Obturation

Scientific Studies
- **Success**
- **Density**
- **Coronal Leakage**

Objective of Endodontics
To Prevent and/or Eliminate Apical Periodontitis

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

Vieira, Siqueira, Rucco, Lopes
JORE 2/12 pg 250-4
**DEBRIDEMENT**

**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 Schickew, 1967*

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**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

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**Warm Vertical Condensation**

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**Cold Lateral**

**Warm Vertical**

*Courtesy Dr. Arnoldo Castelvetro*
**Carrier Based Obturators**

**Continuous Wave of Condensation**

**Treatment in Outcome Endodontics:**
**The Toronto Study**
Prospective Study

**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 continuous wave of condensation technique (CWC).”

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

_Dr. Eduardo Akinez, 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.

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

**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.

_J. Endod. 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.


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

Calamus Pack
Calamus Flow
Calamus Dual
Autofit Heat Pluggers

Downpack

Four Second Automatic Shutoff

Hot Pulp Test Tip

Diagnostic Tests

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

Bienna 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 rise 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

<table>
<thead>
<tr>
<th>Method</th>
<th>Disinfected GP</th>
<th>Not Disinfected GP</th>
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<tbody>
<tr>
<td>Digital</td>
<td>94</td>
<td>84</td>
</tr>
<tr>
<td>CBCT</td>
<td>92</td>
<td>29</td>
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</tbody>
</table>


Disinfection of Gutta Percha Cones 1-minute Soak

Length of time is enough to disinfect cones

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

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

**Effect of Disinfection**

Solutions to the Adhesion Force of Root Canal Filling Materials?

Ferreira de Assis et al.

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**Investigation of Adhesion Force of (Fad)**

between root canal sealers and gutta percha cones following different disinfection protocols

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

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

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**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.

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**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

- **CALCIUM HYDROXIDE BASED SEALERS**
  - Sealapex
  - CRCS (Calclobiotic 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 "bugback" 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 4-6mm 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 plunger and create a Dimple to act as a guide for the electric heat carrier

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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.

The activated electric heat carrier 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 - 6 mm 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 pluggers 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 interfacial region of all multi-rooted teeth.

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Restoration of the Endodontically Treated Tooth
Coronal Leakage

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.

- 1991 Vare attributed up to 50% of failures of endodontically treated teeth to restorative failures.

Closure

- 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.

- 1970 Allison et al. made brief reference to the possibility that a poor coronal seal might contribute to clinical failure.

- 1987 Swanson and Madison showed in vitro that, after only 3 days exposure to artificial saliva, there was extensive coronal leakage of a tracer dye through apparently sound root canal fillings.

- 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.
Closure

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


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

Tavannes P, St. Al J Endo, June 2009
Results

<table>
<thead>
<tr>
<th></th>
<th>Success Rate</th>
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<tbody>
<tr>
<td>Adequate Endo Tx</td>
<td>91%</td>
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<tr>
<td>Inadequate Endo Tx</td>
<td>61%</td>
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<tr>
<td>Adequate Restorations</td>
<td>AP (29%)</td>
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<tr>
<td>Inadequate Restorations</td>
<td>AP (41%)</td>
</tr>
<tr>
<td>Adequate Endo Tx and</td>
<td></td>
</tr>
<tr>
<td>Adequate Restorations</td>
<td>93.5%</td>
</tr>
</tbody>
</table>

Conclusions

- Quality of endodontic treatment was the MOST IMPORTANT factor for success.
- Quality of the coronal restoration ALSO influenced the treatment outcome.