMETRO APICALE



VANTAGGI DEI K FILES:

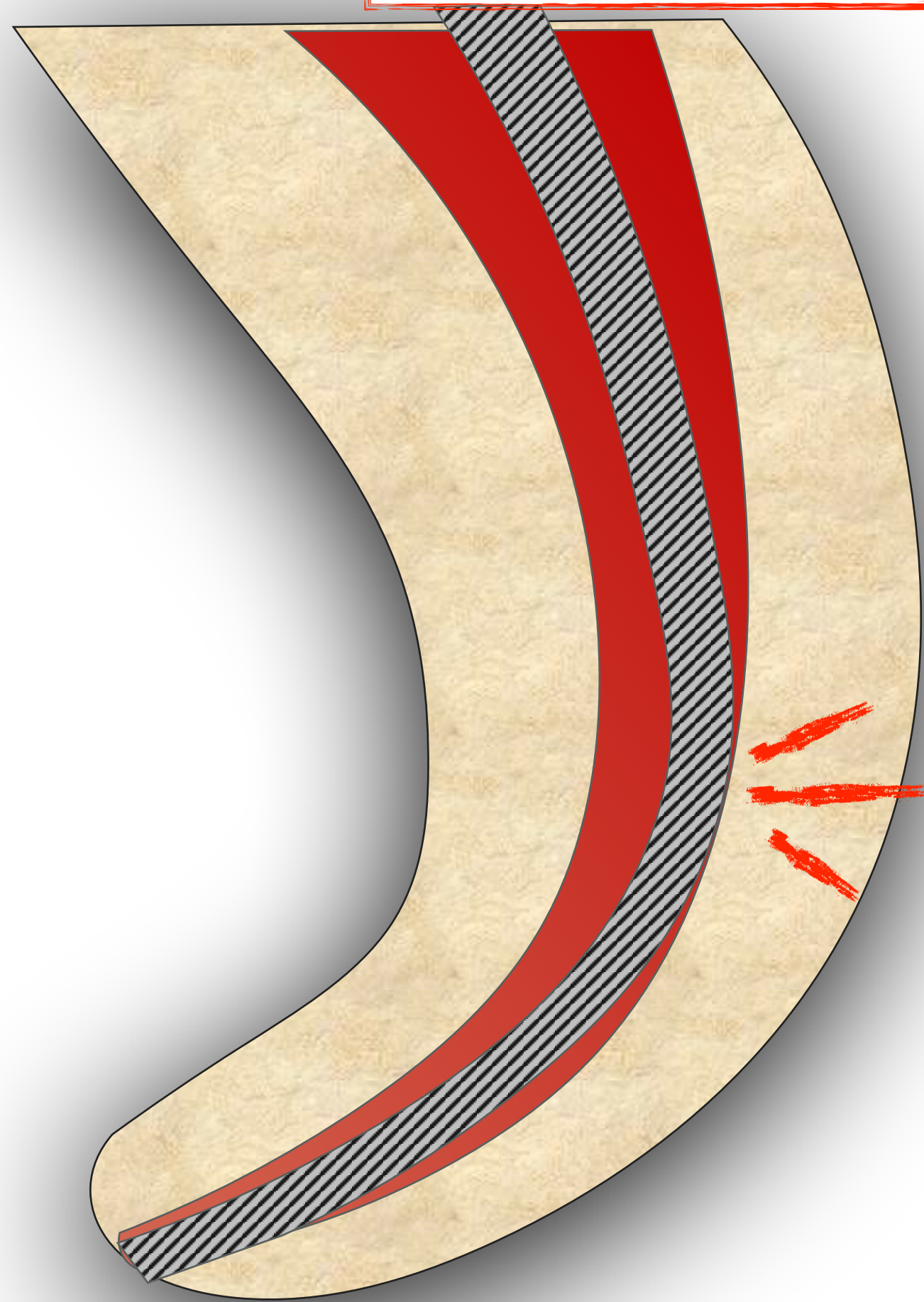
Non occorre nuova strumentazione

LIMITI DEI K FILES:

Soprattutto a diametri grossi o canali curvi sono strumenti molto rigidi che possono creare sensazioni di impegno non in testa ma nel corpo dello strumento dando false registrazioni. Lo strumento potrebbe bloccarsi con un gradino o impattando prima dell'apice proprio perchè rigido..

come evitare questi rischi?

DETERMINAZIONE DIAMETRO APICALE

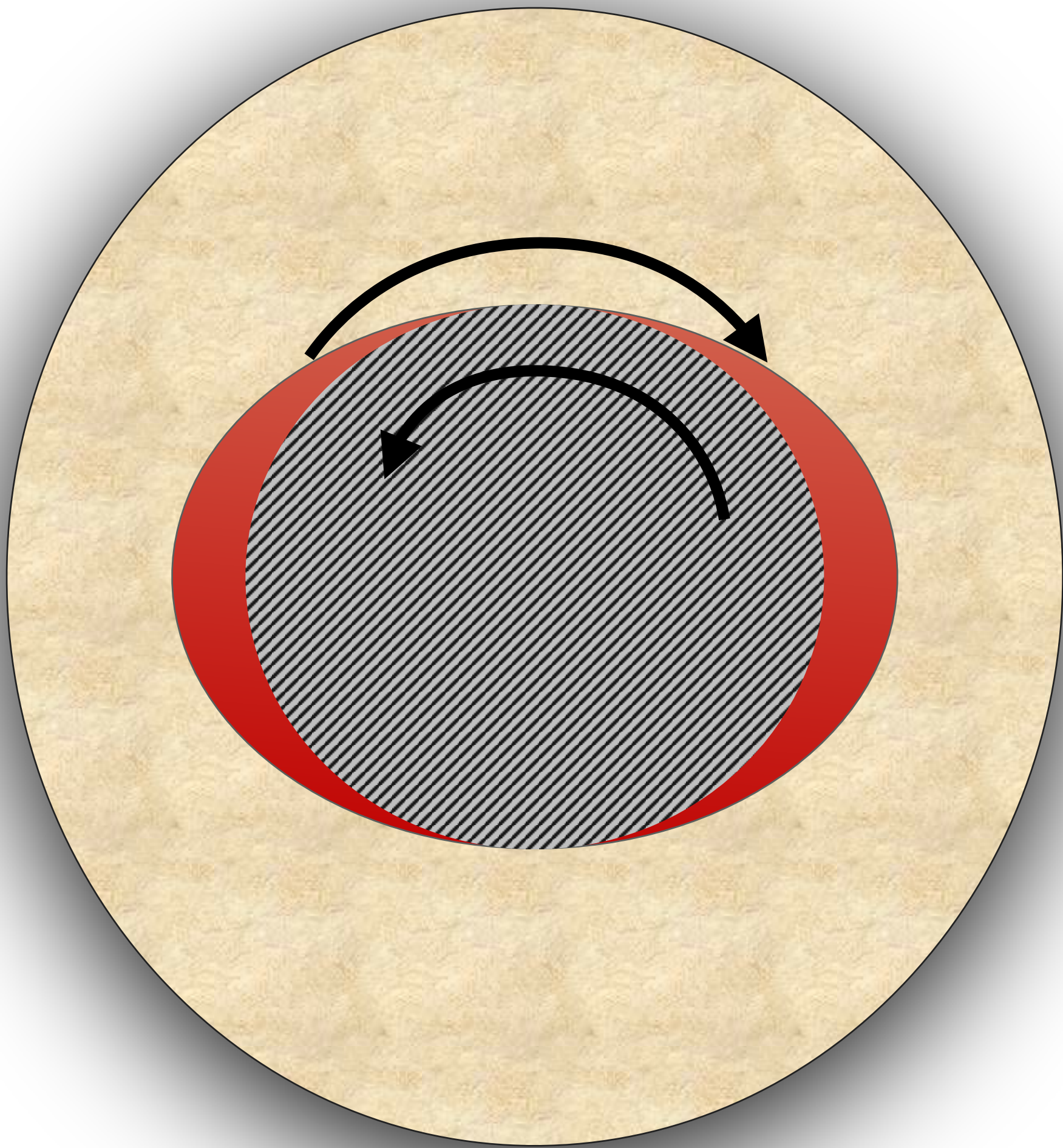


K FILE NITIFLEX:

Buon compromesso sono K files in NiTi utili in quanto grazie all'estrema flessibilità si adattano meglio e non creano impegni nelle eventuali curve.

Ritengo che Soprattutto a diametri grandi è corretto avere nel proprio kit una serie di questi strumenti.

DETERMINAZIONE DIAMETRO APICALE



K FILE NITIFLEX - MOVIMENTO A MOLLA:
una volta a lunghezza di lavoro, il NiTi ti consente di fare
questo test:

ESEGUIRE UN MEZZO GIRO E VALUTARE SE LO STRUMENTO
TORNA IN POSIZIONE PROVANDO L'INGAGGIO CON LE
PARETI.

Pericolo perchè potresti strumentare l'apice.

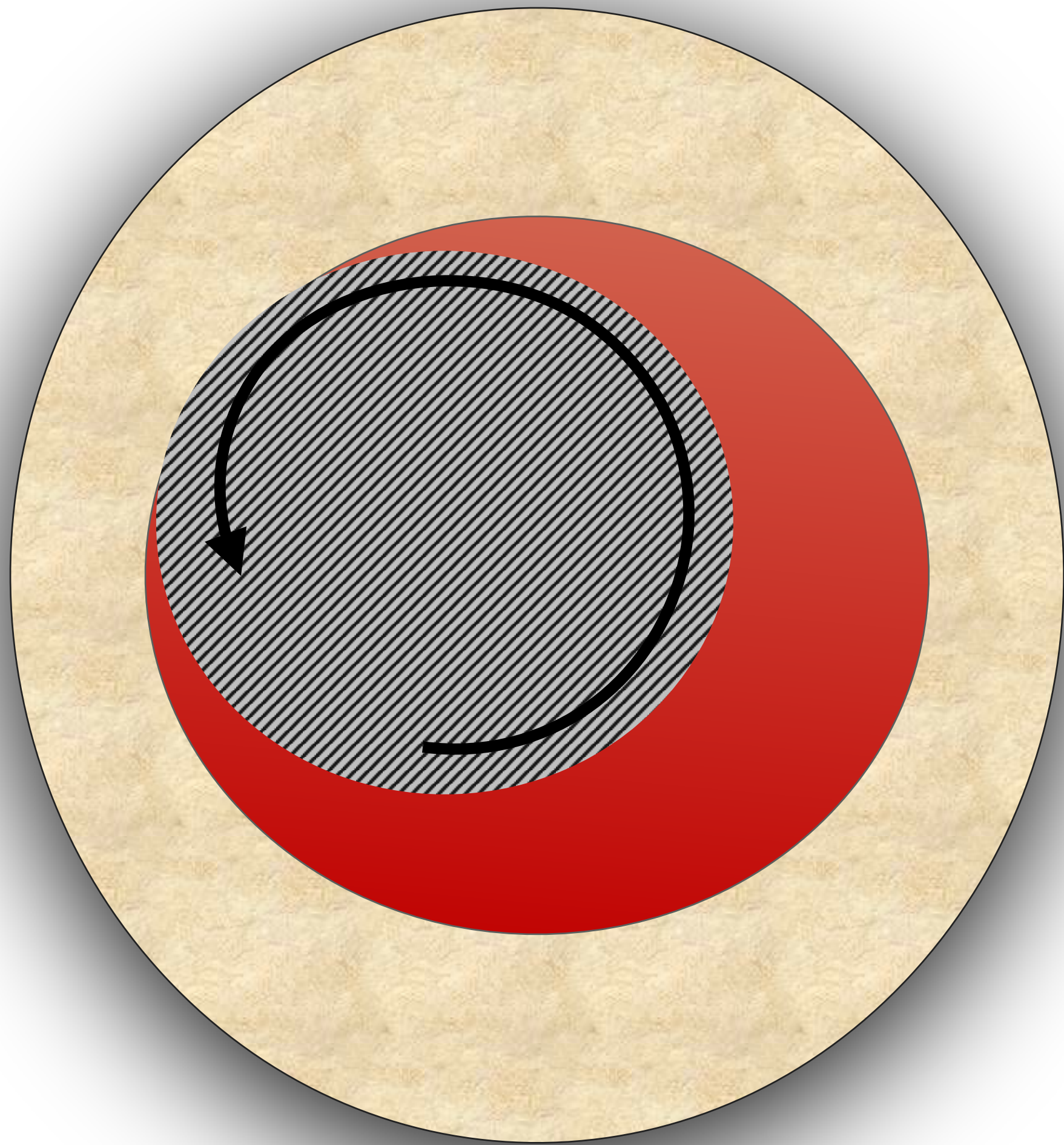
DETERMINAZIONE DIAMETRO APICALE



VISUAL GOUGING:

Valutare eventuali detriti di dentina tra le spire sulla punta dell'ultimo strumento NiTi usato ti da una prova che lo strumento abbia grattato per lo meno un lato della zona apicale.

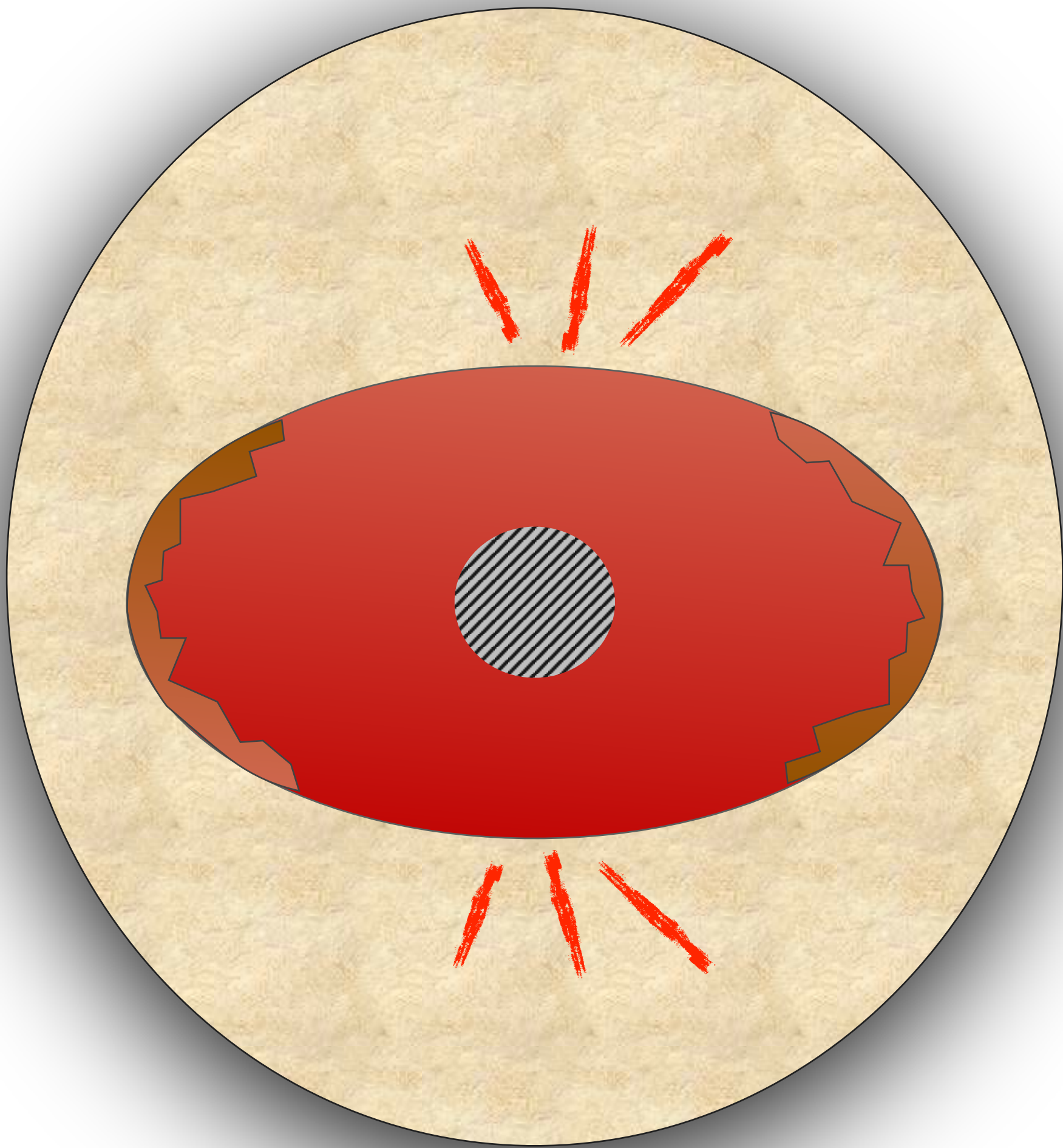
DETERMINAZIONE DIAMETRO APICALE



LIMITI DEL VISUAL GOUGING:

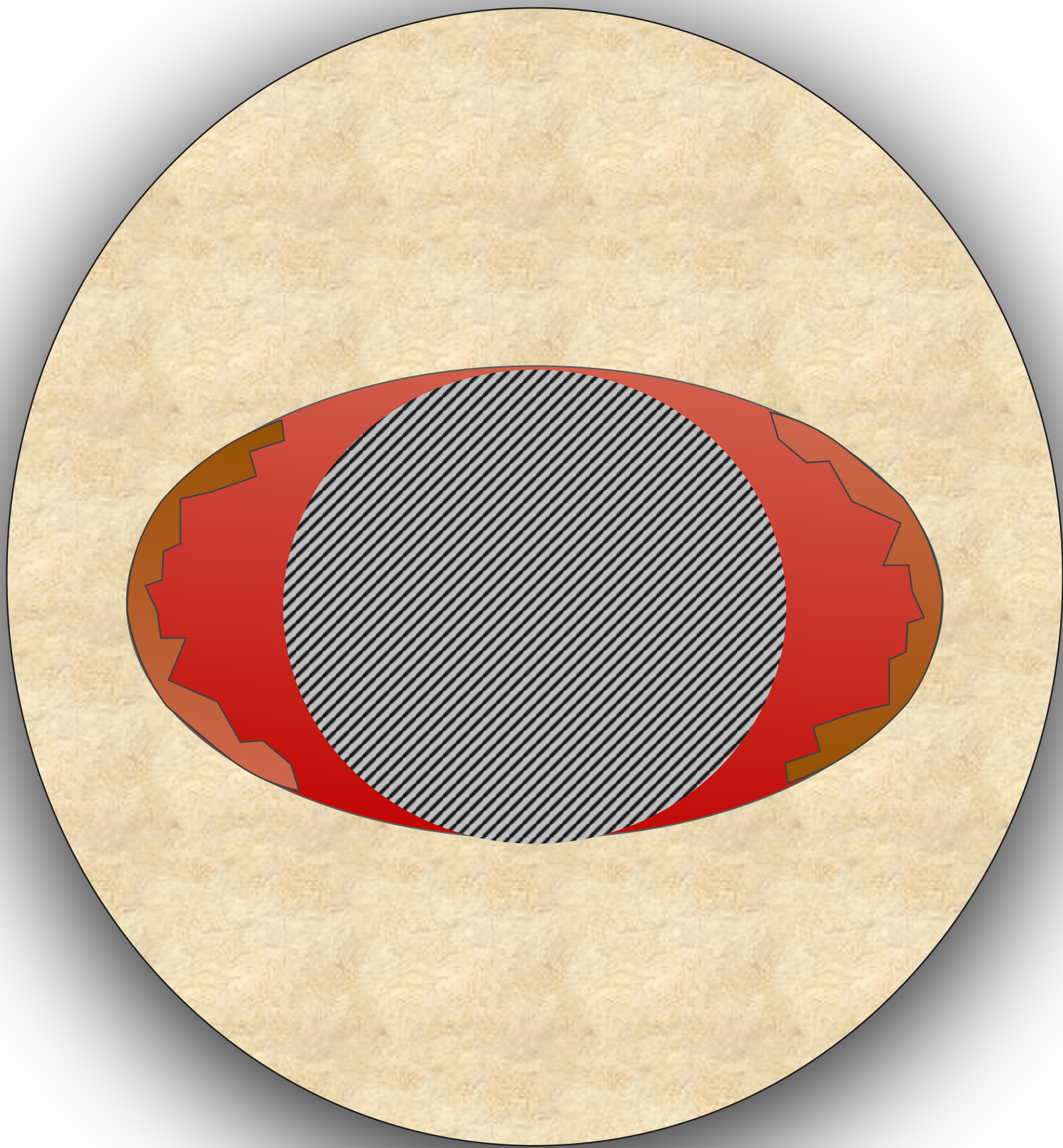
BASTA CHE TOCCHI LA PARETE IN UN PUNTO PER
AVERE LIME SPORCHE IN TUTTI I LATI DELLO
STRUMENTO.

DETERMINAZIONE DIAMETRO APICALE



TUTTE QUESTE PROCEDURE SONO DELLE APPROSSIMAZIONI. NOI LAVORIAMO PER CERCARE LO STRUMENTO CHE MEGLIO SI ADATTA AD UNA GEOMETRIA DI CUI CONOSCIAMO POCHISSIMO!!

DETERMINAZIONE DIAMETRO APICALE



ALLARGARE IL CANALE PUO' ESSERE UNA BUONA STRATEGIA PER MIGLIORARE FITTING E PERVIETA' AGLI IRRIGANTI. OGGI LA LETTERATURA E' CONCORDE SUL FATTO CHE DIAMETRI AMPI SIANO PIU' PERFORMANTI

DETERMINAZIONE DIAMETRO APICALE

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 Srikanth¹, Amaravadi Gopi Krishna², Siva Srinivas³, E Sujayeendranatha Reddy⁴, Someshwar Battu⁵, Swathi Aravelli¹

Conclusion: Minimal apical enlargement for penetration of irrigants to the apical third of root canal system is #30 size.

DETERMINAZIONE DIAMETRO APICALE

Orstavik 1991. The larger the preparation the higher the efficiency in reducing infection

Dalton 1998. There was substantial bacterial reduction with progressive filing. Fewer bacteria remains with larger file size

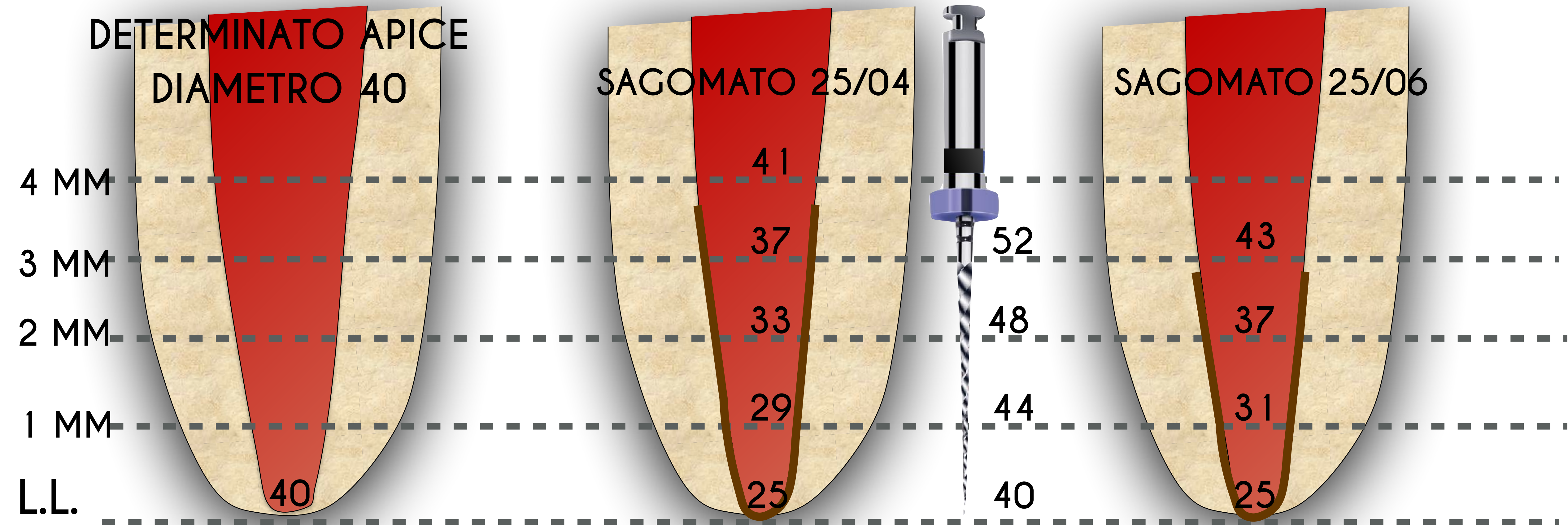
Siqueira 1999. The most dramatic bacterial reduction was obtained after larger apical preparations

Usman 2004. Instrumented apical 3mm with GT 20/06 vs Gt 40/06. There was significant difference in canal cleanliness between the two sizes

Baugh 2009. Apical sizes kept as small as possible rather than as large as required disregards existing scientific literature and appears to be based primarily upon clinical opinion

Mounce 2009. Larger apical sizes create cleaner canals

UNA VOLTA DETERMINATO L'APICE



COME RACCORDARE?

IL MODO PIU' SEMPLICE E' AVERE A
DISPOSIZIONE UN FILI NITI
MARTENSITICO A DIAMETRI GRANDI E
CONICITA' $\varnothing 4$
POSSO ESEGUIRE UNA STEP BACK
MANUALE



PRE OP



CHIUSURA



POST 5
MESI

una Minor preparazione apicale in canali curvi è più sicura
in apici poco preparati il disinfettante arriva meno



REVIEW

Master apical file size – smaller or larger: a systematic review of healing outcomes

A. Aminoshariae¹ & J. C. Kulild²¹Department of Endodontics, Case School of Dental Medicine, Cleveland, OH; and ²Dental School, UMKC, Kansas City, MO, USA

Abstract

Aminoshariae A, Kulild JC. Master apical file size – smaller or larger: a systematic review of healing outcomes. *International Endodontic Journal*, 48, 639–647, 2015.

The purpose of this systematic review was to determine in patients undergoing root canal treatment, whether apical enlargement affected the healing outcome. A PICO (population, intervention, comparison and outcome) strategy was developed to identify studies dealing with apical size of canal and healing outcome as measured clinically and radiographically. The MEDLINE, Embase, Cochrane and PubMed databases were searched. Additionally, the bibliography of all relevant articles and textbooks was manually searched. Based on inclusion and exclusion criteria,

two reviewers independently articles. Four articles were included. There were no apical enlargement and cone beam computed tomography systematic review confirmed research in this area is needed. The best evidence suggests that for periapical lesions, enlargement would result in an increase in terms of clinical and radiographic

Keywords: apical enlargement, master apical file

Received 26 June 2014; accepted 10 October 2014

Introduction

The primary objective of root canal treatment is to eliminate microorganisms and pathologic debris from the root canal system (Kakehashi *et al.* 1969) and to prevent its reinfection (Nair 2004). Gutierrez & Garcia (1968) reported that root canal systems are often improperly cleaned and shaped.

Byström & Sundqvist (1981) cultured 15 teeth with necrotic pulps after instrumentation accompanied with saline irrigation. They reported a 100- to 1000-fold reduction in the bacterial counts, yet no teeth

cultured bacteria-free. Chemomechanical preparation devices promote but is not able to (Dalton *et al.* 1998, 2005, Alves *et al.* 2013).

In a quest for the contaminants from authors have suggested that instrumentation may be improved (Ørstavik *et al.* 1995, Shulman *et al.* 1995, Rollison *et al.* 2005). The authors defined the master apical file as the largest file that can be inserted into the apical portion of the canal. This was accepted as the

Correspondence: Anita Aminoshariae, Diplomate of American Board of Endodontics, 2123 Abington Road A 280, Cleveland, Ohio 44106, USA (Tel: 1 216 368 1188; e-mail: axa53@case.edu).

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The Role of Apical Instrumentation in Root Canal Treatment: A Review of the Literature

Dean Raugh, DDS, and James Wallace DDS, MDS, MSD, MS

Abstract

The issue of final apical preparation size remains controversial despite considerable clinical and in vitro research. The astute clinician must be aware of this research before choosing any instrumentation system because the informed clinician's decision must be guided by the best available evidenced-based information. This review article generated a Medline-based search strategy to disclose these studies and provides a critique and summary of the results.

From the University of Pittsburgh School of Dental Medicine, Pittsburgh, Pennsylvania.
Address request for reprints to Dean Raugh, DDS. E-mail address: baughd@yahoo.com.
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The most important objective of root canal therapy is to minimize the number of microorganisms and pathologic debris in root canal systems to prevent or treat apical periodontitis. This process of chemomechanical debridement, or cleaning of the root canal system, has been described as the removal of all of the contents of the root canal systems before and during shaping. Grossman (1) described mechanical cleaning as the most important part of root canal therapy. Schilder (2) also considered cleaning and shaping as the foundation for successful endodontic therapy.

Thorough instrumentation of the apical region has long been considered to be an essential component in the cleaning and shaping process. It was discussed as a critical step as early as 1951 by Groove (3). Simon (4) later recognized the apical area as the critical zone for instrumentation. Other authors (5, 6) concluded that the last few millimeters that approach the apical foramen are critical in the instrumentation process. Mechanical instrumentation and irrigation are sound endodontic principles and essential components of successful endodontics (7, 8). Research has shown that mechanical instrumentation greatly reduces the number of microorganisms remaining in the root canal system. Mechanical instrumentation (9) has been shown to reduce bacterial count even without irrigants or dressings. A combination of mechanical instrumentation and irrigation (9, 10) further reduced the number of microorganisms by 100 to 1000 times. However, mechanical instrumentation with irrigation does not reliably disinfect an infected root canal system (11–14).

Manufacturers developed nickel-titanium rotary instrumentation systems to facilitate the cleaning and shaping process. They are popular because of their apparent ease of use and reduced number of instruments. However, Syangbeg (6) noted that the strong emphasis on reducing the number of instruments and limiting apical preparations to small size does not produce clean apical preparations in diseased teeth. Given this controversial and important topic, we conducted a broad-based Medline search of the literature to characterize the major factors involved in apical canal instrumentation. Table 1 provides the Medline search strategy used to identify relevant articles for this review. A secondary search was then conducted using the references from the computer-generated list of articles. We have organized this review to cover the major factors impacting the selection of the final apical size, namely the anatomy of the apical constriction, apical canal diameter, apical instrumentation, and bacteria.

The Apical Constriction

The apical constriction (cementodentinal junction or CEJ) has long been advocated as the terminal end of instrumentation and obturation (3, 4). It is in theory the narrowest part of the canal and the location where the pulp ends and the periodontium begins. Ricci (15) advocated instrumenting to the apical constriction because impingement outside this junction may delay wound healing or result in adverse effects on the outcome of endodontic therapy. Materials or medications extruded beyond the constriction may promote inflammation and a foreign body reaction. Ricci and Langland (16) showed that instrumentation and obturation to the apical constriction gave the best prognosis. A poorer prognosis was observed when obturating material extended beyond the apical constriction. A literature review by Wu *et al.* (17) agreed with the major findings of Ricci and Langland. However, it is worth noting that the apical constriction may not always be present or easily identifiable (4, 18).

Better microbial removal and more effective irrigation occurs when canals are instrumented to larger apical sizes

30-35

AMINOSHARIE 2015

BAUGH 2005

DIAMETRO DI PREPARAZIONE

ALLARGAMENTO
APICALE



MIGLIORA EFFICACIA
IRRIGANTI



MIGLIORE DISINFEZIONE
MECCANICA



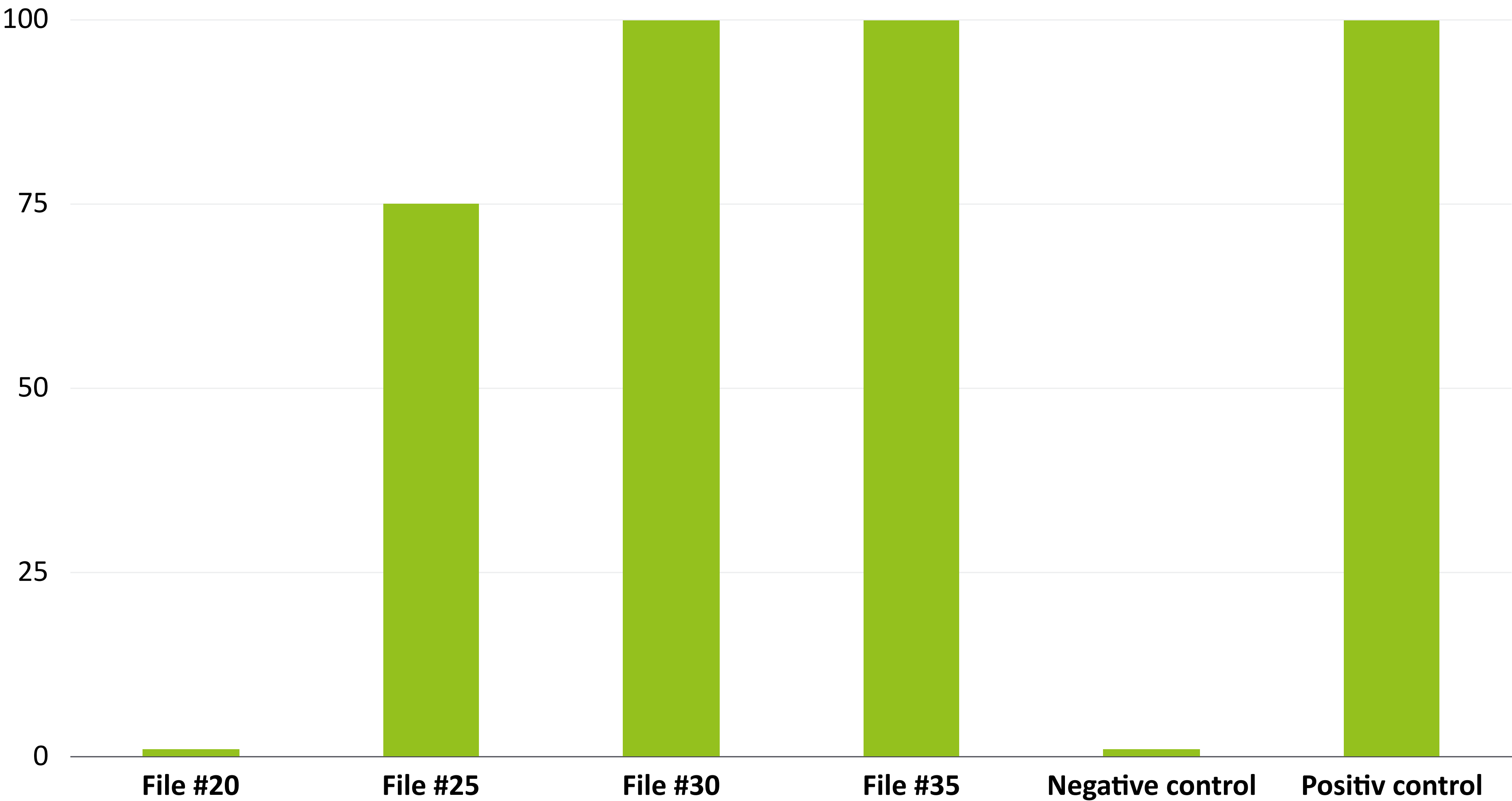
STUDY SUMMARY

Preparation to size 30 offers minimum requirements for irrigation and obturation

Determination of the Minimum Instrumentation Size for Penetration of Irrigants to the Apical Third of Root Canal Systems

(J Endod 2006;32:417– 420)

Smear layer removal from the apical third of the canal in six groups (%)



Abbasali Khademi, DDS, MS, Mohammad Yazdizadeh, DDS, MS, and Mahboobe Feizianfard, DDS, MS



USUALLY, THE MORE SEVERE THE
CANAL CURVATURE,
THE GREATER THE RISK OF
TRANSPORTATION AND
UNEXPECTED FRACTURE
...WHEN LARGER APICAL
PREPARATIONS ARE TARGETED

SHAHER 2009

Aumento del diametro apicale



40.4



60.4

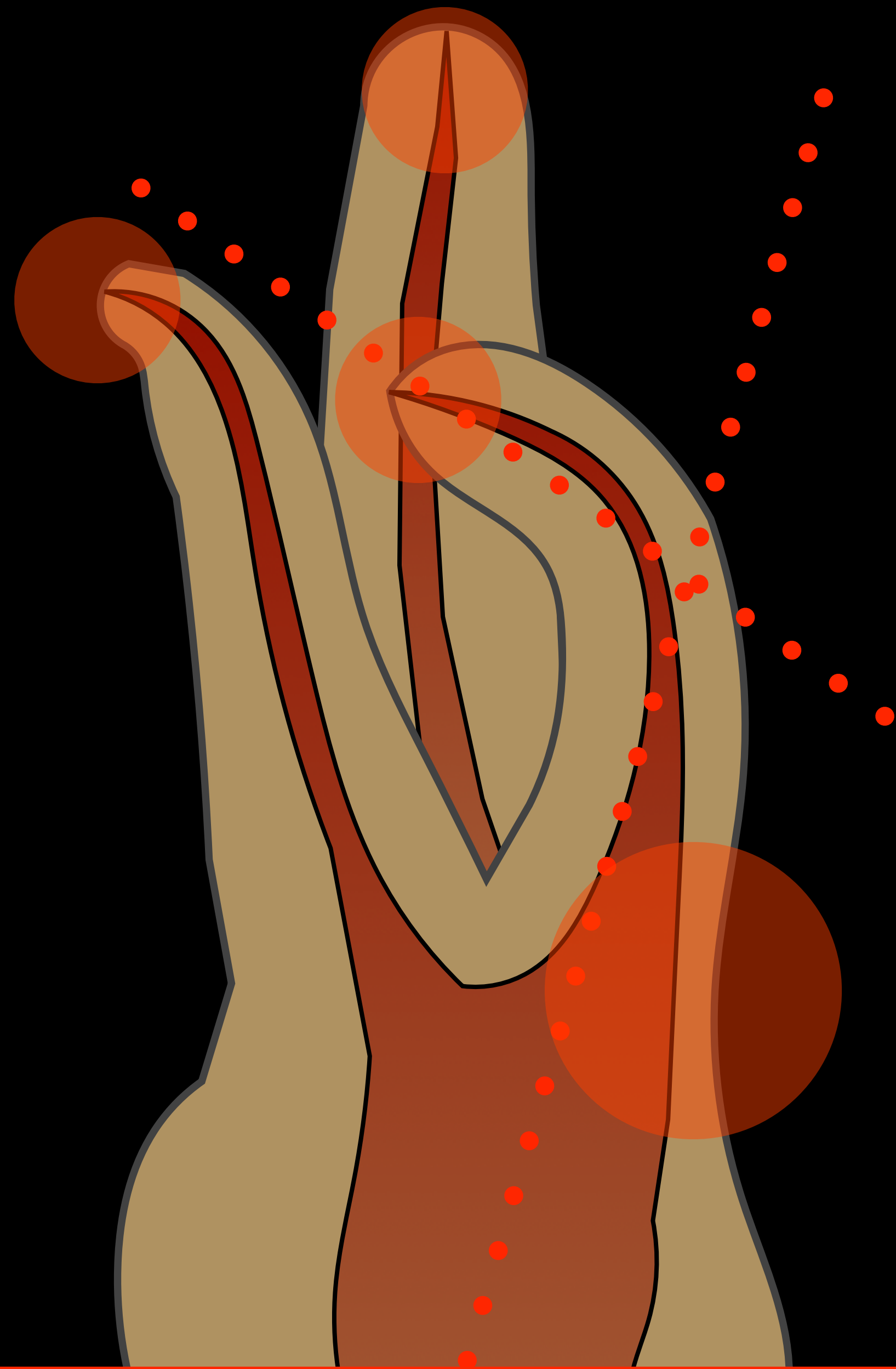


30.4

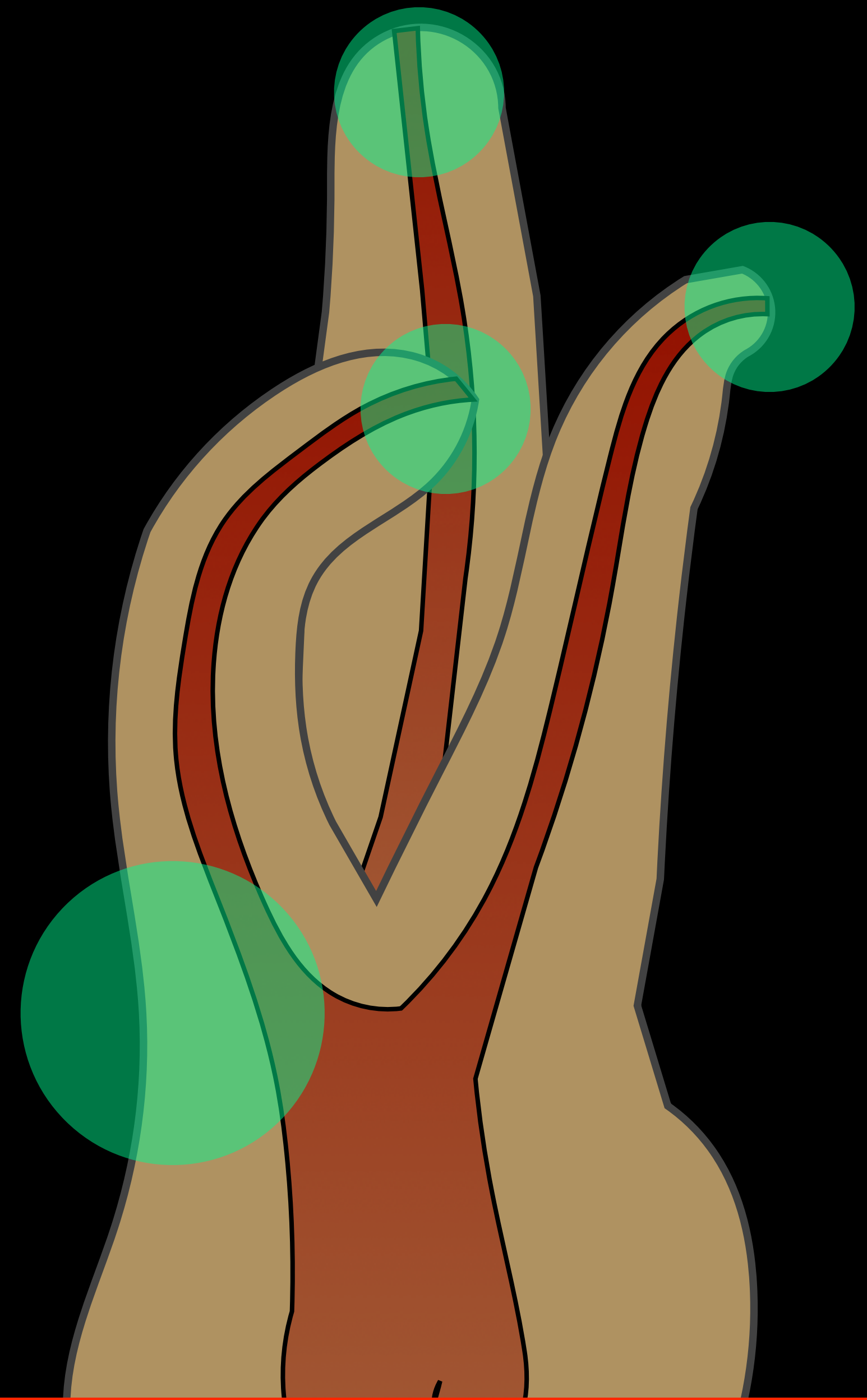


35.4

Diminuzione della conicità



FILE AUSTENITICI



FILE MARTENSITICI

TAKE HOME MESSAGES:

I TRATTAMENTI TERMICI AUMENTANO LA RESISTENZA

RIDUCONO IL RITORNO ELASTICO

AIUTANO NEL MANTENIMENTO DELL'ANATOMIA

RIDUCONO RISCHI DI STRIPPING E TRASPORTO

DANNO IL LORO MEGLIO ALL'AUMENTARE DEL DIAMETRO

CONSENTONO DI AUMENTARE IL DIAMETRO E RIDURRE LA CONICITA'

LA SCELTA DELLE TECNICHE DI SAGOMATURA

LE MODERNE TECNICHE DI SAGOMATURA CI
CONSENTONO DI MASSIMIZZARE LA DETERSIONE E LA
SAGOMATURA DELLA ZONA APICALE, PRESERVANDO
DENTINA PERICERVICALE NEL PIENO RISPETTO
DELL'ANATOMIA DEL DENTE TRATTATO





CanalPro X-Move



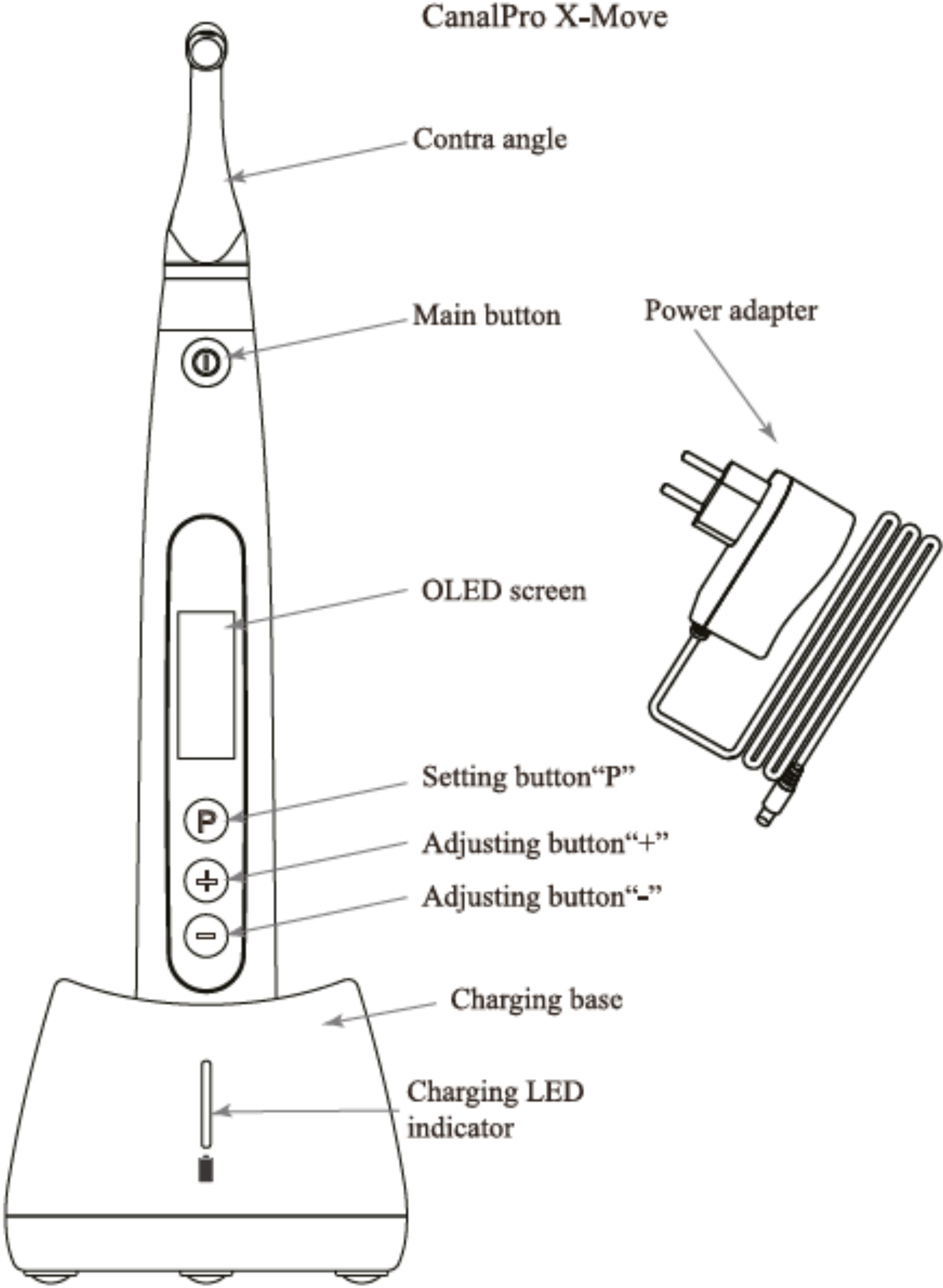
KOL meeting - September, 21-23, 2023

CanalPro X-Move



CanalPro X-Move

Endomotor



Descrizione del Prodotto

Specifiche

- Wireless
- Rotazione Continua 
- Movimento Reciprocante con preimpostazione degli angoli di rotazione del OneReci 
- Localizzatore Apicale Integrato
- Contrangolo Isolato
- Files Coltene preimpostati, per un facile utilizzo



Descrizione del Prodotto

Benefits



- Rilevatore d'apice integrato & Rotazione Continua + Movimento Reciprocante:
TUTTO IN UN DISPOSITIVO
- Contrangolo isolato con dimensioni ridotte per:
FACILITA' DI UTILIZZO, FACILE ACCESSO E MIGLIORE VISIBILITA'
- Files Coltene preimpostati:
RISPARMIO DI TEMPO E FACILITA' DI UTILIZZO



Descrizione del Prodotto

Specifiche Tecniche

Contrangolo:

- Trasmissione 6:1
- Rotazione di 360 gradi

Torque range: 0.4 Ncm - 5.0 Ncm (4 mNm – 50 mNm)

Speed range: 100 rpm – 2500 rpm

Regolazione degli angoli di reciprocazione: intervalli di 10°

Angoli possibili: 20° - 400°

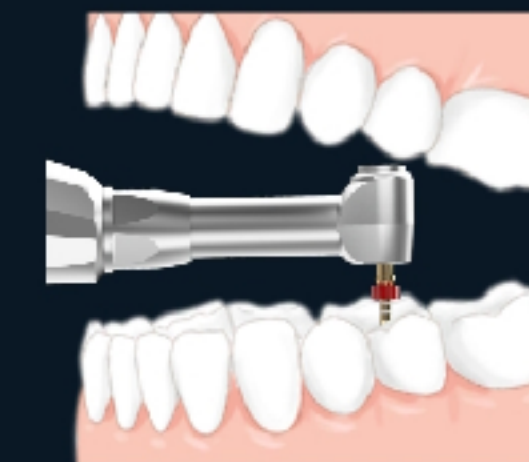
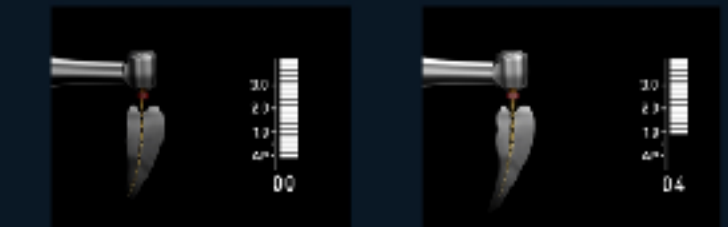
Contrangolo di dimensioni ridotte ed ISOLATO:

Diametro di 8 mm ed altezza di 9.7 mm

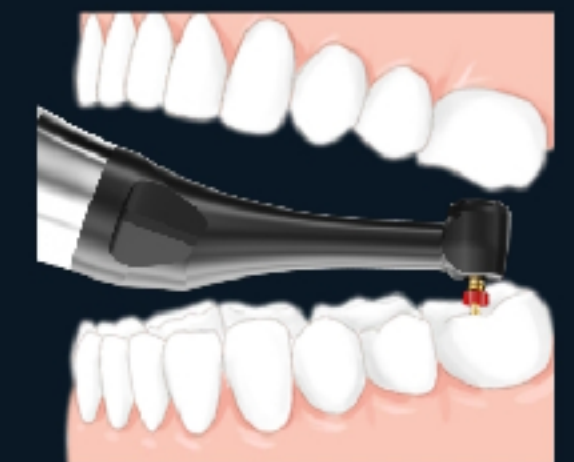


Built-in Apex locator

Integrated length determination makes endodontic treatment safer and more efficient. Realize real-time display of file location in canal. Automatically stops or reversely rotates as soon as the file reaches the apical stop, so as to prevent perforation. Auto Start and Auto Stop functions respectively enable motor to automatically start while the file gets in canal and stop when it is out.



Normal contra angle
head & neck



Woodpecker contra angle
Super Mini head & Slim neck

Coltene setting files

File system name		Mode Continuous or reciprocating motion	Torque N.cm	Speed	Size/taper	Angles of reciprocating movement (CCW - CW)
1st level	2nd level					
One Flare		Continuous	3	350	25/.09	-
One G		Continuous	1,2	350	14/.03	-
One Curve mini		Continuous	2,5	350	25/.04	-
One RECI		Reciprocating	4	400	20/.04	170° - 60°
2Shape mini	TS1	Continuous	2	350	25/.04	-
	TS2		2,5	350	25/.06	-
	F35		2.5	350	35/.06	-
	F40		2	350	40/.04	-
HyFlex OGSF	Opener	Continuous	2.5	400	18/.11	-
	Glidepath		1.8	300	15/.03	-
	Shaping		2.5	400	18/.045	-
	Finishing		2.5	400	30/.04	-
HyFlex EDM	Orifice Opener	Continuous	2.5	400	25/.12	-
	Glidepath File 15/.03		1.8	300	15/.03	-
	Glidepath File 10/.05		1.8	300	10/.05	-
	EDM 20/.05		2.5	400	20/.05	-
	One File		2.5	400	25/.~	-
	Finishing Files		2.5	400	40/.04 50/.03 60/.02	-
HyFlex CM	All files	Continuous	2,5	500		-
Remover		Continuous	2,5	800	30/.07	-



QUICK START

Quick starter guide

1. Power ON and power OFF the device:

To power ON the device, press the Power button. The device enters in stand-by state. The display shows the stand-by interface of the last program used.

To start the motor from the stand-by state, press the Power button.

The display shows the working interface according to the program used.

To stop the motor, press the Power button again. The device goes back in stand-by state.

To power OFF the device, hold down the Setting button “P”, and press the Power button. In stand-by state, the device will automatically shut down after 3 minutes.

2. Select User Programs:

The device contains 10 memories User Programs (M0-M9).

M0 = apex locator, M1 to M9 = free memories settings.

All preset Coltene File Systems available directly from the stand-by state.

Quick starter guide

3. Access to the coltene files

Press 3 seconds on « P », to set your 5 favorite files.

Press the adjusting button “+”/”-“ to scroll through the list of COLTENE files.

Press “P” to select a file, and then “+”/”-“ to adjust the setting.

Press the Power button to freeze the settings.

F&Q

1. Is the Contra angled isolated internally and externally by a layer?
The layer / surface creates the isolation.
2. How long is the charging time?
2-3 hours, but in practice 80% of capacity is achieved within 1 h.
3. What about the capacity of the Accumulator?
2-2,5 hours of continues motor rotation
4. What surrounding is recommended while measuring the apex?
The canal must not be dry. Too much lubrications lead to short cuts.
5. How to oil the Contra angle?
With a spray can or oil and the adapter which is included or Show picture!
6. For what purpose are the integrated O-Rings
Is not needed for the X-Move.
7. How to use the probe?
It is helpful to reach the tooth e.g. molar / small mouth opening
8. How many file setting can be programmed as a sequence?
Dr Choice: 9 different file settings are programmable
9. How many COLTENE files can be programmed as a sequence?
5 COLTENE files

F&Q

10. How to power off the Motor?

To power OFF the device, hold down the Setting button “P”, and press the Power button. In stand-by state, the device will automatically shut down after 5 minutes.

11. How to access the device parameters?

From the power OFF state, hold down the Setting button “P” and press Power button.

12. What happens if the file reaches the apex?

3 Options:

- OFF: Disable apical action.
- STOP: Motor stops automatically. Motor restarts automatically when the file is pulled away from the reference point .
- REVERSE: Motor automatically reverse the rotation. Motor goes back automatically to the initial rotation direction / movement, when the file is pulled away from the reference point.

THE FUTURE IS NOW

CanalPro™ Jeni



caratteristiche Tecniche

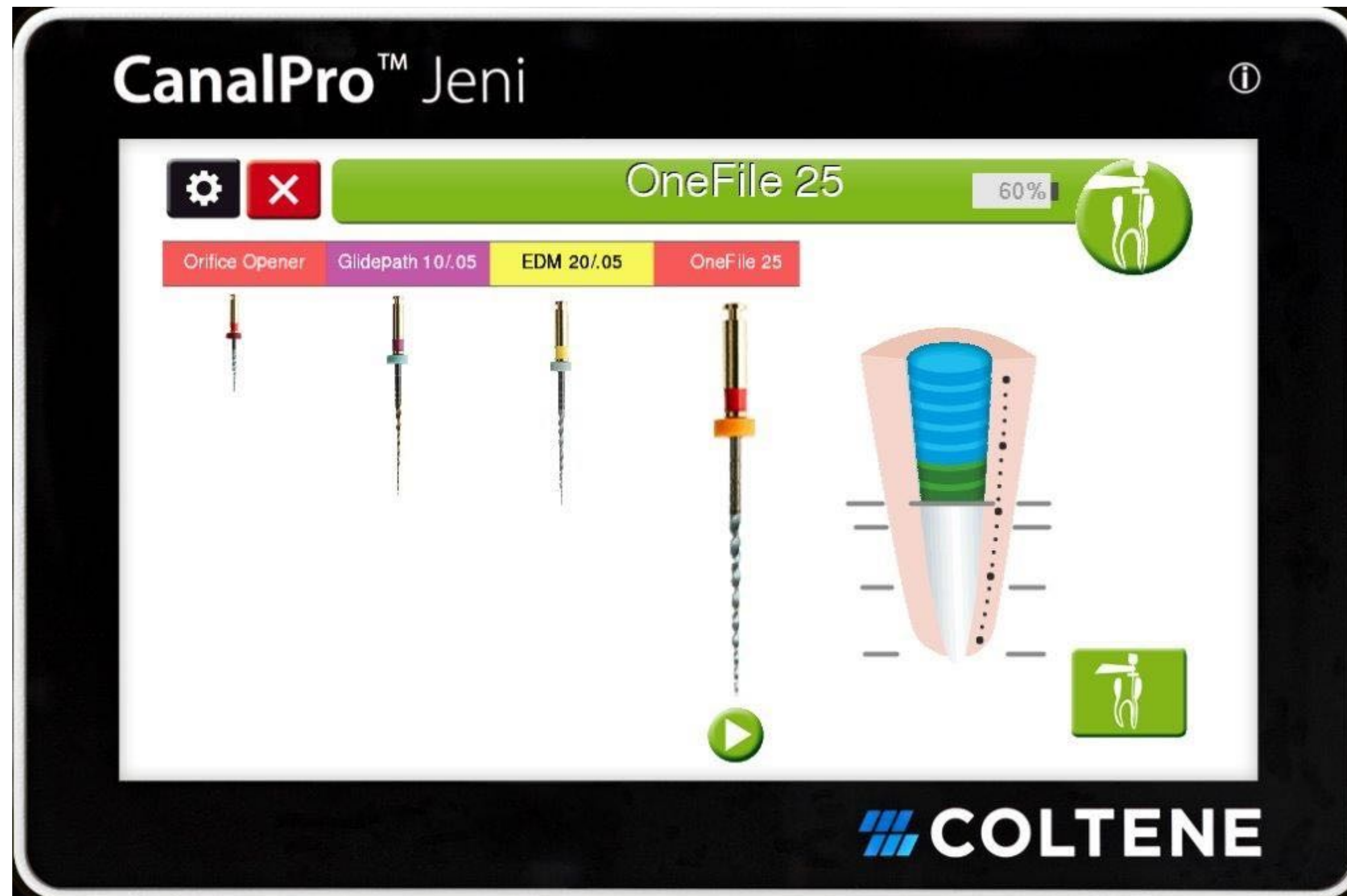
- ✓ MOTORE DA TAVOLO CORDLESS
- ✓ MONITOR TOUCH SCREEN 7" A COLORI
- ✓ SCHEDA SD CONTENENTE IL SOFTWARE
- ✓ CONTRANGOLO CON RILEVATORE D'APICE INTEGRATO
- ✓ PEDALE BLUETOOTH



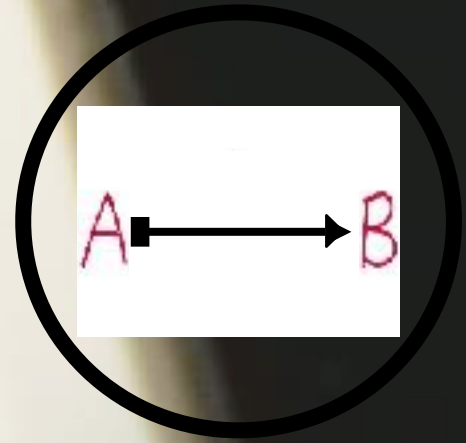
Apex locator

2 in 1

LOCALIZZATORE D'APICE
INTEGRATO



caratteristiche software



4 PROGRAMMI : HYFLEX EDM, HYFLEX CM,
MM ONECURVE, MM 2SHAPE

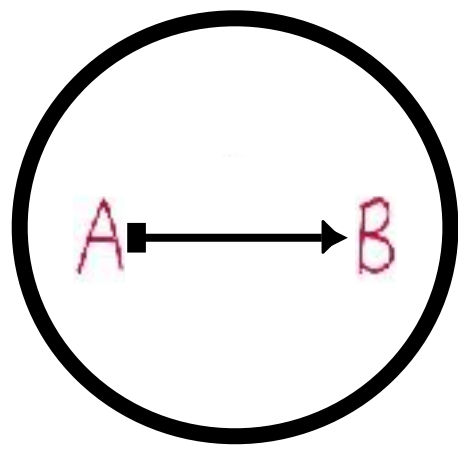


NOTIFICA DI IRRIGAZIONE AUTOMATICA
(BEEP LUNGO)



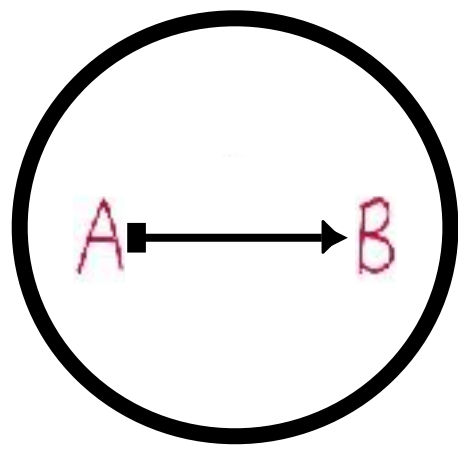
NOTIFICA DI CAMBIO FILE
AUTOMATICA (PIU BEEP BREVI)

4 PROGRAMMI : HYFLEX EDM, HYFLEX CM, MM ONECURVE, MM 2SHAPE



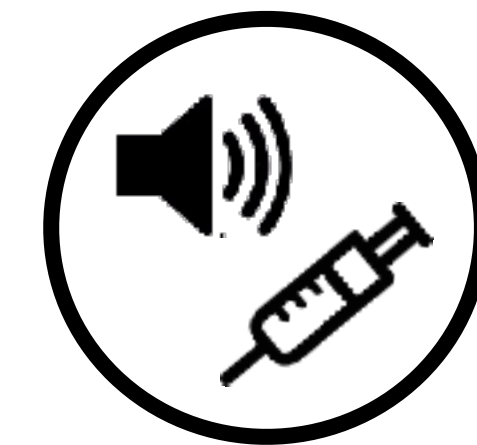
APPLICANDO UNA LEGGERA PRESSIONE CONTINUA SUL MANIPOLO, IL MOTORE RILEVA AUTOMATICAMENTE L'INTENSITA' ATTUALE DELLO STRESS DEL FILE, L'ANATOMIA DEL CANALE RADICOLARE E LA PRESSIONE APPLICATA E REGOLA DI CONSEGUENZA IL MOVIMENTO DEL FILE.

4 PROGRAMMI : HYFLEX EDM, HYFLEX CM,
MM ONECURVE, MM 2SHAPE



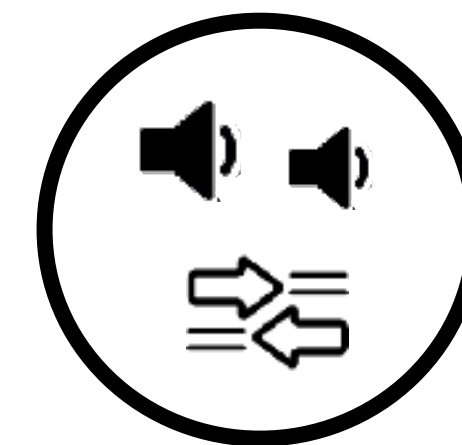
LA RISPOSTA DEL MOTORE E
DIVERSA PER OGNI STRUMENTO E
CIASCUN CANALE RADICOLARE.
NON E NECESSARIO IL MOVIMENTO
DI PECKING NE DI BRUSHING.

NOTIFICA DI IRRIGAZIONE AUTOMATICA (BEEP LUNGO)



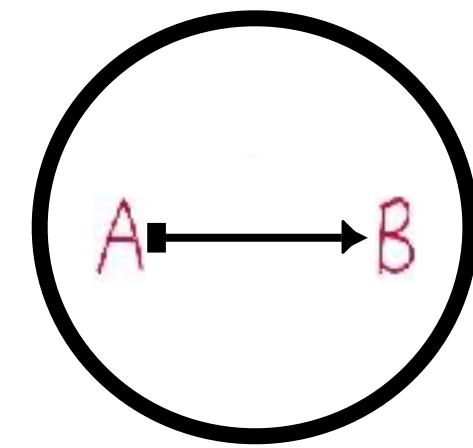
IL MOTORE EMETTE
AUTOMATICAMENTE UN
SEGNALE ACUSTICO PER
INDICARE IL MOMENTO IN CUI È
NECESSARIO ESTRARRE IL FILE
DAL CANALE ED IRRIGARE .

NOTIFICA DI CAMBIO FILE
AUTOMATICA (PIÙ BEEP BREVI)



IL MOTORE INDICA CHE IL FILE
DEVE ESSERE CAMBIATO DOPO
UN CERTO NUMERO DI UTILIZZI
(PER EVITARE LA ROTTURA)

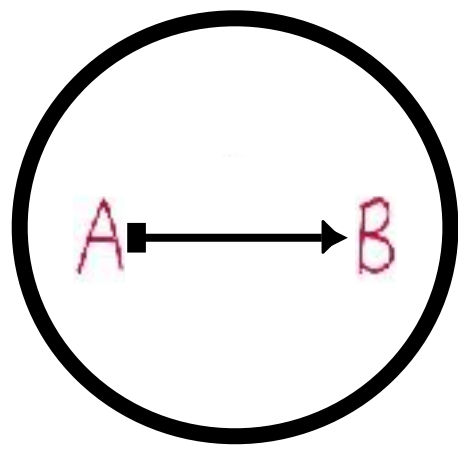
COME FUNZIONA JENIMODE?



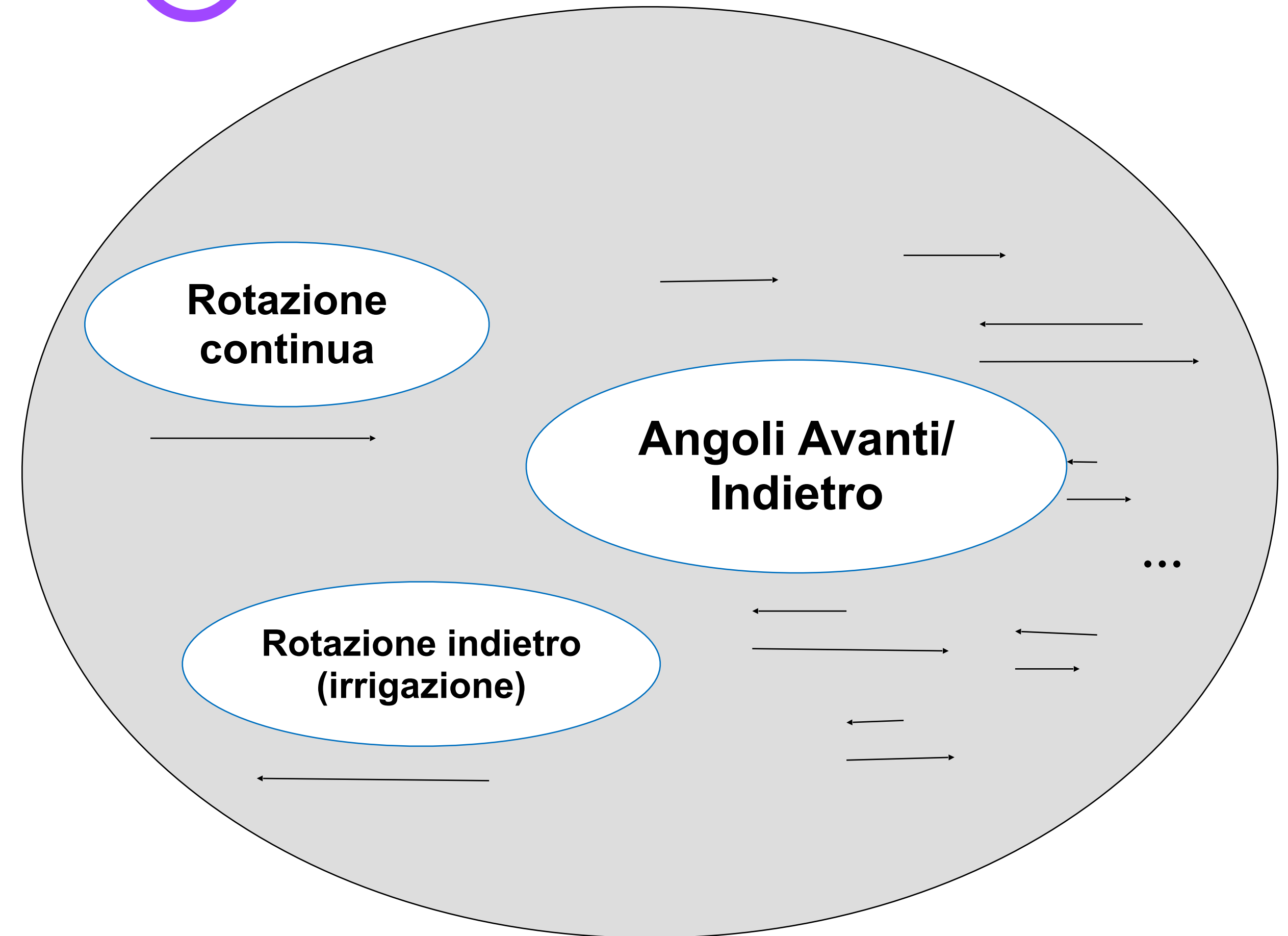
ANALIZZA COSTANTEMENTE I SEGUENTI
PARAMETRI...



COME FUNZIONA JENIMODE?



... DECIDE
AUTOMATICAMENTE IN
MILLISECONDI QUALE
MOVIMENTO INDIVIDUALE
E NECESSARIO PER
AVANZARE IN MANIERA
SICURA ED EFFICIENTE
ALL'INTERNO DEL
CANALE



COME FUNZIONA JENIMODE?



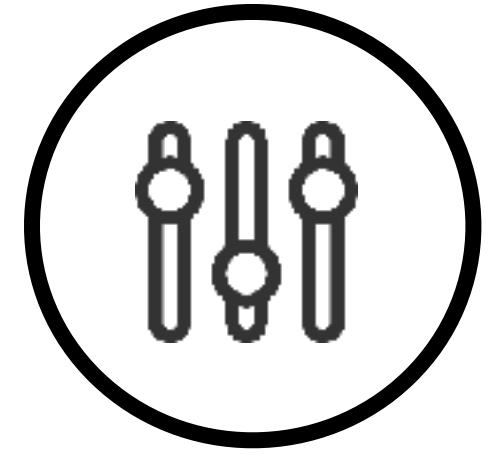
... EMETTE UN
SÈGNALE
ACUSTICO
QUANDO IL
CANALE DEVE
ESSERE IRRIGATO.



BEEP



caratteristiche software



PROGRAMMA DOCTOR'S CHOICE



CONSENTE DI PROGRAMMARE ALTRI 8 FILES E SALVARLI COME PREFERITI.

E' POSSIBILE AVERE ROTAZIONE CONTINUA CON STRUMENTI CHE AVANZANO IN SENSO ORARIO .

E' POSSIBILE AVERE SOLO RECIPROCAZIONE DALL'INIZIO ALLA FINE, SCEGLIENDO IL VERSO ED I GRADI DI ROTAZIONE CON STRUMENTI A TAGLIO IN SENSO ORARIO E CON STRUMENTI A TAGLIO ANTIORARIO (RECIPROC, WAVEONE GOLD).

IN QUESTA MODALITA NON E POSSIBILE UTILIZZARE IL MOVIMENTO "JENI".

SCARICA IL PDF

- Scansione il QR code e scarica l'estratto della presentazione in pdf



SCAN ME

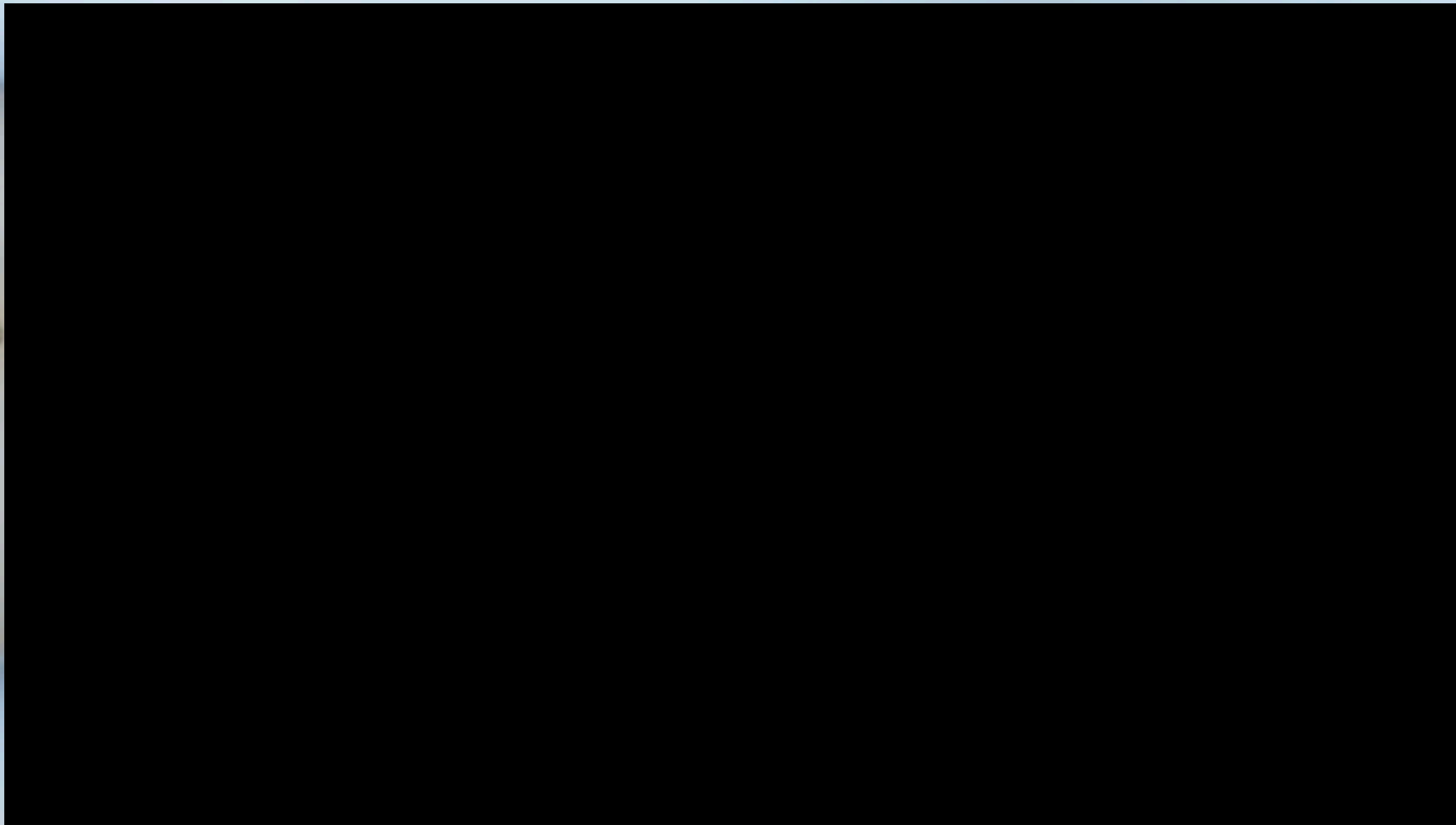
Study Club 2023

GIOVEDÌ 9 NOVEMBRE ALLE 21.00
THE SOCIAL HUB

Tappe in tutta Italia!
Stay tuned

**Sealer
Bioceramici:**
Tecniche di otturazione
e principi di utilizzo

SCOPRI CHI SIAMO:



Fabio_PiccottiDDS



SHAPEITENDO



SHAPEITENDO



SHAPEITENDO

GRAZIE

ShapeIT[®]



DR. GIACOMO SUARDI



DR. FABIO PICCOTTI



DR. ANDREA BALOCCO



DR. MARCO BUCCI



DR. GIANLUCA FUMEI