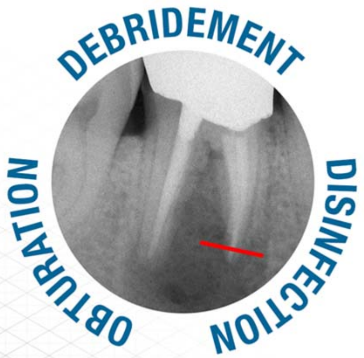
Obturation

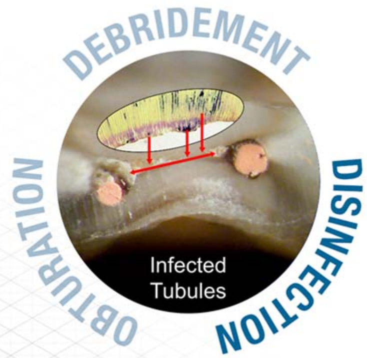
Scientific Studies

- ☑ Success
- ☑ Density
- ☑ Coronal Leakage

Objective of Endodontics

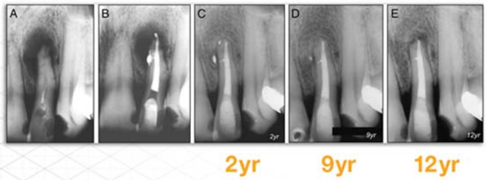
To Prevent and/or Eliminate Apical Periodontitis





Dentinal Tubule Infection as the Cause of Recurrent Disease and Late Endodontic Treatment Failure: A Case Report

Adalberto R. Vieira, DDS, MSc, José F. Siqueira, Jr, DDS, MSc, PhD,† Domenico Ricucci, MD, DDS,*† and Weber S.P. Lopes, DDS, MSc*†*



Vieira, Siqueira, Ricucci, Lopes
JOE 2/12 pg 250-4

DEBRIDEMENT

DISINFECTION

OBTURATION

Obturation

It is essential, that endodontic therapy must include sealing of the root canal system to prevent tissue fluids from percolating into the root canal and prevent toxic by–products from both necrotic tissue and microorganisms regressing into the periradicular tissues.

The End Game

“In the final analysis, it is the sealing off of the complex root canal system from the periodontal ligament and bone which insures the health of the attachment apparatus against breakdown of endodontic origin.”

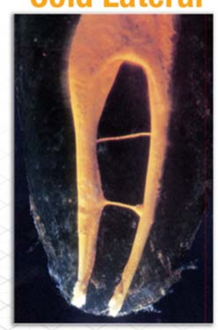
Herbert Schilder, 1967

Objectives of Obturation

- To prevent percolation of periradicular exudate into the pulp space via the apical foramina and or lateral and furcation canals
- To prevent percolation of gingival exudate and microorganisms into the pulp space via lateral canals opening into the gingival sulcus
- To prevent microorganisms left in the canal after preparation from proliferating and escaping into the periradicular tissue via the apical foramina and/or lateral canals
- To seal the pulp chamber and canal system from leakage via the crown in order to prevent passage of microorganisms and/or toxins along the root canal filling and into the periradicular tissue via the apical foramina and/or lateral canals

Warm Vertical Condensation

Cold Lateral



Warm Vertical

-courtesy Dr. Arnaldo Castellucci

Carrier Based Obturators

Continuous Wave of Condensation

Treatment in Outcome Endodontics:

The Toronto Study

Prospective Study

Friedman et. al, JEndo 2003-2008

Conclusions

"...the present study was aimed to quantify microleakage of the bacterial endotoxin (LPS) in teeth recently extracted, obturated through lateral condensation method and the thermoplastic continous wave of condensation technique (CWC)."

"...teeth obturated with CWC showed statistically significantly less microleakage of LPS than those obturated with lateral condensation."

Dr. Eduardo Akisue, University of Sao Paulo

Continuous Wave of Condensation

- ☑ **The continuous wave of condensation is less time consuming, provides less microbial coronal leakage than lateral compaction.**

  Jacobson H, Baumgartner J. Gutta-percha obturation of lateral grooves and depressions. J Endod 2002;28:269–71.

- ☑ **Chemical rinses have a penetration depth of 100 microns which results in the possibility of bacterial entombment and microleakage.**

  DuLac KA, Nielsen CJ, Tomazic TJ, Ferrillo PJ Jr, Hatton JF. Comparison of the obturation of lateral canals by six techniques. Endod Prac 1998;1:7–10, 13–6. Goldberg F, Artaza L, Silvio A. Effectiveness of different obturation techniques in filling of simulated lateral canals. J Endod 2001;27:362–4.

Microbial Leakage Evaluation of the Continuous Wave of Condensation

The purpose of this study was to evaluate bacterial leakage in teeth obturated using the continuous wave of condensation compared with teeth obturated with the lateral condensation of gutta-percha.

An anaerobic bacterial leakage model was used.

Jacobson J, Xia T, Baumgartner C, Marshall G, Beeler W.
J Endo 28, NO. 4, April 2002

Microbial Leakage Evaluation of the Continuous Wave of Condensation

Results indicate that microbial coronal leakage occurs more quickly using lateral condensation than with the System B continuous wave of condensation and Obtura II backfill.

Jacobson J, Xia T, Baumgartner C, Marshall G, Beeler W.
J Endo 28, NO. 4, April 2002

Electric Heat Carriers

Alpha and Beta by B&L

Alpha and Beta by B&L

Obtura III Max System Spartan/Obtura

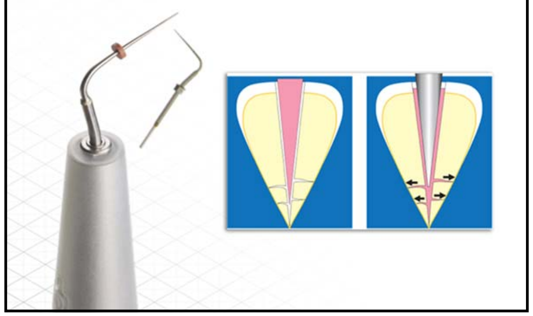
Elements Obturation Unit

System B™

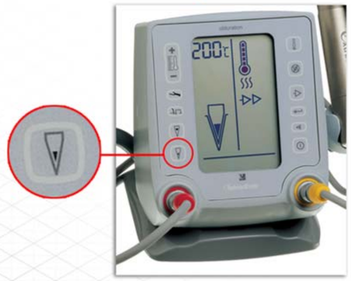
Left Side

- ☑ Display
- ☑ Buttons
- ☑ Handpiece

Autofit Heat Pluggers



Downpack



Four Second Automatic Shutoff

Hot Pulp Test Tip

Reproduce

Reproduce Reproduce

Diagnostic Tests

Reproduce Reproduce

Reproduce

Hot Testing

- ☑ Heated Gutta Percha
- ☑ Heated Ball Burnisher
- ☑ Hot Water
- ☑ Prophy Cup
- ☑ System-B Heat Testing Tip

C Nerve Fibers

Comparison of Heat Testing Methodology

Bierma M. Et. Al. JOE August, 2012

Facts

- Heat can damage pulps!!
- Temps of 42°-42.5° C may be high enough to cause damage to the pulp
- A 4° C rise in intrapulpal temperature can cause minimal temporary changes
- 10° C rises causes greater damage and 20° C rise can cause pulp necrosis

Conclusions

- Hot Water was LEAST CONSISTENT
- System-B Heat Testing Tip WAS MOST CONSISTENT (mean increase in temp=2.8° C)
- Hot Water and heated ball burnisher caused temperature increases high enough to damage pulp tissue

Hot Pulp Test Tip

Elements Obturation Unit

Extruder

Right Side

- Display
- Buttons
- Handpiece

Extruder Cartridges

Disinfection of Gutta Percha Cones

Impact of Three Radiographic Methods in the Outcome of Nonsurgical Endodontic Treatment: A Five-Year Follow-up

	Disinfected GP	Not Disinfected GP
Digital	94	84
CBCT	92	29

Fernandez F, Cadavid D, Zapata S, Alvarez L, Restrepo F, J Endod 2013; 39, 1097-1103

Disinfection of Gutta Percha Cones 1-minute Soak

Length of time is enough to disinfect cones

Royal MJ, Willianson AE, Drake DR. Comparison J Endod 2007;33:42–4.
Pang NS, Jung IY, BaeK S, Baek SH, Lee WC, KumKY. J Endod 2007;33:594–8.

Disinfection of Gutta Percha Cones 1-minute Soak

Any longer time can deteriorate the surface structures, which sometimes can even damage the whole structure of the material

Royal MJ, Willianson AE, Drake DR. Comparison J Endod 2007;33:42–4.
Valois CRA, Silva LP, Azevedo RB. Int Endod J 2005;38:425–9.
Moller B, Orstavik D. I Scand J Dent Res 1985;93:158–61

Disinfection of Gutta Percha Cones 1-minute Soak

Any longer time can increase the elasticity which can lead to difficulties in obturation, especially in curved canals

Valois CRA, Silva LP, Azevedo RB. Int Endod J 2005;38:425–9.
Moller B, Orstavik D. I Scand J Dent Res 1985;93:158–61

Effect of Disinfection

Solutions to the Adhesion Force of Root Canal Filling Materials?

Ferreira de Assis et. al
J Endo 2012, 38; 853-855.

Investigation of Adhesion Force of (Fad) between root canal sealers and gutta percha cones folowing different disinfection protocols

The decontamination of gutta percha cones with 2% Chlorohexidine resulted in higher Fad values

The use of CHX in the disinfection process of gutta percha cones might be a better option before root canal obturation

Requirements for an Ideal Sealer

- ☑ It should be easily introduced into the root canal system.
- ☑ It should seal the canal laterally as well as apically.
- ☑ It should not shrink after being inserted.
- ☑ It should be impervious to moisture.
- ☑ It should be bacteriostatic or at least not encourage bacterial growth

Requirements for an Ideal Sealer

- ☑ It should be radiopaque.
- ☑ It should not stain tooth structure.
- ☑ It should not irritate periapical tissue.
- ☑ It should be sterile or easily and quickly sterilized immediately before insertion.
- ☑ It should be easily removed from the root canal if necessary.

Classification of Sealers

- ZINC OXIDE AND EUGENOL SEALERS
- Kerr Pulp Canal Sealer
- Rickert's Sealer
- Procosol
- Tubli-Seal
- Wach's Paste

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Classification of Sealers

- CALCIUM HYDROXIDE BASED SEALERS
- Sealapex
- CRCS (Calciobiotic Root Canal Sealer)

Classification of Sealers

- RESIN BASED SEALERS
- EndoRez (Diketone)
- AH Plus (Epoxy)
- Epiphany (Methacrylate)

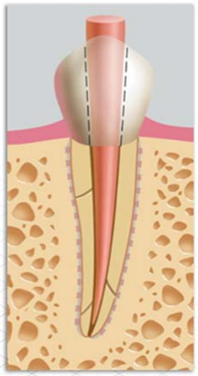
- CALCIUM PHOSPHATE BASED
- Bioseal

Classification of Sealers

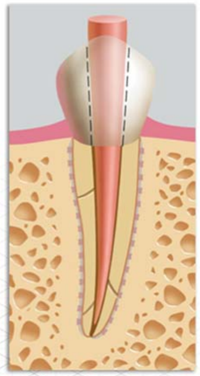
- Bioactive Sealers
- MTA Fillapex

Technique

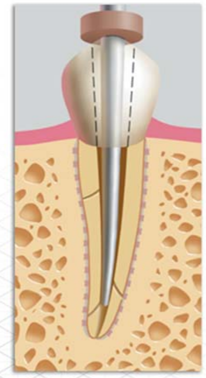
Continuous Wave of Condensation



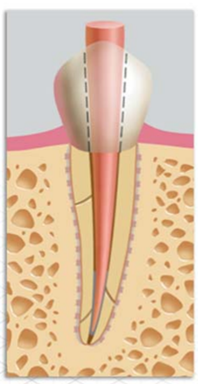
- ☑ Choose appropriate size gutta percha point
- ☑ Obtain "tugback" at working length
- ☑ Take a confirmatory radiograph



Then remove .5 - 1mm of the apical portion of the point to accommodate for vertical movement to the apex

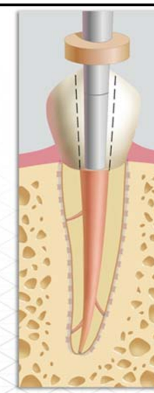


Pre-fit the appropriate electric heat carrier to its binding point (within 4-6m of the working length) and adjust the rubber stopper to the corresponding occlusal reference point



The apical 4mm of the master cone is buttered lightly with sealer and using gentle pressure, the cone is seated to place.

- ☑ Using the activated electric heat carrier sear off the cone at the orifice level
- ☑ And SEAT the cone with the large end of a stainless steel plugger and create a DIMPLE to act as a guide for the electric heat carrier



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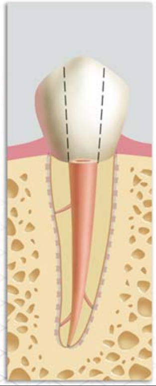

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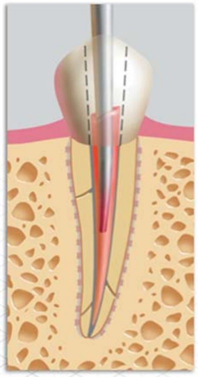
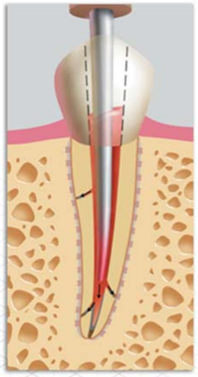
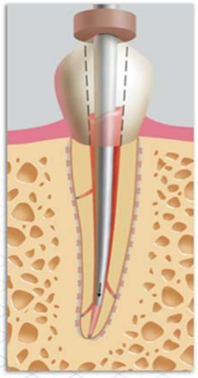


The activated electric heat carrrier is inserted through the center of the cone in a single motion to a point 2 mm shy of its apical binding point.

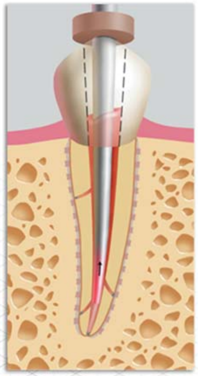
** Automatic 4 second shut off



While maintaining pressure on the heat carrier, the activator button is released and the heat carrier slows its apical movement as the carrier tip cools and approaches the apical binding point.



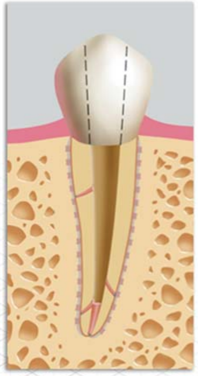
Pressure is sustained, just short of the binding point, on the carrier for 10 seconds to minimize shrinkage on cooling



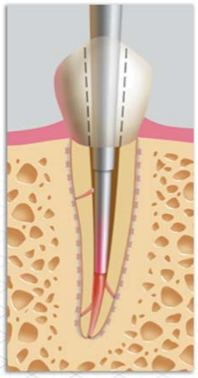
Separation Burst

The heat carrier is activated again for a quick separation heat burst

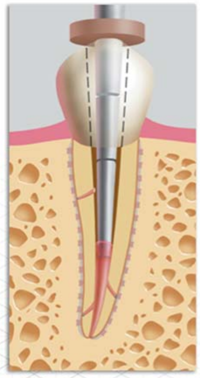
"activate, deactivate, hesitate, remove"



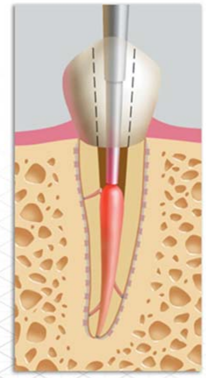
The heat carrier is removed and the surplus material will come out with it leaving a clean canal space



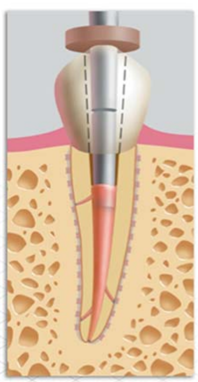
- Sealer is applied to the walls of the canal before beginning to backfill.
- The backfill tip is inserted into the coronal aspect of the apical gutta percha plug.
- It is allowed to warm the apical gutta percha plugger momentarily then 4 - 6mm increments are delivered.



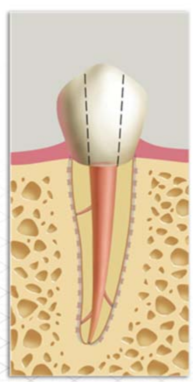
- The prefitted pluggers are now used to condense the thermosoftened material
- Slow measured delivery ensures the densest mass of material



The condensing cycle begins with the smaller plugger and then increase in size with the application of each increment



- The entire canal space should be sealed initially regardless of whether or not a post is planned
- Lateral canals are present throughout the furcation and interfurcal region of al multi-rooted teeth



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- Lateral canals are present throughout the furcation and interfurcal region of al multi-rooted teeth

Restoration of the Endodontically Treated Tooth

Coronal Leakage

Studies

- 1961 Marshall and Massler expressed concern about the role of the occlusal seal in root-filled teeth. Using a radioactive tracer, they showed that coronal leakage occurred despite the presence of a coronal dressing.
  Marshall FJ, Massler M. The sealing of pulpless teeth evaluated with radioisotopes. J Dent Med 1961;16:172-84.
- 1979 Allison et al. made brief reference to the possibility that a poor coronal seal might contribute to clinical failure.
  Allison D, Weber C, Walton R. The influence of the method of canal preparation on the quality of apical and coronal obturation. J Endodon 1979; 5:289-304.

Studies

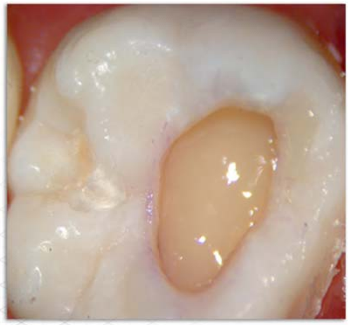
- 1987 Swanson and Madison showed in vitro that, alter only 3 days exposure to artificial saliva, there was extensive coronal leakage of a tracer dye through apparently sound root canal fillings.
  Swanson K, Madison S. An evaluation of coronal microleakage in endodontically treated teeth. Part 1. Time periods. J Endo 1987;13:56-9.
- 1988 Madison and Wilcox confirmed in vivo that exposure of root canals to the oral environment allowed coronal leakage, in some instances, along the entire length of the root canal.
  Madison S, Wilcox LR. An evaluation of coronal microleakage in endodontically treated teeth. Part 3. In vivo study. J Endo 1988;14:455-8.

Studies

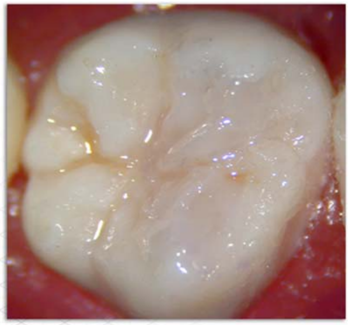
- 1987 Khayat et al. found that root canals obturated with laterally or vertically condensed gutta-percha and ZOE sealer were contaminated apically with bacteria from saliva that was only in contact with the coronal part of the root canal 30 days after exposure.
  Khayat A, Lee S-J, Torabieejad M. Human saliva penetration of coronally unsealed obturated root canals. J Endodon 1993;19:458-61.
- 1991 Vire attributed up to 59% of failures of endodontically treated teeth to restorative failures.
  Vire DE. Failure of endodontically treated teeth: classification and evaluation. J Endodon 1991;17:338-42.

Closure

Closure



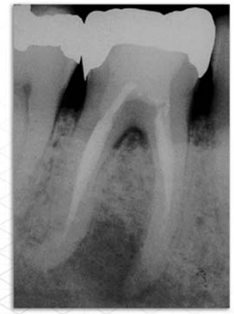
Closure



"Periapical Status of Endodontically Treated Teeth in Relation to the Technical Quality of the Root Filling and the Coronal Restoration"

Ray HA, Trope M. Int Endod J, 1995.

Poor Endodontics



Good Endodontics

Poor Restoration

Good Restoration

Case	n	% Success
Eg & Rg	330	91.4
Eg & Rp	164	44.1
Ep & Rg	302	67.6
Ep & Rp	188	18.1
E=Endo R=Restoration g=good p=poor		

Prevalence of Apical Periodontitis in Root Canal Treated Teeth From an Urban French Population: Influence of the Quality of Root Canal Fillings and Coronal Restorations

Tavares P., Et. Al. J Endo, June 2009

Results

Adequate Endo Tx	91% Success Rate
Inadequate Endo Tx	61% Success Rate
Adequate Restorations	AP (29%)
Inadequate Restorations	AP (41%)
Adequate Endo Tx and Adequate Restorations	93.5% Success Rate

Tavares P., Et. Al. J Endo, June 2009

Conclusions

- Quality of endodontic treatment was the MOST IMPORTANT factor for success
- Quality of the Coronal Restoration ALSO influenced the treatment outcome

Tavares P., Et. Al. J Endo, June 2009