Obturation Techniques

Contents

Introduction

- Most common obturation techniques – lateral and vertical compaction – considerable debate for years

- Both “lateralists” and “verticalists” consider this debate artificial – impossible to condense either laterally or vertically alone

- Softened gutta-percha mass – compacted vertically into the canal preparation, automatically assumes a lateral component of force

- Discussion regarding superior technique: not in terms of “lateral” or “vertical” forces, but rather of “cold compaction” versus “warm compaction.”

Classification

I. Solid Core Gutta-Percha with Sealers

A. Cold gutta-percha points
   1. Lateral compaction
   2. Variations of lateral compaction

B. Chemically plasticized cold gutta-percha
   1. Essential oils and solvents
      a. Eucalyptol
      b. Chloroform
      c. Halothane

C. Canal-warmed gutta-percha
   1. Vertical compaction
   2. System B compaction
   3. Sectional compaction
   4. Lateral/vertical compaction
      a. Endotec II
   5. Thermomechanical compaction
      a. Microseal System
      b. Hybrid Technique
      c. J.S.-Quick-Fill
      d. Ultrasonic plasticizing

D. Thermoplasticized gutta-percha
   1. Syringe insertion
      a. Obtura
      b. Inject-R-Fill, backfill
   2. Solid-core carrier insertion
      a. Thermafil and Densfil
      b. Soft Core and Three Dee GP

II. Apical-Third Filling

A. Simplifill

B. Dentin-chip

C. Calcium hydroxide

Solid Core Gutta Percha with Sealers

Cold Gutta Percha Points

Lateral Compaction

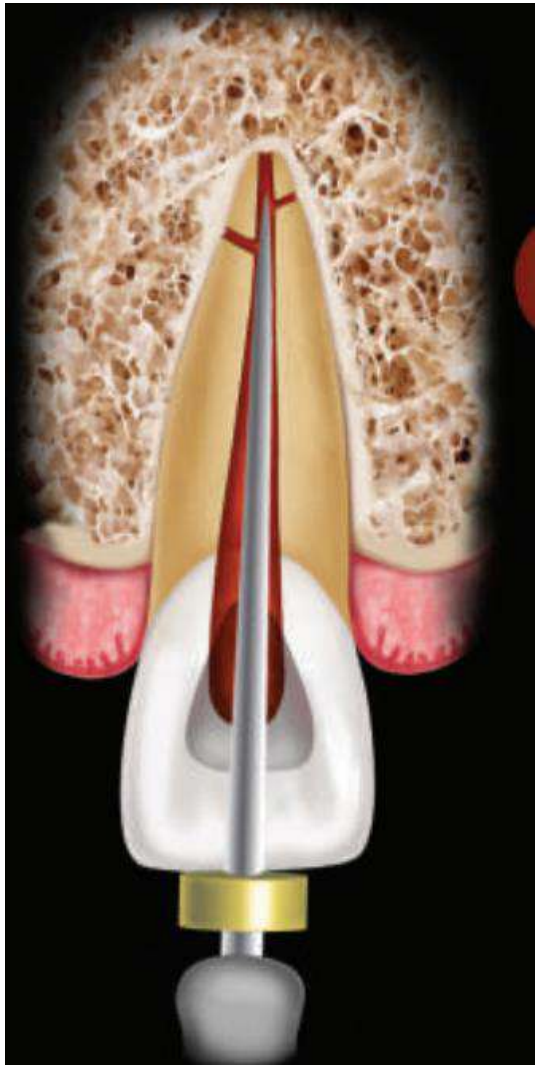
- Most commonly used technique by practitioners
- Standard against which other methods of canal obturation are judged

- **Steps**

1. Spreader size determination
2. Master Gutta Percha point size determination
3. Drying the canal, and
4. Mixing and placement of the sealer

Spreader Size Determiation

- Reach within 1.0 to 2.0 mm of working length
- Match the taper of preparation
- Spreader of same apical instrument size or one size larger is chosen
- **Spreader taper > Canal taper** – apical direction force during condensation that can result in overfill
- **Canal taper > Spreader taper** there is tendancy to displace MGP coronally during condensation



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Master Gutta-percha placed in the canal

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Spreader inserted adjacent to Master Gutta Percha

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Spreader does not reach premeasured depth

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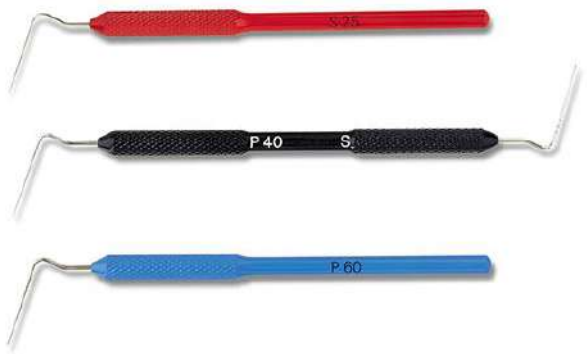
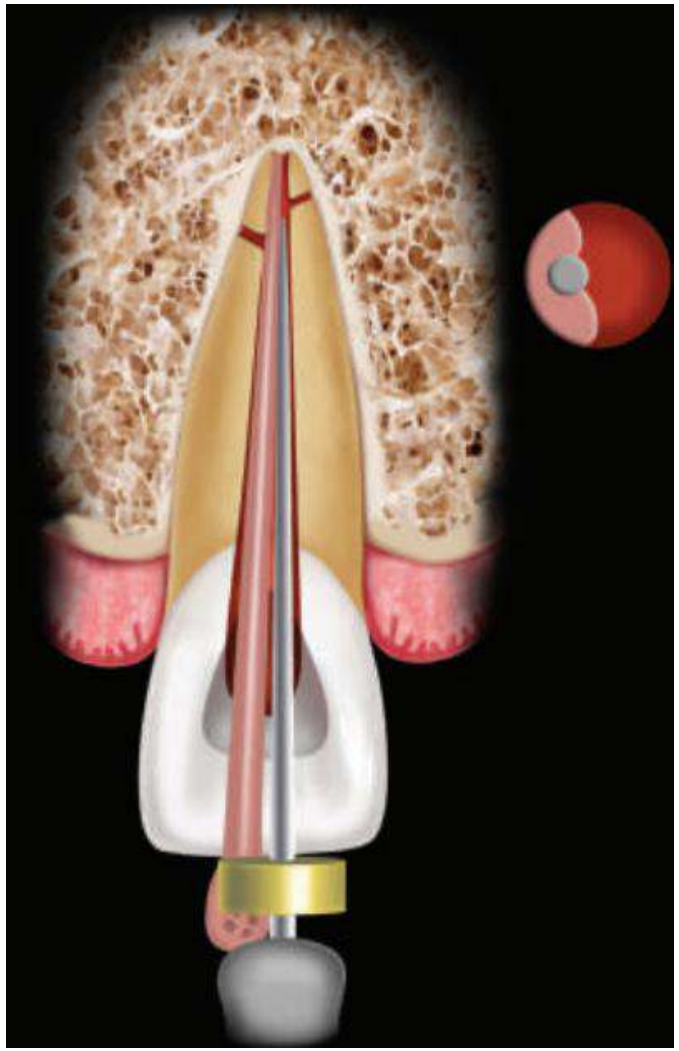
Condensation of the gutta-percha occurs laterally





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Master Gutta Percha Point Size Determination

- Standardized to match the standardized instrument sizes
- Master GP point selected to match the size of last instrument
- Pre-sterilized from the package or
- Sterilized with a germicide for 1-5 minutes in sodium hypochlorite (5.25%), hydrogen peroxide (3%), or chlorhexidine (2%)
- Gutta-percha itself does not readily support bacterial growth **(Cleary PT, et al. 1992)**

- Methods used to determine the proper fit of the Master Gutta Percha points:
    1. Visual test
    2. Tactile test
    3. Patient's response
    4. Radiographic Test

Visual Test

- GP measured and grasped with tweezers 1mm short of the prepared length of the canal
- Point placed in the canal until tweezer touches reference point of the tooth
- Master point should always be tried into the wet canal
- Beyond the apex ⟶ next larger size point should be tried
- If larger point does not go till the apex, then original point may be used by cutting the tip

Tactile Test

- Determines whether the point tightly fits the canal
- Apical 3-4 mm prepared with parallel walls, some force is required to seat the point
- Once in position – pulling force required to dislodge – known as “tugback”

Patient's Response

- Patients – not anesthetized may feel GP point penetrate the foramen
- Adjustment can then can be made until patient is completely comfortable
- Good method when position of foramen not accurately determined by radiograph or by tactile sensation

Radiographic Test

- Position of master GP Point must be checked by the radiographic test
- Point extending to within 1 mm from the tip of the preparation
- Better criterion of success than either the visual or tactile method
- Final opportunity to check all steps of therapy completed adequately

Technique

Master GP coated with sealer and slowly moved to working length

↓

Spreader introduced between the master cone and the dentin walls to make room for the first auxiliary cone

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Spreader penetrate up to 2 mm of the working length alongside the master cone

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Instrument rotated in 180-degree motion

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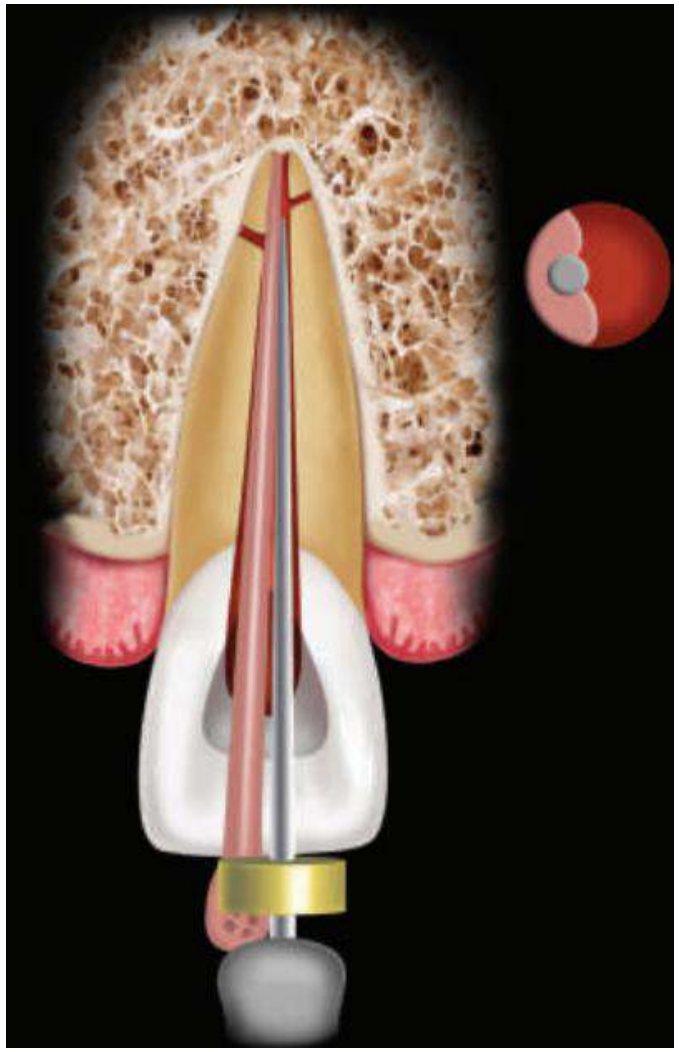
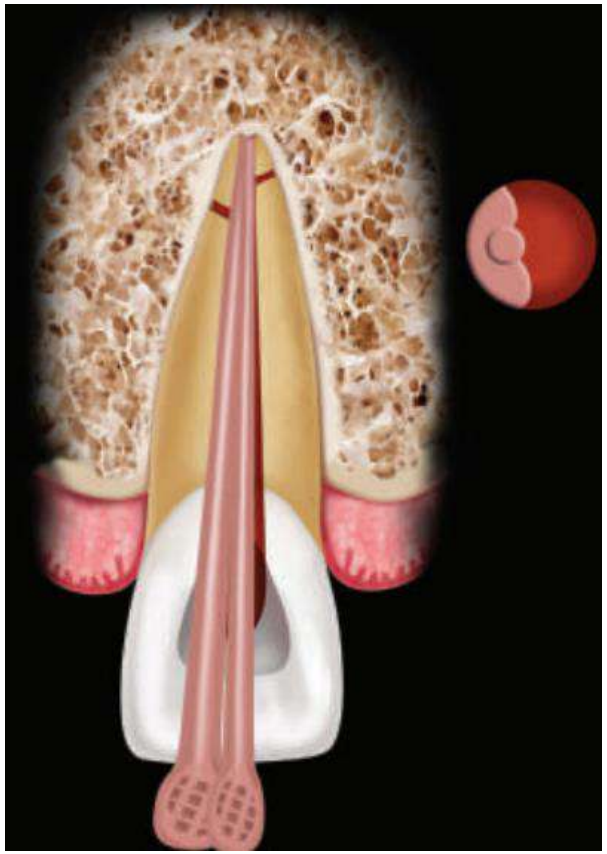
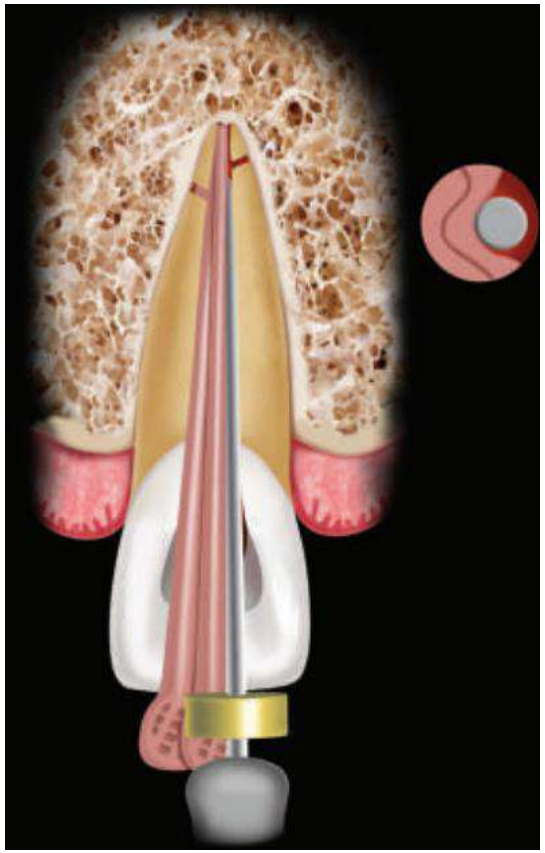
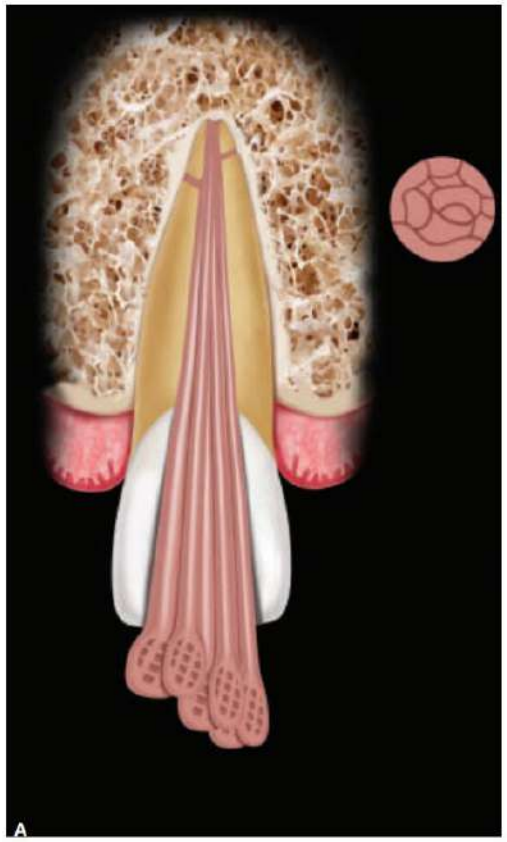
Master cone is now laterally (and somewhat vertically) compacted





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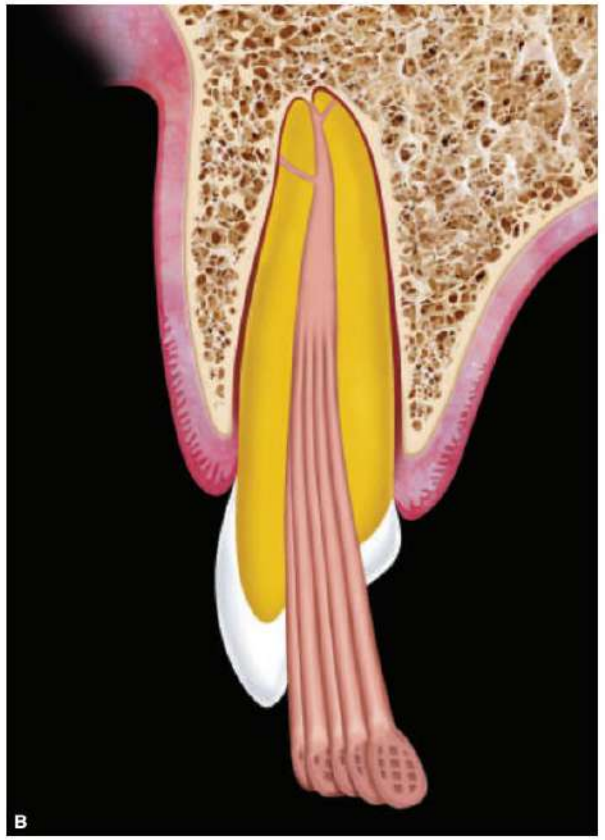
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- Pressure exerted – very light – gutta-percha not compressible
- As little as 3 lbs of pressure is capable of fracturing the root
- Excess of gutta-percha protruding in the pulp chamber seared off with a heat carrier and vertically compacted with prefitted pluggers
- The pulp chamber is cleaned with cotton pellets soaked in alcohol to remove any residual particles of gutta-percha or sealer

Drawbacks of lateral condensation:

- Does not form homogeneous, compact mass
- Filling of lateral portals of exit occurs less frequently
- As heat is not used, the seal in this area is, therefore, mainly entrusted to the sealer.
- Excessive lateral forces, increased risk of root fracture

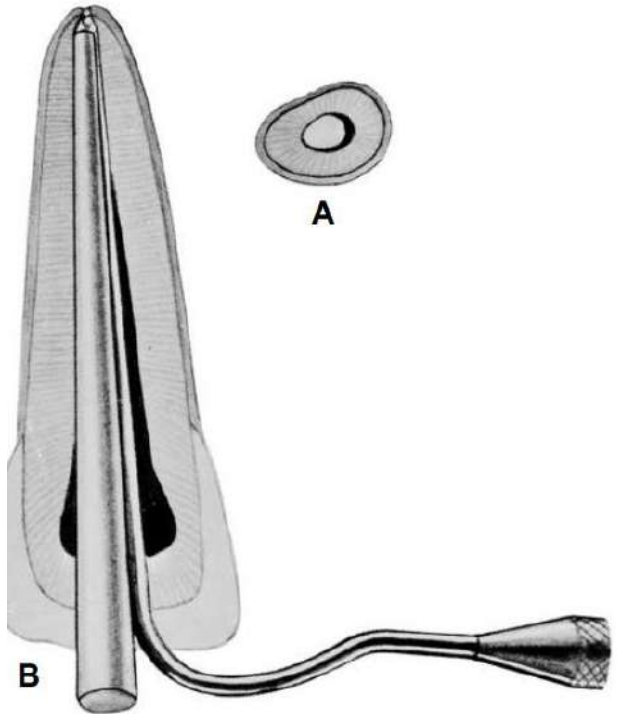
Variations of Lateral Compaction

Tubular Canals

Large tubular canal – best filled with a Master GP cone that has been blunted by cutting off the tip

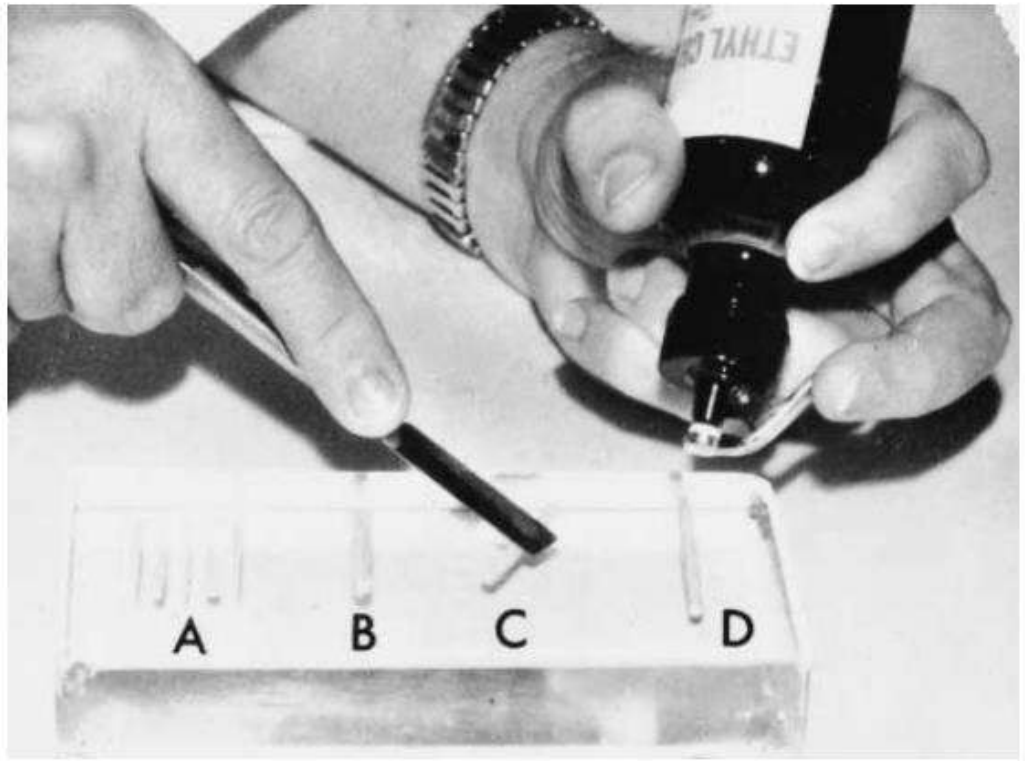
Objective of the Master GP point: block the foramen, while auxiliary points are condensed to complete the filling

With care, a well-compacted filling may be placed without gross overfilling of either cement or gutta-percha



Tailor-Made Gutta-Percha Roll

- Tubular canal is so large that the largest gutta-percha point is still loose in the canal, a tailor-made point must be used as Master GP point



A, Number of heated gutta-percha points are arranged butt to tip, on sterile glass slab.
B, Points are rolled with spatula into rod-shaped mass
C, By repeated heating and rolling, the roll of gutta-percha is formed to approximate size of canal to be filled. No voids should exist in mass
D, Before Master GP point testing of tailor-made roll, gutta-percha should be chilled with ethyl chloride spray

Chemically Plasticized Cold Gutta-percha

- Modification of lateral compaction technique
- Involves the use of a solvent to soften the Master Gutta Percha point
- Disadvantage of original technique – use of excess amount of chloroform solvent

- <u>Solvents used</u>:
- Chloroform
- Eucalyptol

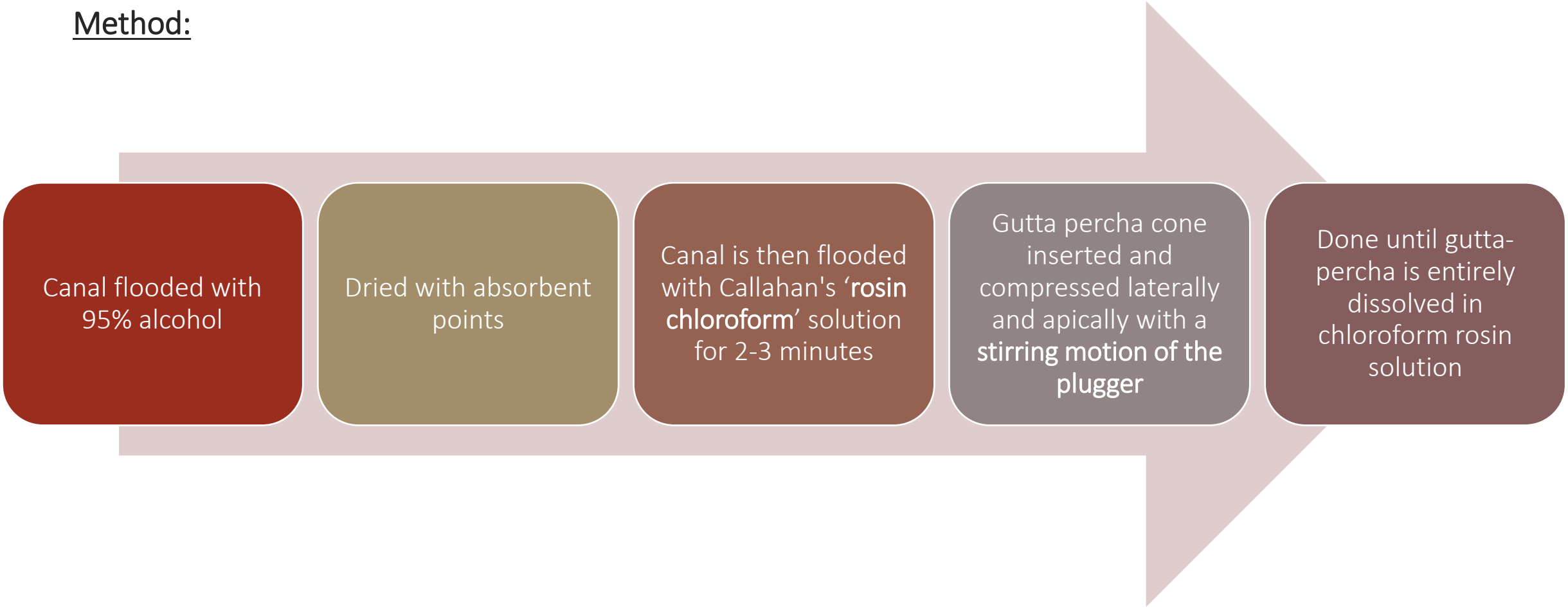
Choropercha Method: (Callahan's chloropercha technique)

- Gutta-percha dissolved in chloroform – chloropercha
- Chloropercha paste used as sole root canal filling material
- Technique – **unsound** – excessive shrinkage of the filling after evaporation of chloroform
- If used as a **sealer** with a well fitted GP cone, chloropercha can fill accessory canals and the root canal space successfully

Johnston-Callahan Method

- Johnston modified the Callahan chloropercha technique to develop the Johnston-Callahan diffusion technique

Method:



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Nygaard-Ostby

- Modified the chloropercha method
- **Finely ground gutta-percha**, Canada balsam, colophonium and zinc oxide powder mixed with chloroform in a dappen dish

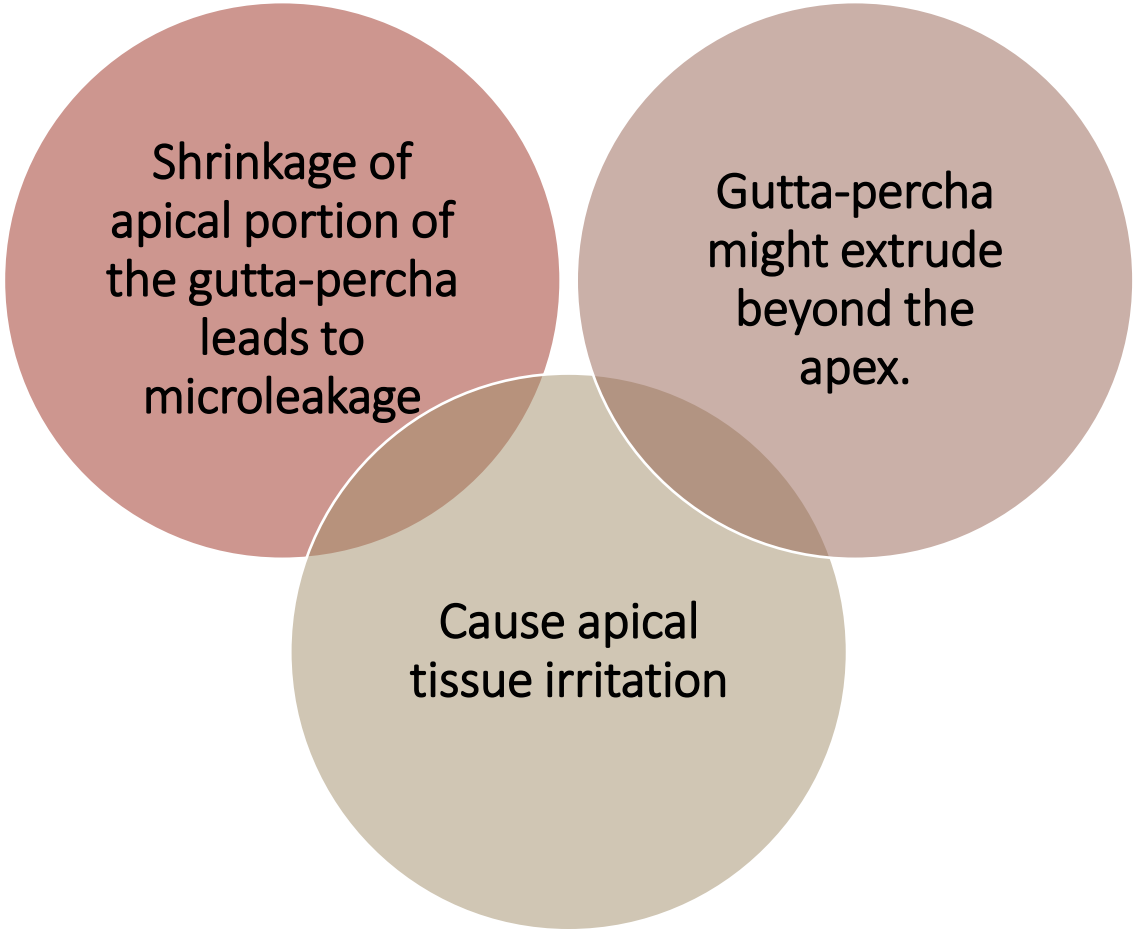
Method

- Canals are coated with chloropercha

- Master GP cone dipped in the sealer inserted apically, pushing partially dissolved tip of the cone to its apical seat

- Additional cones dipped in the sealer packed into the canal to obtain a satisfactory filling
- Additional **lateral condensation –** to avoid overfilling – **delayed** until a subsequent appointment
- Reported to greatly reduce, apical extrusions & shrinkage of the final filling

Disadvantages of chemically plasticized gutta-percha obturation technique:



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Canal-warmed gutta-percha

Vertical Compaction

- Introduced by Schilder in 1967
- Obturating the prepared root canal space “three-dimensionally” with gutta-percha, warmed in the canal and compacted vertically with pluggers
- Schilder – All “portals of exit” – clinically significant
- Obturated with a maximum amount of gutta-percha and a minimum amount of sealer

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Heat Transfer Instrument

- Initially: Instrument designed like a spreader – used to transfer heat from a Bunsen burner to the gutta-percha
- Heated “cherry-red,” immediately carried into the canal
- Submerged into the mass of gutta-percha, and drawn through the gutta-percha for 2 or 3 seconds to allow the heat to transfer from the heat carrier
- Withdrawn in a slightly circular wiping motion, “freezing” some of the gutta-percha onto the heat carrier

- The Schilder heat carrier has been superseded by the Touch ’n Heat 5004 (SybronEndo/Analytic; Irvine, Calif.)

- Electronic device specially developed for the warm gutta-percha technique

- <u>Advantage</u>: Generates heat automatically at the tip of the instrument.

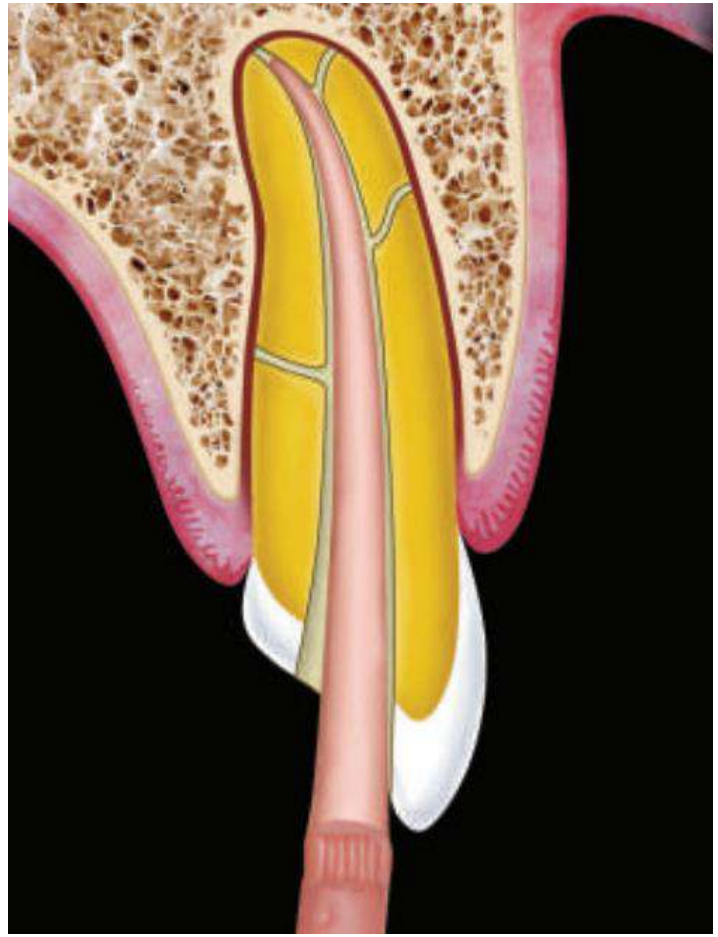
PROCEDURE

Fitting the Master Gutta-percha Cone

- Cone placed to reach radiographic terminus and then cut back 0.5–1.0 mm

- Cone-fit guidelines:

1. Shorter, wider, and straighter the canal, the farther the cone should be cut back
2. Longer more curved, and narrower the canal, the closer the cone should fit to the radiographic terminus



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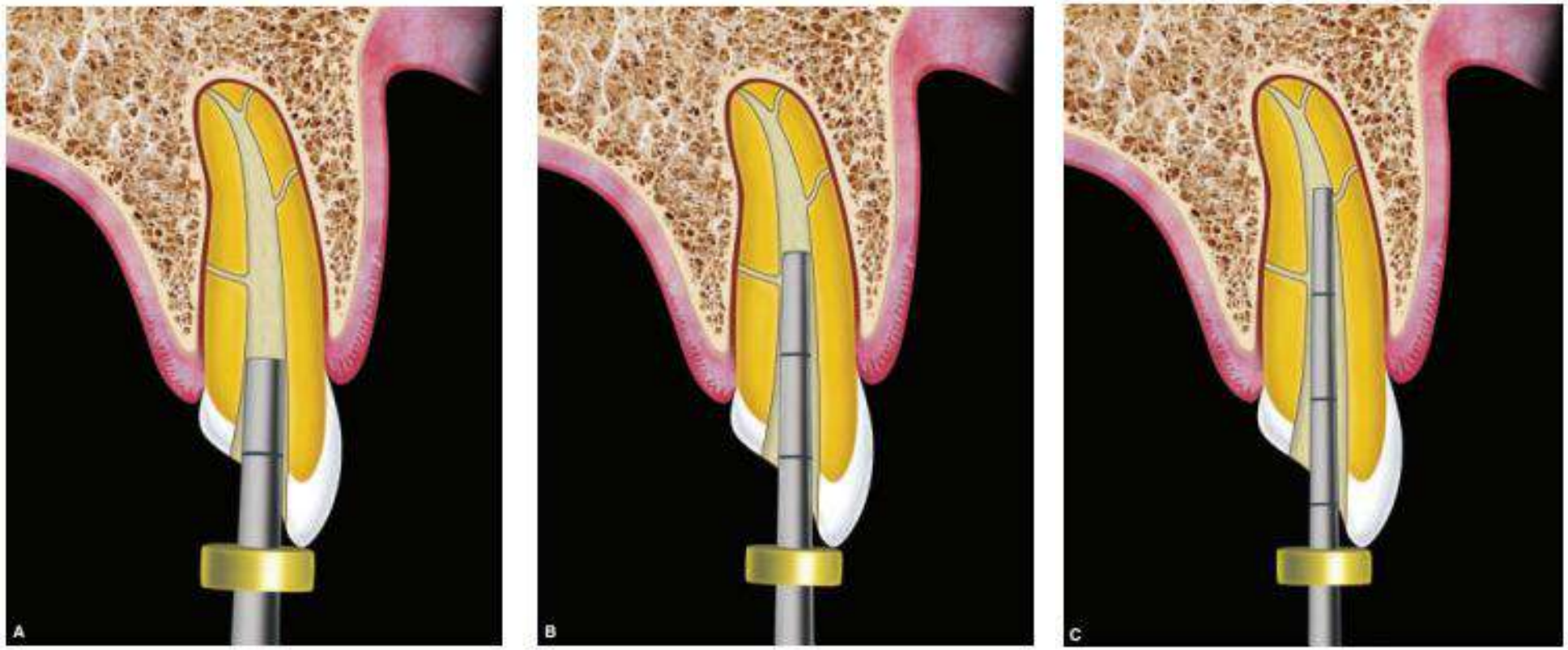
- **Prefitting the Vertical Pluggers**
- Set of pluggers designed by Schilder (Dentsply/ Maillefer; Tulsa, Okla.)

- Objective: Widest appropriate plugger – capture the maximum cushion of warm gutta-percha as the heat wave is carried apically



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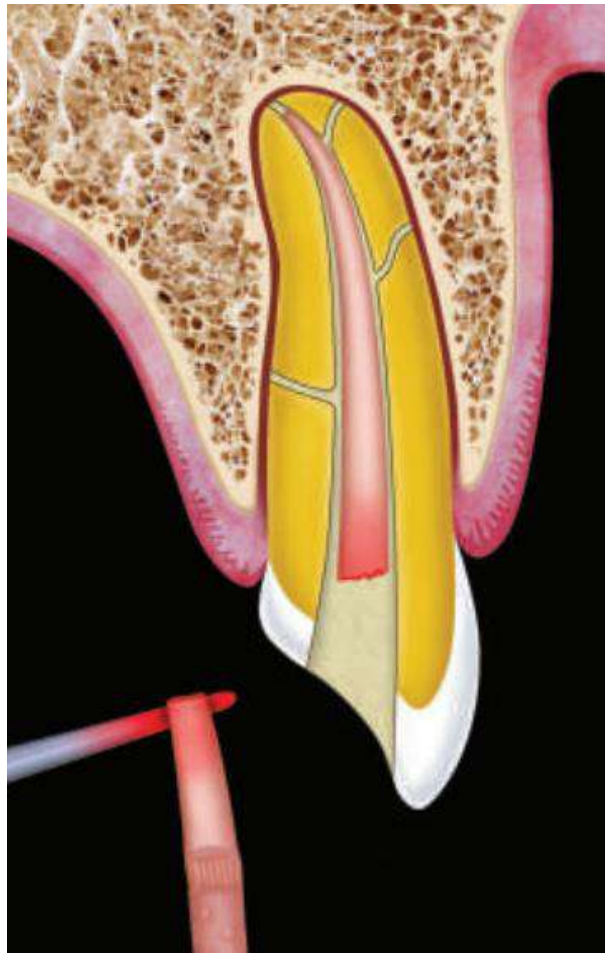
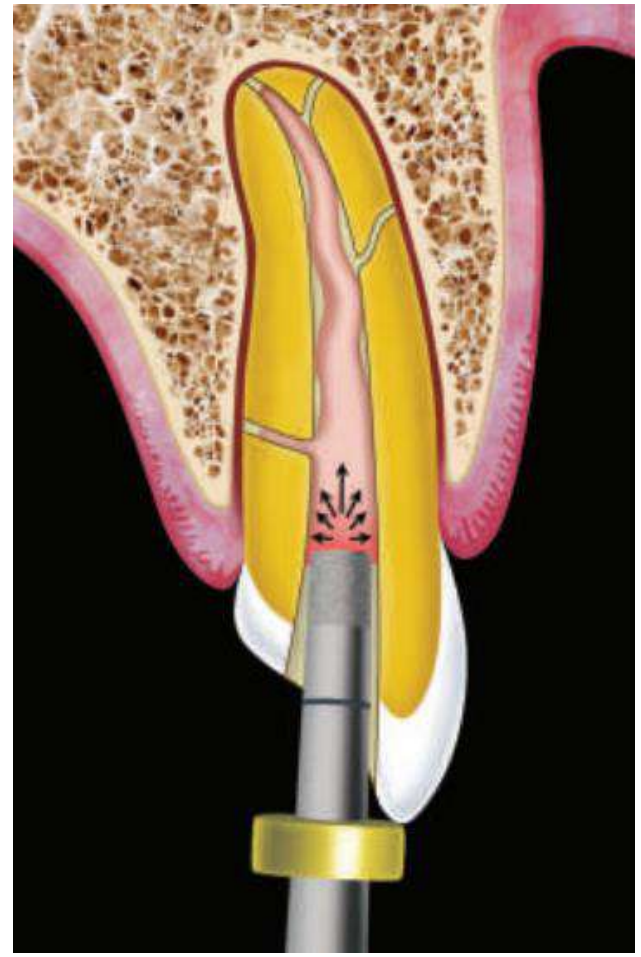
Steps

- Apical third of Gutta-percha cone coated with sealer
- Master gutta percha point is placed in the canal
- Heat carrier is used to sear off the cone surplus in the pulp chamber
- Transfers heat to the coronal third of the gutta-percha
- Platform is created to begin the first wave of compaction





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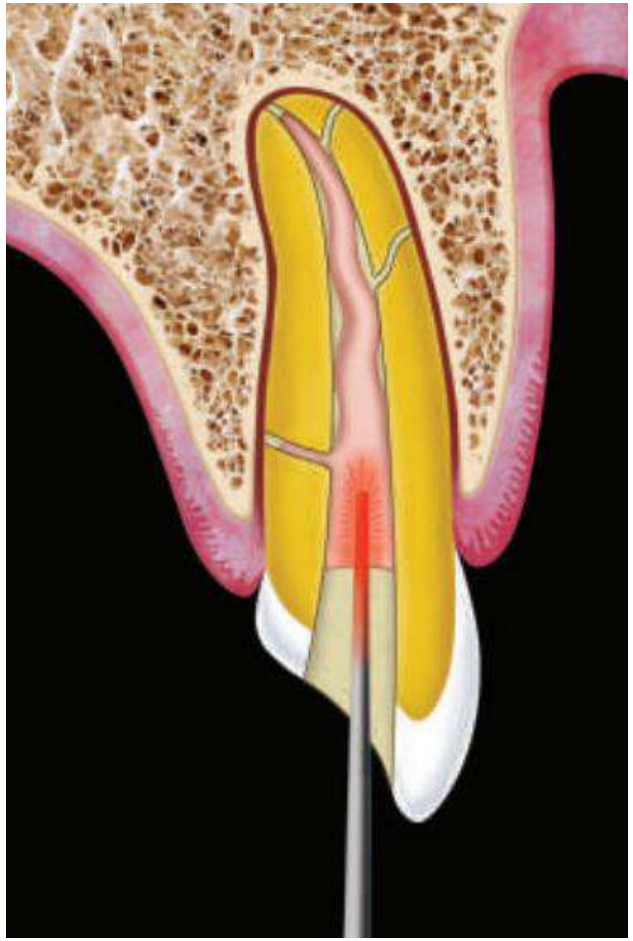

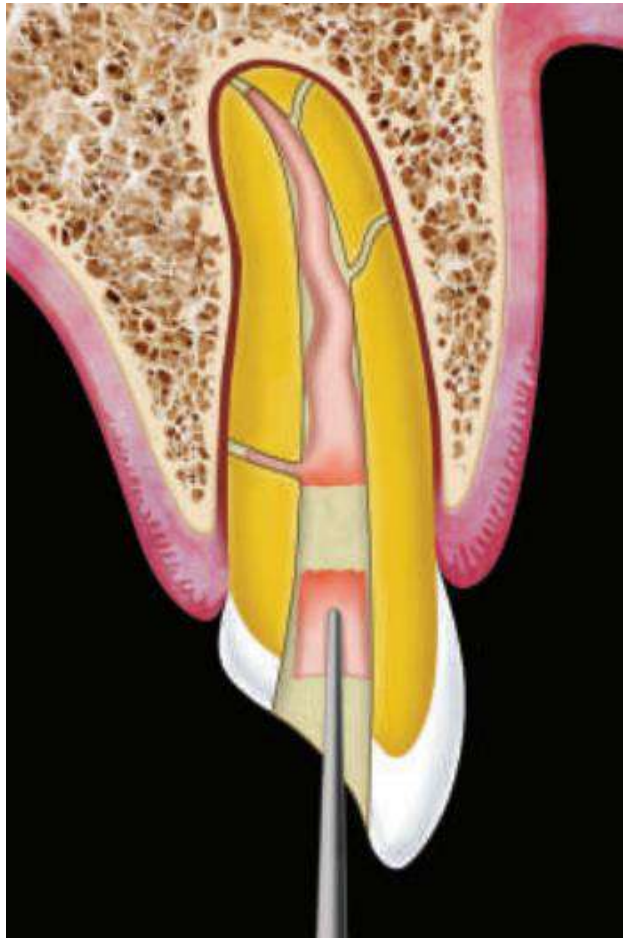

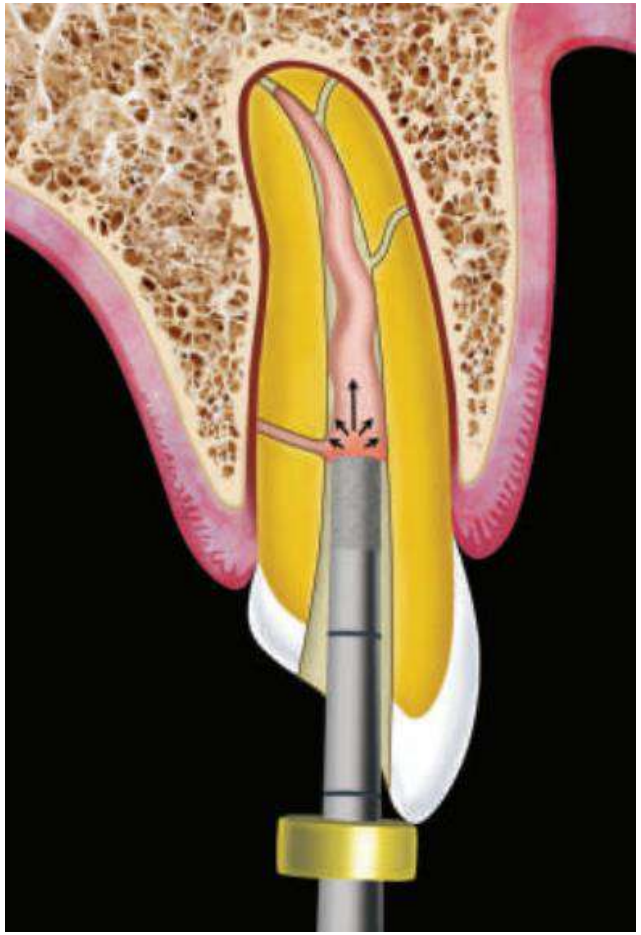

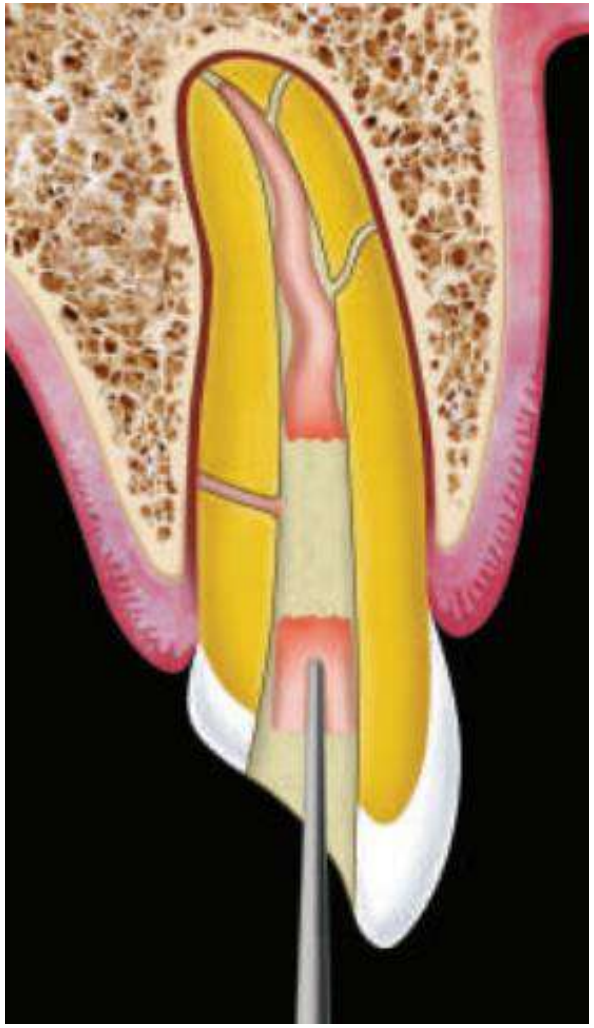

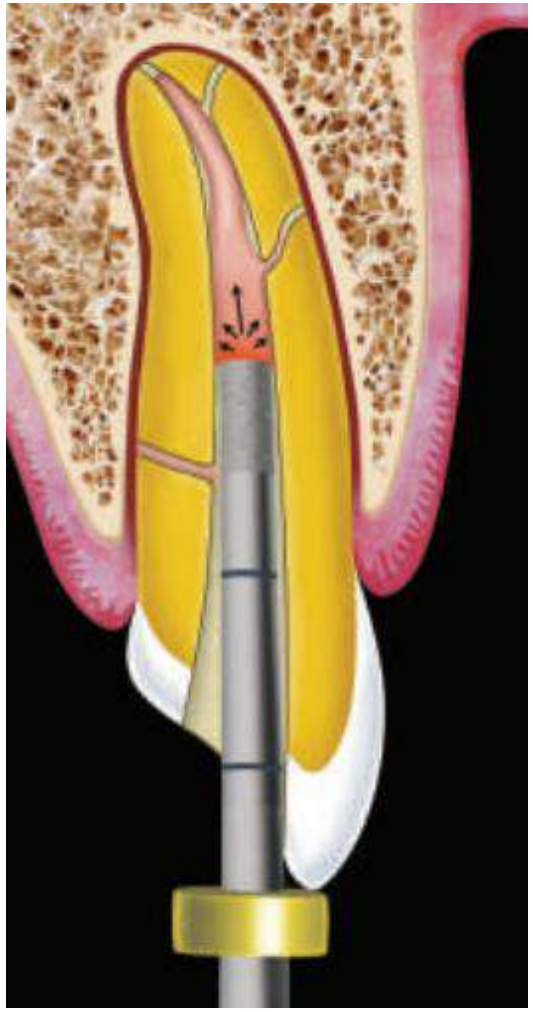

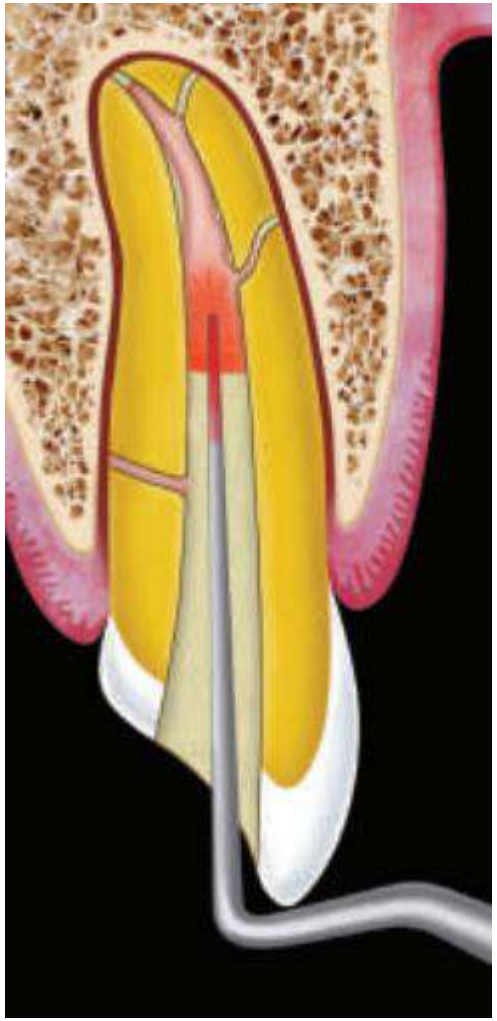

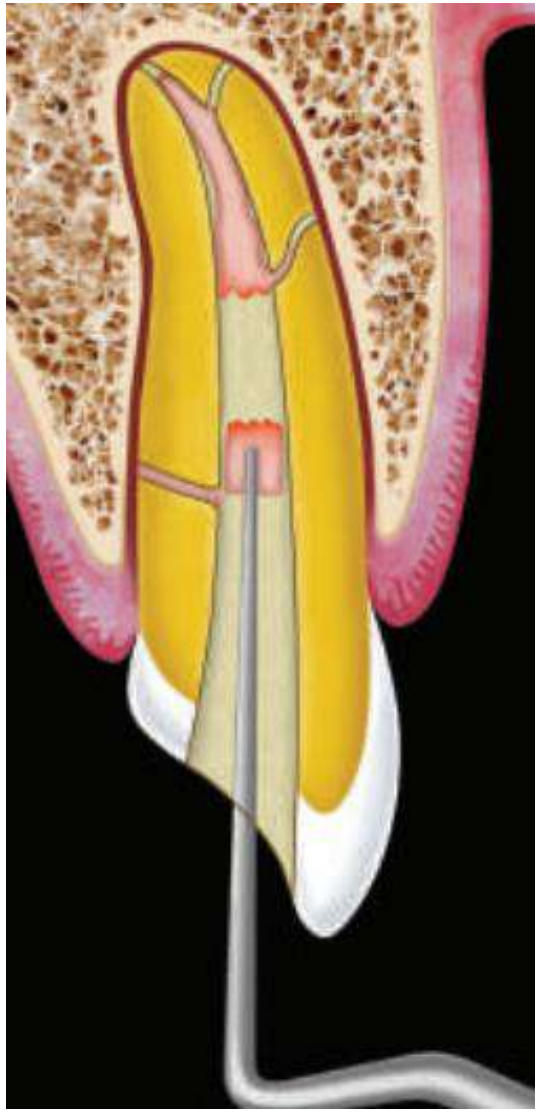

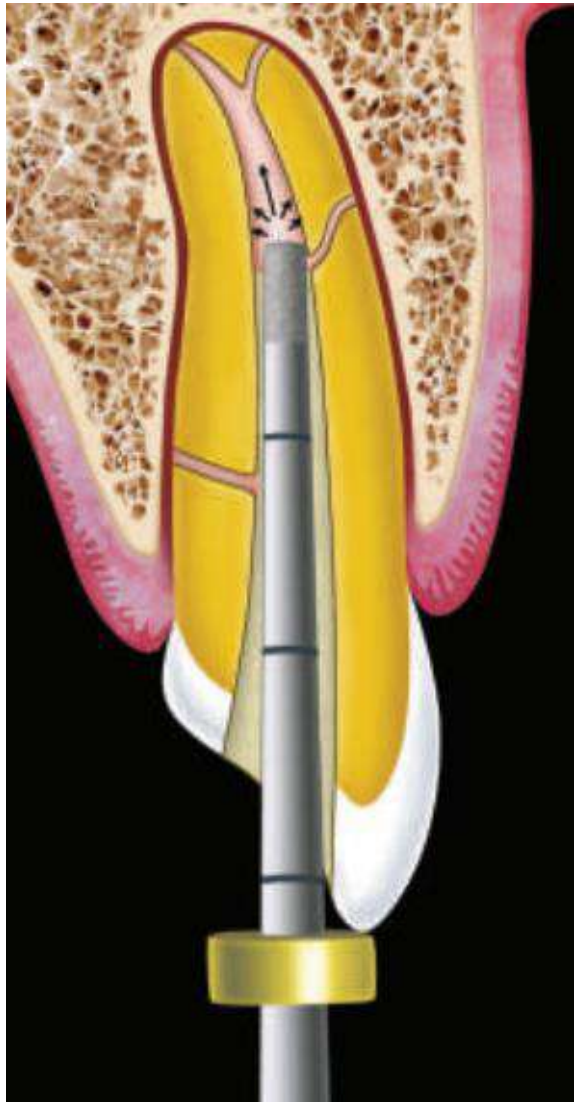

Backpacking the remainder of the canal completes the obturation

- The classic method of backpacking:

Place 5 mm precut segments of gutta-percha in the canal

↓

Cold welding them with the appropriate plugger to the apical material (Figure O)

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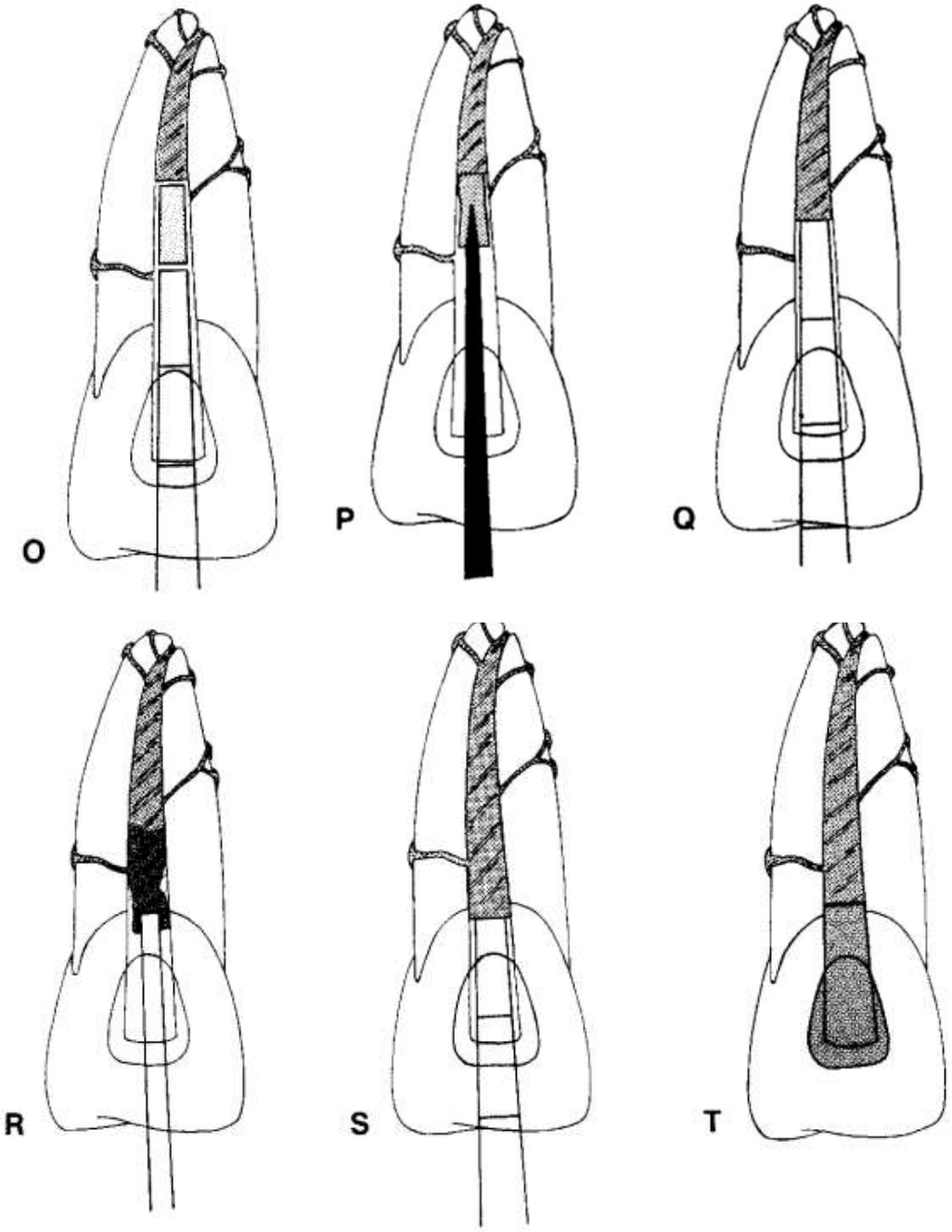
Warming with the heat-carrier (Figure P), and then compacting

- This sectional procedure is continued with heat and the next wider plugger until the entire canal is obturated



Continuous Wave Compaction Technique/System B

- Introduced by Buchanan in 1996
- A variation of warm vertical compaction
- Employs the System B connected to 0.04, 0.06, 0.08, 0.10, or 0.12 tapered stainless steel dead-soft pluggers
- Recommended temperature setting for the System B unit is 200°C

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Downpack Technique

An appropriate size guttapercha cone is checked (confirmed radiographically)

Cone removed and corresponding plugger tried for size in the canal

The stop attachment adjusted at coronal reference point

lPlugger removed and attached to Heat Source

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The canal is dried

The Master GP point coated with sealer and pushed into place till the apical stop

The Heat Source activated; temperature set for 200˚C

Cone seared at orifice with preheated plugger tip

Preheated plugger tip driven smoothly through gutta-percha to within 3 to 4 mm of its binding point in the canal

Maintaining apical pressure, the plugger continued to move apically – at this time the heat switch is released

The plugger is held there, cold, under sustained pressure, for additional 10 seconds

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During this period the gutta-percha flows to the apical matrix and into accessory canals

The pressure also compensates for the shrinkage that might occur as the mass cools

To remove the plugger: while still maintaining apical pressure, the heat switch is activated for only 1 second followed by a 1-second pause

The “cold” plugger is then quickly withdrawn

Radiographic confirmation

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Backfill Technique

Same size gutta-percha cone and plugger used

↓

Cone is coated with sealer and positioned in the backfill space in the canal

↓

The System B temperature is set at 100˚C

↓

Preheat the plugger out of the canal for only 1/4 second

↓

The heat is cut

↓

Plugger placed into the backfill cone immediately

↓

Hold in place for 3 to 5 seconds as the gutta-percha cools

↓

Another cone is added in the backfill space and heat is applied again

Sectional Compaction Technique

- Earliest modification of the vertical compaction method
- Described by Webster in 1911
- Use of small warmed pieces of gutta-percha
- Widely promoted by Coolidge, Blayney, and Lundquist – of Chicago
- Eventually came to be known as the ‘Chicago technique’

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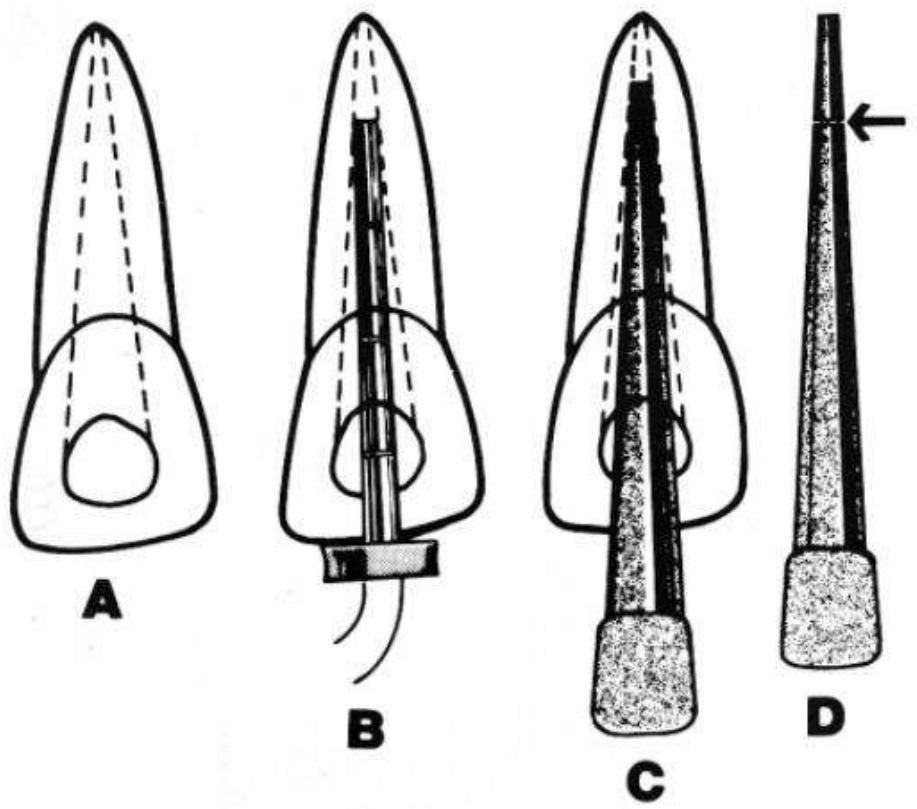
Method:

- Plugger should fit loosely and extend to within 3 mm of the working length
- Length marked, silicone stop set
- Master gutta-percha point should fit within 1 mm of the working length and confirmed radiographically
- 3 mm tip of the point cleanly excised with a scalpel



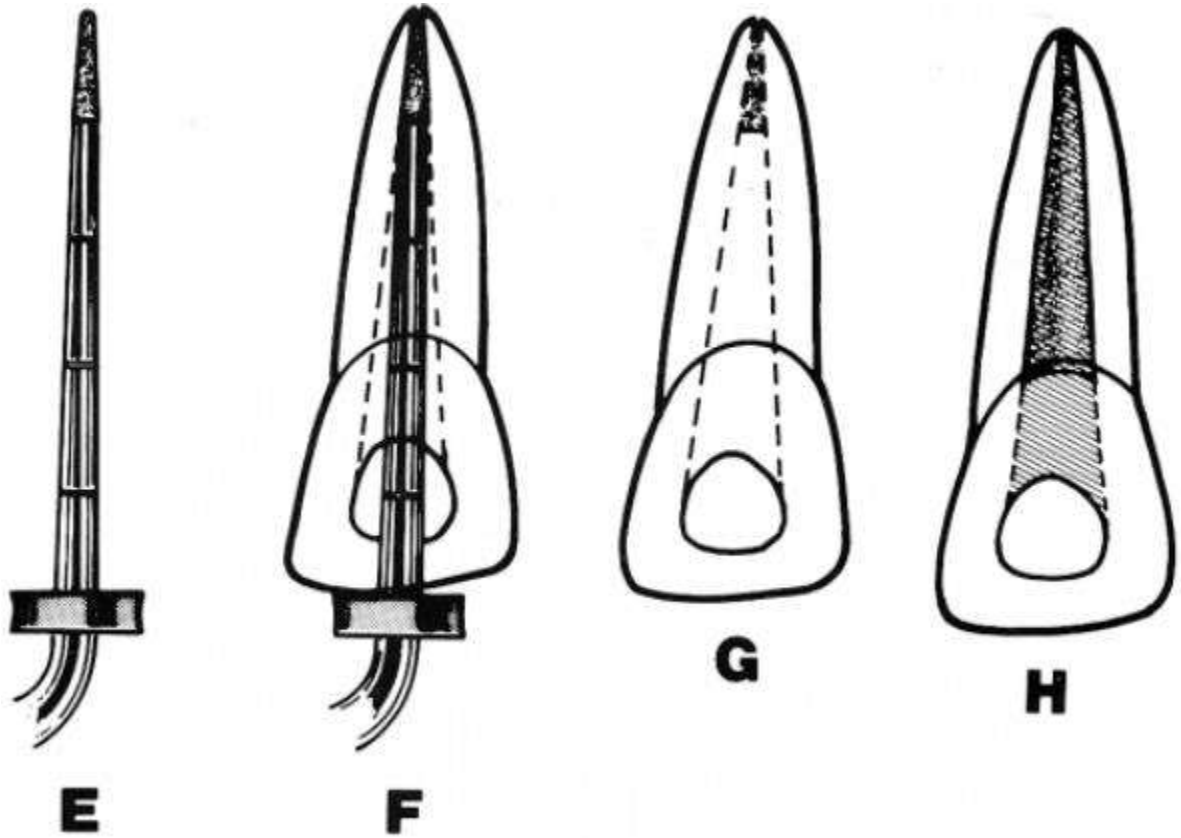
This small piece is luted to the end of the warmed plugger

Sealer is applied

Gutta-percha tip warmed by passing through flame and placed in the canal

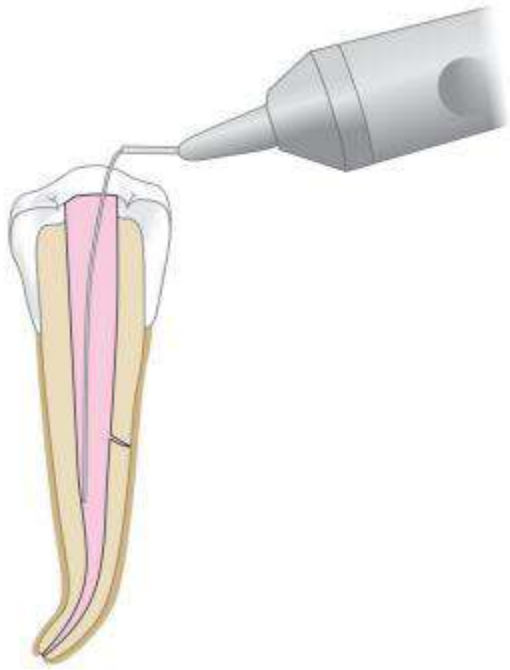
Plugger rotated under apical pressure, to separate the gutta-percha and it is thoroughly packed in place

Remainder of the canal is filled similarly compacting additional pieces of warmed gutta-percha



Lateral/Vertical Compaction Technique

- Combines ease and speed of lateral compaction and; superior density gained by vertical compaction of warm gutta-percha



- Martin, 1987 developed Endotec II (Medidenta Inc; Woodside, N.Y.)

- Battery-powered, heat-controlled spreader/plugger that ensures complete thermo-softening of gutta-percha

- Quick-change, heated tips, equivalent to a No. 30 instrument, are autoclavable, and may be adjusted to any access angulation

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Master GP is fitted to full working length

↓

Hand spreader and the Endotec plugger/spreader are fitted as well

↓

Silicone stops placed to mark the length of canal

↓

Drying of the canal

↓

Sealer is applied

↓

Master GP firmly positioned and gently adapted with a hand or finger spreader

↓

One or two additional GP points placed to reduce the possibility of loosening the point when tip is retracted

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Endotec plugger is placed in the canal to marked depth → Device activated

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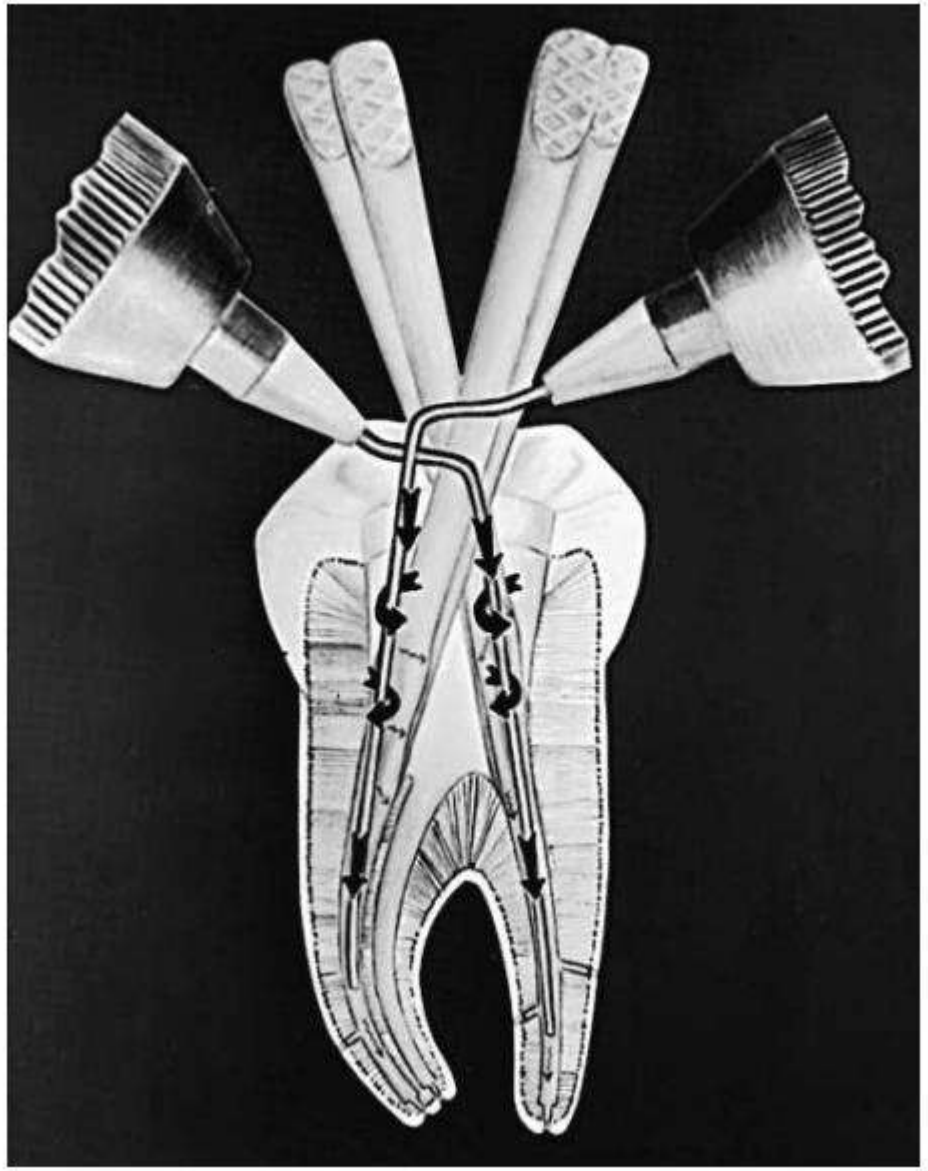
Heating plugger is moved in a clockwise motion for 15 secs → Heating stopped; plugger cools immediately

↓

Removed from the gutta-percha with a counterclockwise motion



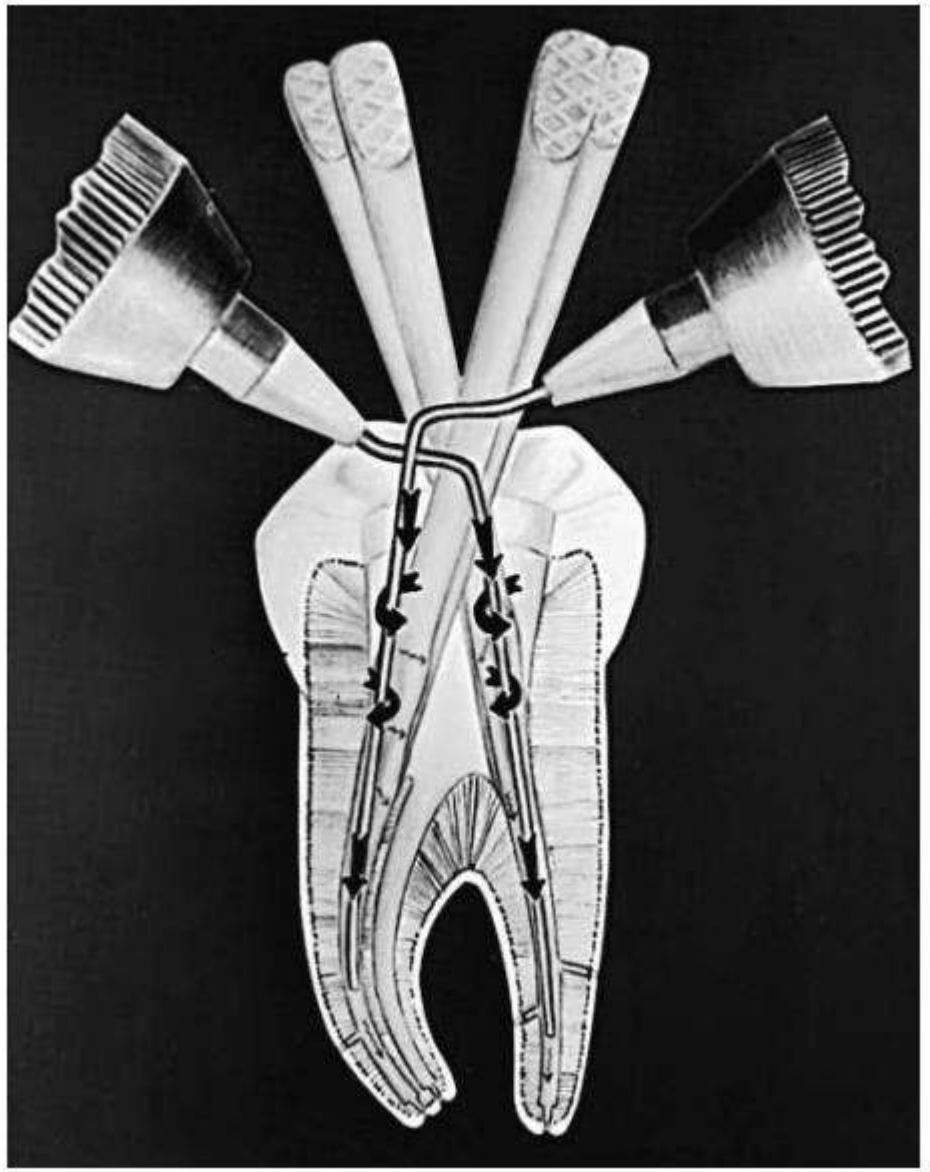
This lateral compaction forms a space for an additional point

Plugger is placed again, heated, moved clockwise for 10 to 15 seconds, cooled, and retracted counterclockwise

Plugger can now be used to cold compact the softened gutta-percha

Followed again by warming and lateral space preparation for additional points

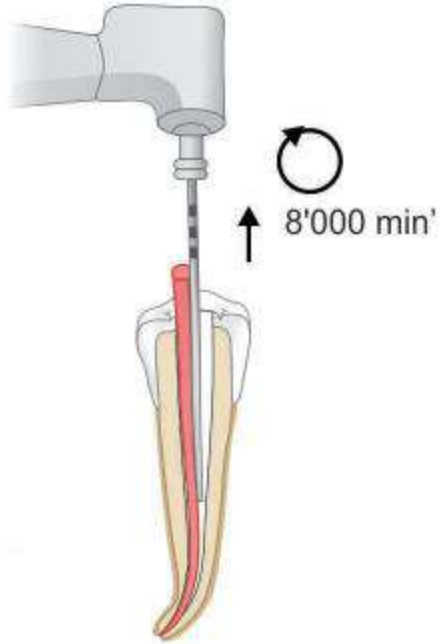
Finally, a cold hand plugger can be used to firmly condense the fused gutta-percha bolus



Lateral compaction with the heated plugger to provide space for additional gutta-percha, and the vertical compaction with the cooled plugger to condense the heat-softened gutta-percha

Thermomechanical Compaction

- Introduced by McSpadden in 1979
- Initially called the McSpadden Compactor
- Device resembled a reverse Hedstroem file, or a reverse screw design
- Fit into a latch-type handpiece
- Spun in the canal at speeds between 8,000 and 20,000 rpm



- Heat generated by friction softened the gutta-percha and the design of the blades forced the material apically

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GROSSMAN'S ENDODONTIC PRACTICE – 13TH EDITION
NISHA GARG TEXTBOOK OF ENDODONTICS – 4TH EDITION

Disadvantages:

1. Fragility and fracture of the instruments
2. Overfilling because of the difficulty in mastering the technique

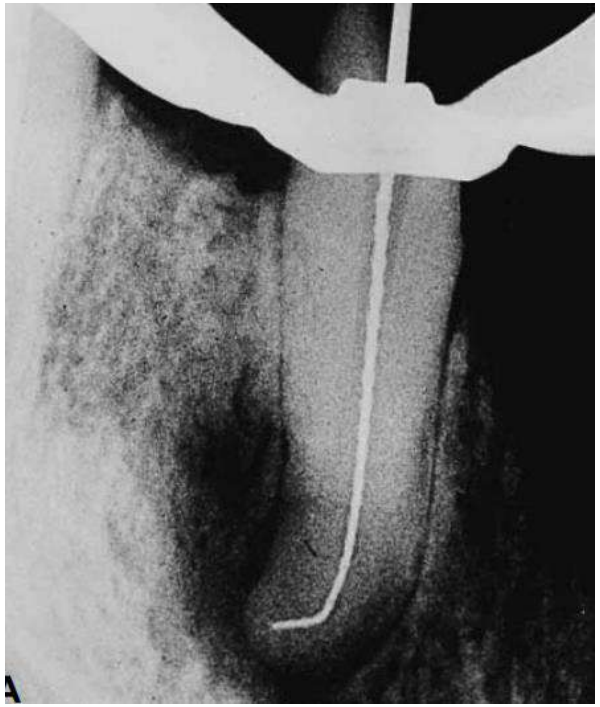
- In Europe, Maillefer modified the Hedstroem-type instrument as the Gutta-Condenser, and Zipperer (Germany) called its modification the Engine Plugger
- McSpadden, in the meantime, modified his original patent and brought out a newer, gentler, slower-speed model
- Now supplied as an engine-driven instrument made of nickel titanium and presented as part of the Microseal System (Analytic/ Quantec, USA)
- Because of their flexibility, the NiTi condensers may be used in curved canals

Micro-Seal Gutta-percha Condenser is operated at slow speed. The reverse-screw action compacts plasticized gutta-percha apically and laterally.

Microseal System

- Microseal Condenser used in conjunction with heat-softened, alpha phase gutta-percha as well as regular gutta-percha points
- Master gutta-percha point, placed in the canal
- Appropriate size condenser coated with the heat-softened gutta-percha placed in the canal
- Condenser spun in the canal at 1,000 to 4,000 rpm
- This “flings” the gutta-percha laterally and vertically
- Allowed to cool and harden to form an apical plug against which the remaining canal is obturated

Loading plasticized Phase II gutta-percha onto Micro-Seal Condenser already coated with Phase I gutta-percha.



Remarkable flexibility of nickel-titanium condenser allows careful rotation in curved canals at very slow speed

MODIFIED THERMOMECHANICAL TECHNIQUE (HYBRID TECHNIQUE)

- Hybrid technique by Tagger et al.
- Gutta-Condensor (Maillefer) and Engine Plugger (Zipperer) used in this technique

Master GP point coated with sealer, placed in the canal

Spread aside with a finger spreader followed by an accessory point

Engine Plugger, size 45 or 50, placed 4 or 5 mm into the canal and rotate it at 15,000 rpm

After 1 second, it is advanced into the canal until resistance is met and then slowly backed out while still rotating

Only 2 or 3 seconds are involved to completely fill the canal

THERMOMECHANICAL SOLID-CORE GUTTA-PERCHA OBTURATION

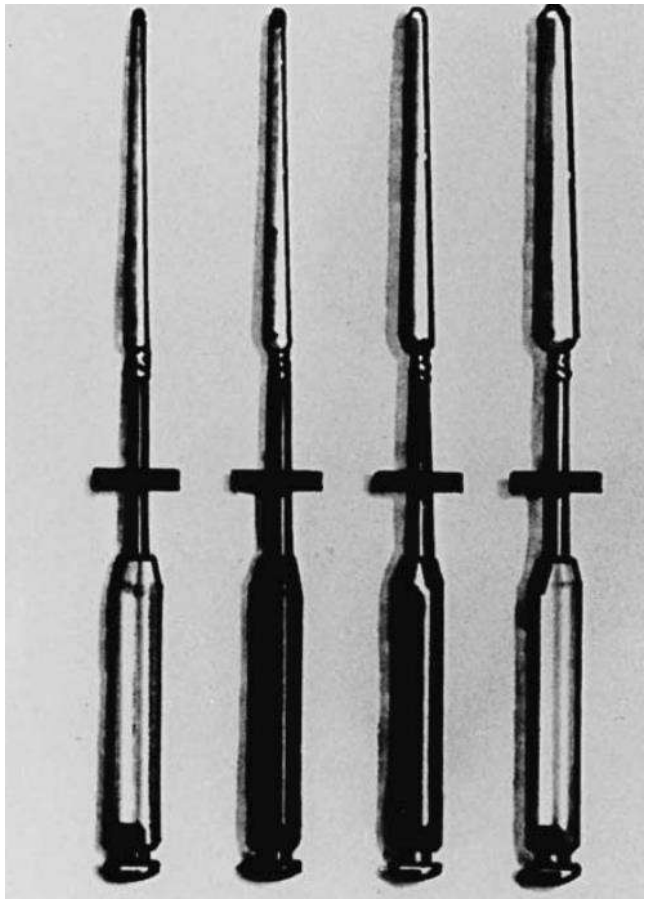
- Other innovation using the thermo-mechanical principle introduced as the J.S. Quick-Fill (J.S. Dental Co., Sweden/USA)
- Consists of titanium core devices in ISO sizes 15 to 60
- Resemble latch-type endodontic drills, coated with alpha-phase gutta-percha

Fit checked in prepared root canal

Sealer applied

Spun in the canal with at low-speed, in latch-type handpiece

Friction heat plasticizes the gutta-percha and it is compacted by the design of the Quick-Fill core



J.S. Quick-Fill titanium carriers

ULTRASONIC PLASTICIZING

First suggested by Moreno from Mexico

Used a Cavitron ultrasonic scaler (Dentsply/Caulk; Milford, Dela.) with a PR30 insert

Design: limits use only in the anterior teeth

Moreno placed gutta-percha points to virtually fill the canal

Ultrasonic tip inserted and activated without the liquid coolant

Gutta-percha plasticized by friction

Final vertical compaction could be done with hand or finger pluggers

Thermoplasticized Gutta-percha Injection

- Introduced by Yee, Torabinejad, and Marlin et. al.
- Device, introduced to the profession in 1977
- Gun shape device with cartridges containing small gutta-percha cylinders heated to a controlled temperature
- Exerting pressure on the “trigger” activates a piston that presses the gutta-percha toward the tip
- The gutta-percha is then conveyed through a thin needle

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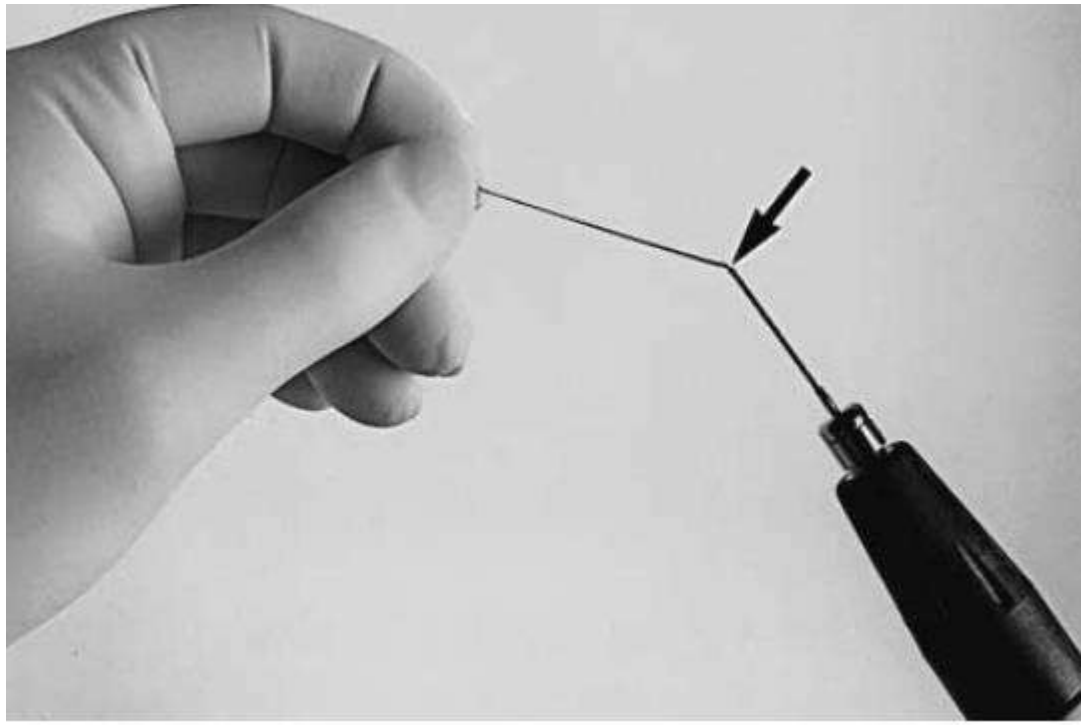
Obtura II Heated Gutta-Percha Syringe insertion System

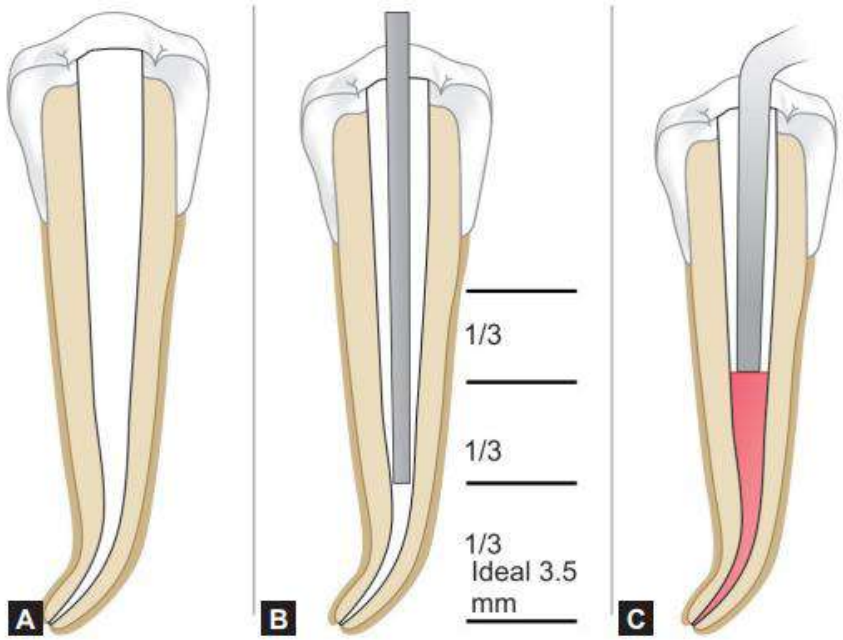
- Digitally controlled temperatures ranging from 160˚C to 200˚C
- Size has been reduced to either 20 gauge (equal to a size 60 file) or 23 gauge (equal to a size 40 file)



Warm plasticized gutta-percha stream extruded through needle tip (arrow) of Obtura II.

Method of use

- The injection needle and pluggers are tried for size in the canal
- Reach within 3.5 to 5 mm of the terminus and fit loosely at that point
- Placement of sealer
- Followed by insertion of Obtura needle, and deposition of gutta-percha
- Once gutta percha is deposited, premeasured plugger is used to move the gutta-percha apically and laterally



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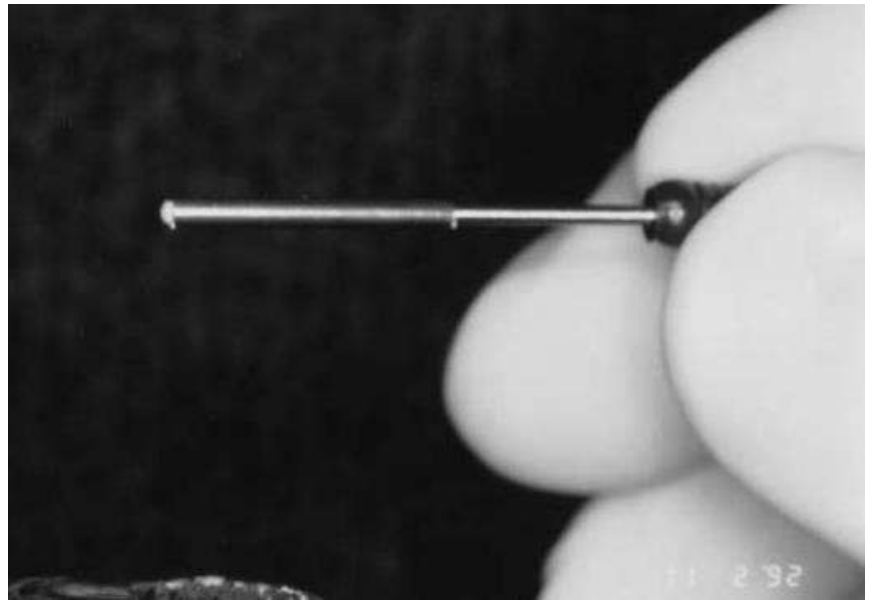
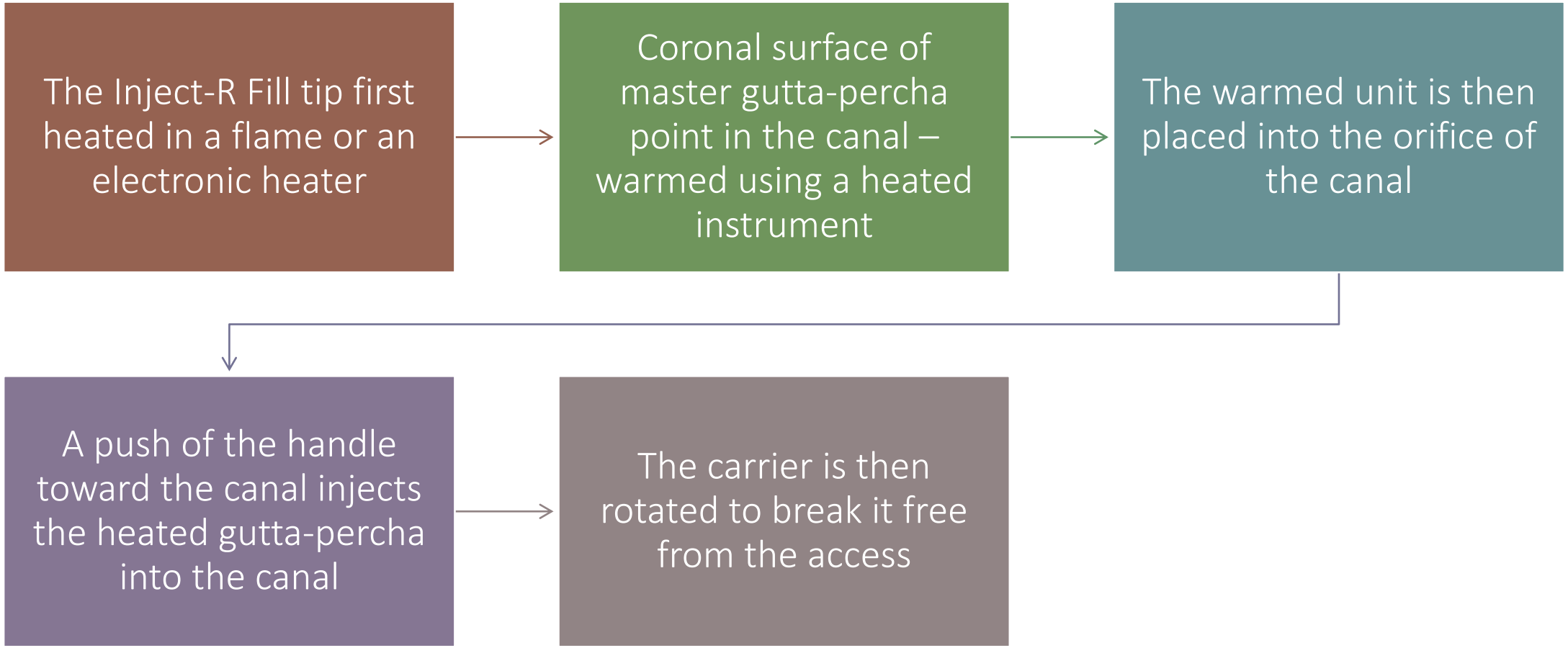
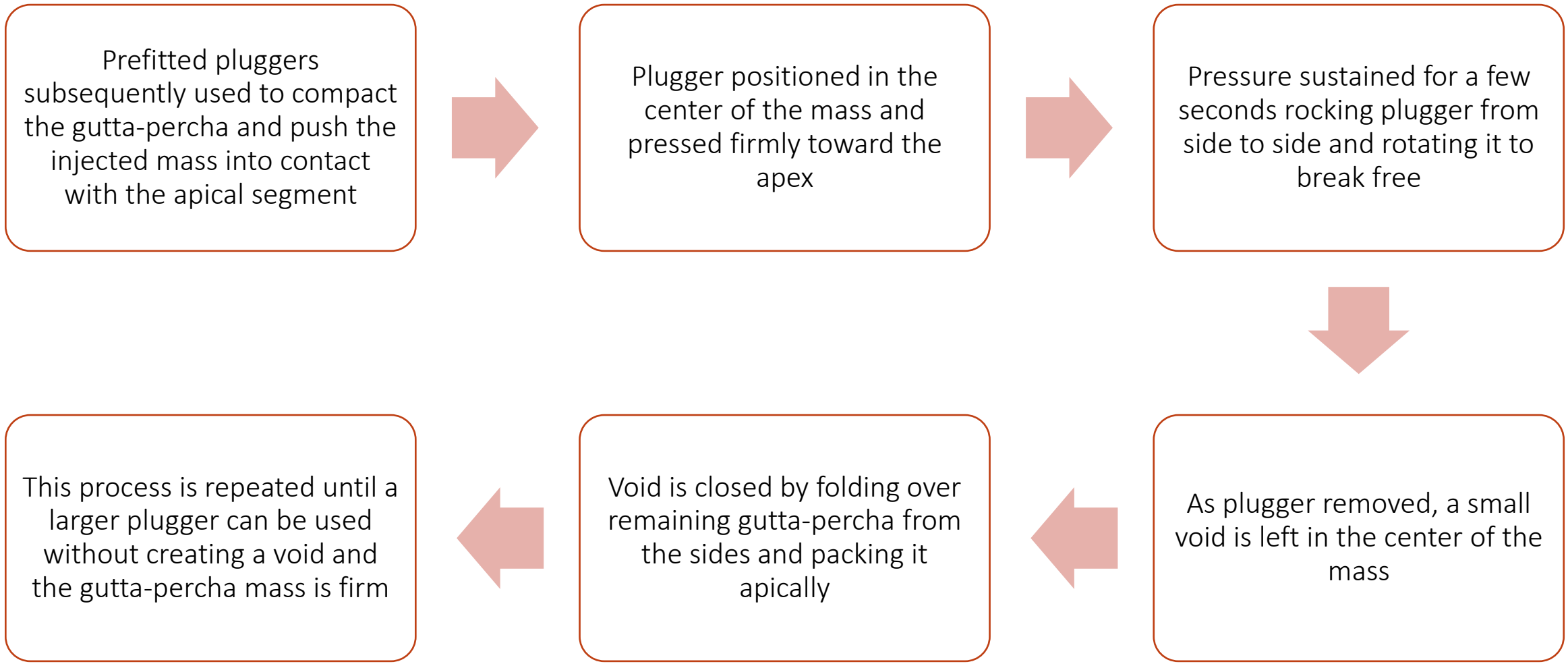
Inject-R Fill–Backfilling Technique

- Developed by Roane at University of Oklahoma and marketed as Inject-R Fill (Moyco-Union Broach, N.Y.)
- Miniature-sized metal tube containing conventional gutta-percha and plunger
- Technique allows for delivery of a single backfill injection of gutta-percha once the apical segment of a canal has been obturated

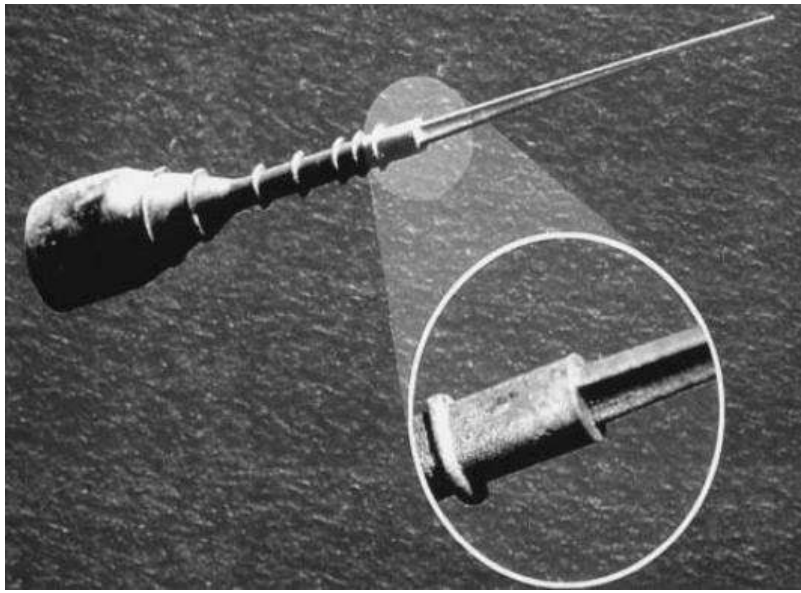



The Inject-R Fill tip first heated in a flame or an electronic heater
Coronal surface of master gutta-percha point in the canal – warmed using a heated instrument
The warmed unit is then placed into the orifice of the canal
A push of the handle toward the canal injects the heated gutta-percha into the canal
The carrier is then rotated to break it free from the access


Prefitted pluggers subsequently used to compact the gutta-percha and push the injected mass into contact with the apical segment
Plugger positioned in the center of the mass and pressed firmly toward the apex
Pressure sustained for a few seconds rocking plugger from side to side and rotating it to break free
As plugger removed, a small void is left in the center of the mass
Void is closed by folding over remaining gutta-percha from the sides and packing it apically
This process is repeated until a larger plugger can be used without creating a void and the gutta-percha mass is firm

SOLID-CORE CARRIER: MANUAL INSERTION

- Descried by Johnson in 1978
- Canal obturated with thermoplasticized alpha-phase gutta-percha carried on an endodontic file
- ThermaFil (Dentsply/Tulsa) is considered the major core-carrier technique
- Soft-Core (Soft-Core System, Inc.), and its European version, Three Dee GP (Deproco UK Ltd.)
- Traditionally the carriers made from stainless steel and titanium
- Now only manufactured from plastic that is grooved along 60 degrees of their circumference

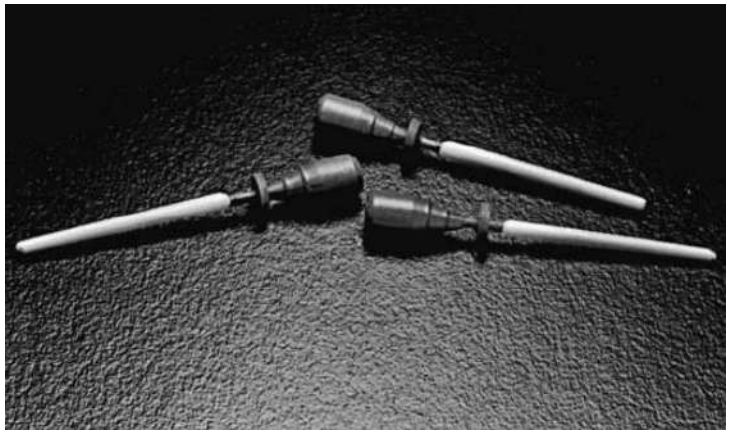


TOMSON RM, POLYCARPOU N, TOMSON PL. CONTEMPORARY OBTURATION OF THE ROOT CANAL SYSTEM. BRITISH DENTAL JOURNAL. 2014 MAR 21;216(6):315-22.
INGLE'S TEXTBOOK OF ENDODONTICS – 5TH EDITION

- ThermaFil consists of a flexible central carrier, sized and tapered to match (.04/.06) endodontic files

- Central carrier uniformly coated with a layer of refined and tested alpha-phase gutta-percha

- ThermaFil system comes with **metallic size verifiers** used to determine, the size and shape of the prepared canal prior to choosing the correct ThermaFil carrier



Thermafil Obturators—alpha-phase gutta-percha mounted on radiopaque, flexible, plastic carriers

TOMSON RM, POLYCARPOU N, TOMSON PL. CONTEMPORARY OBTURATION OF THE ROOT CANAL SYSTEM. BRITISH DENTAL JOURNAL. 2014 MAR 21;216(6):315-22.
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- Plastic core carriers are heated in a controlled oven environment called the ThermaPrep Plus heating system (Dentsply/Tulsa)
- The heating time is dependent on the size of the core carrier
- Canal dried
- Sealer is applied
- Warmed obturator removed from ThermaPrep Plus heater and carried slowly to full working length in the canal

TOMSON RM, POLYCARPOU N, TOMSON PL. CONTEMPORARY OBTURATION OF THE ROOT CANAL SYSTEM. BRITISH DENTAL JOURNAL. 2014 MAR 21;216(6):315-22.
INGLE'S TEXTBOOK OF ENDODONTICS – 5TH EDITION
COHEN'S PATHWAYS OF PULP – 11TH EDITION

- The carrier is not twisted during placement

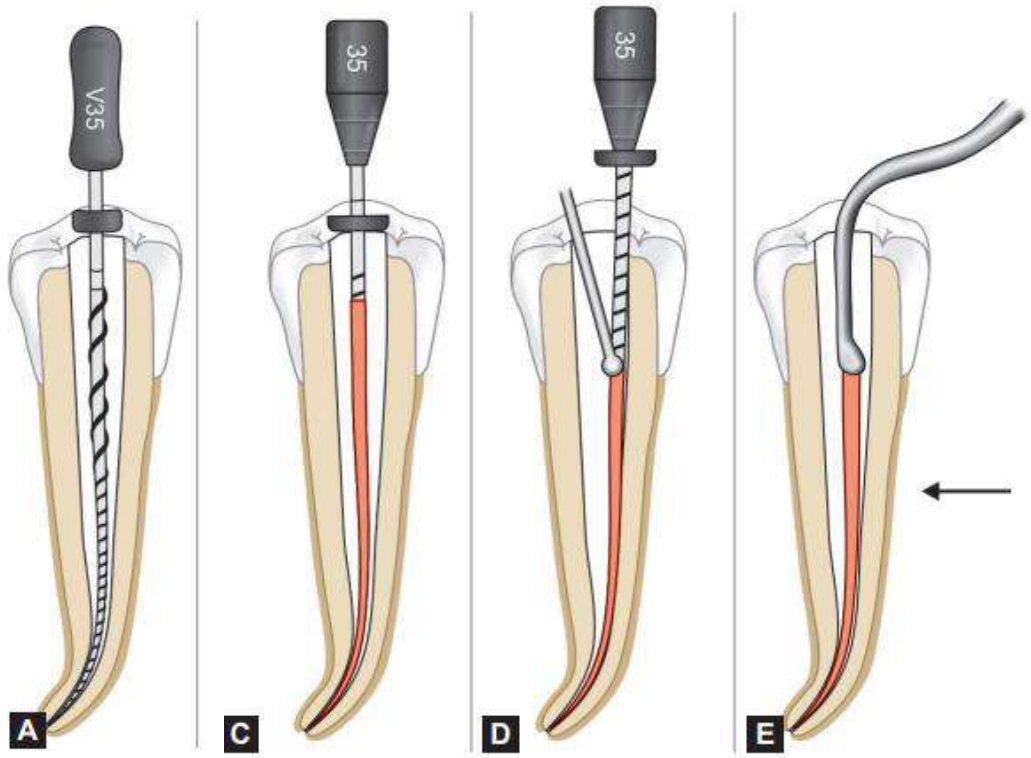
- Attempts to reposition the carrier should be avoided to prevent disruption of the gutta-percha

- Once it is ensured radiographically that the canal has been filled to the desired position, the shaft is severed in the coronal cavity

- Inverted cone bur is used to trim off the shaft 2 mm above the coronal orifice

- Specific burs have also been developed for this task: Prepi Bur (Prepost Preparation Instrument) (Dentsply/Tulsa; Tulsa, Okla.)

- Prepi Bur, a noncutting metal ball, is run in a handpiece



TOMSON RM, POLYCARPOU N, TOMSON PL. CONTEMPORARY OBTURATION OF THE ROOT CANAL SYSTEM. BRITISH DENTAL JOURNAL. 2014 MAR 21;216(6):315-22.
INGLE'S TEXTBOOK OF ENDODONTICS – 5TH EDITION

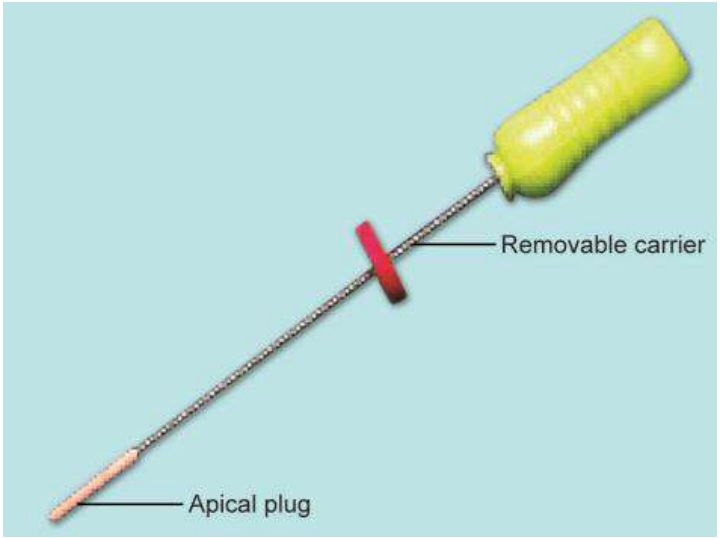
APICAL THIRD FILLING

SIMPLIFILL OBTURATION TECHNIQUE

- Two-phased obturation method
- Stainless steel carrier used to place and compact 5 mm segment of gutta-percha into the apical portion of a canal
- Second phase uses a specially designed syringe to backfill the remainder of the canal with accessory cones of gutta-percha

- Advantages

1. Conserves dentin because of the Lightspeed instrumentation technique (less flaring)
2. Eliminates additional internal forces since no spreader or plugger is used to compact the apical plug
3. Simple to master
4. No carrier is left in the canal.



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INGLE'S TEXTBOOK OF ENDODONTICS – 5TH EDITION

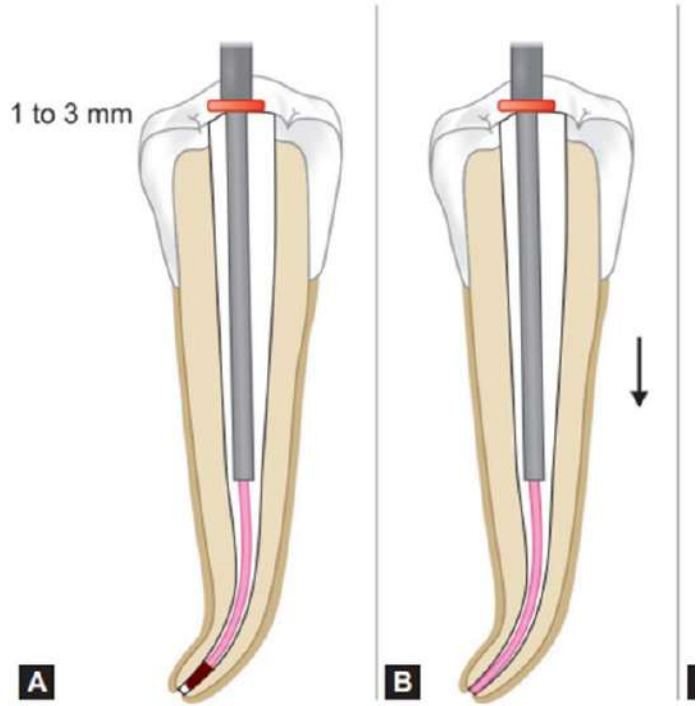
- Specially designed Apical GP Plug Carrier corresponding to the Master Apical Rotary is trial fitted without sealer into the dry canal

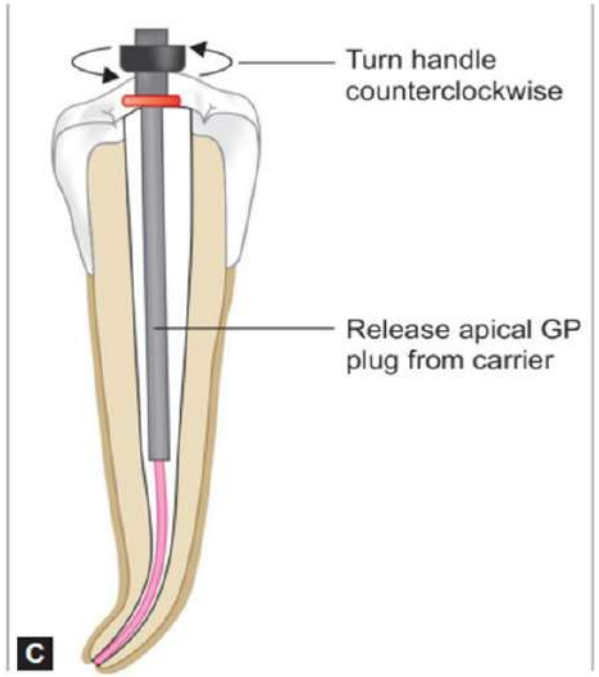
- Rubber stopper on the carrier, is set 2 mm short of WL

- The carrier inserted into the canal and slowly advanced, till the length indicated by the rubber stop

- Fit verified, Sealer Applied

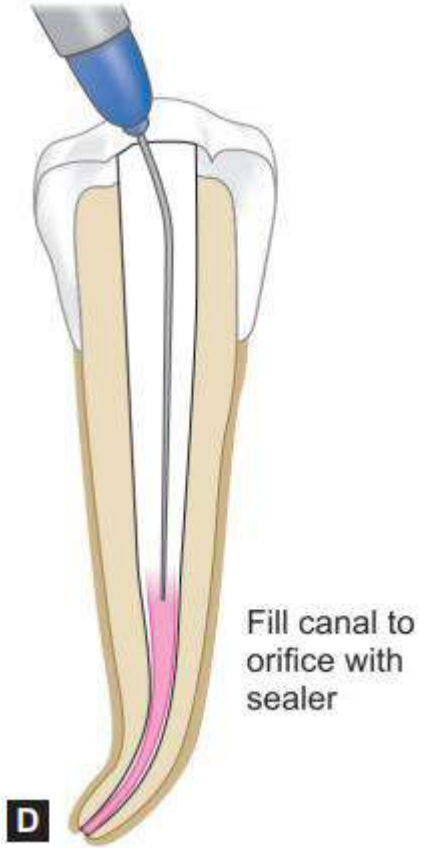
- GP Plug coated with sealer, inserted in the canal, and advanced until resistance is felt, about 2 mm short of the working length
- GP Plug is now vertically compacted to the working length with firm apical pressure using carrier
- The carrier must not be rotated during insertion or compaction
- Once the GP Plug is snugly fit, the GP Plug is released by rotating the carrier handle counterclockwise
- During this rotation, the carrier must not be pushed or pulled





COHEN'S PATHWAYS OF PULP – 11TH EDITION
INGLE'S TEXTBOOK OF ENDODONTICS – 5TH EDITION
NISHA GARG TEXTBOOK OF ENDODONTICS – 4TH EDITION

- Phase two consists of backfilling the remaining canal
- SimpliFill syringe loaded with a sealer
- Sealer injected into the canal space
- Gutta-percha cone, equivalent in size to the Apical GP Plug – coated with sealer and placed into the sealer-filled canal until it contacts the GP Plug
- Accessory gutta-percha cones can be added as space filler



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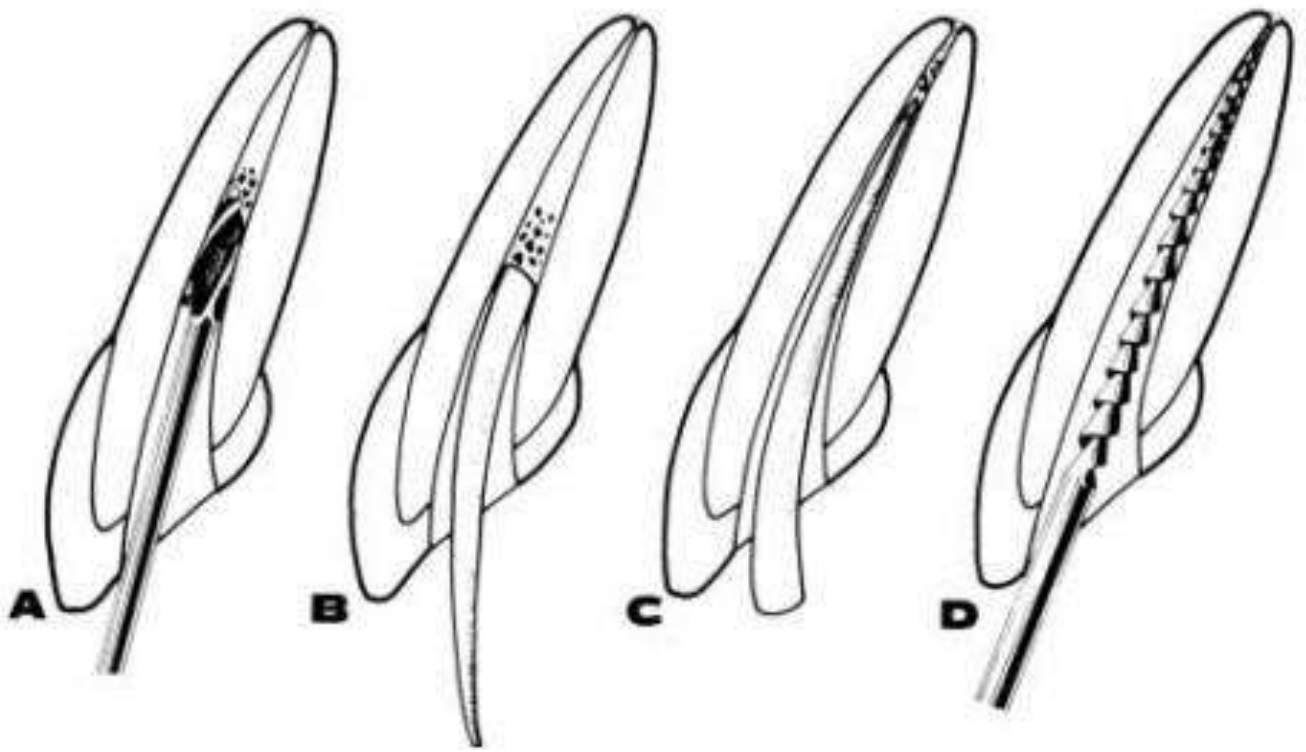
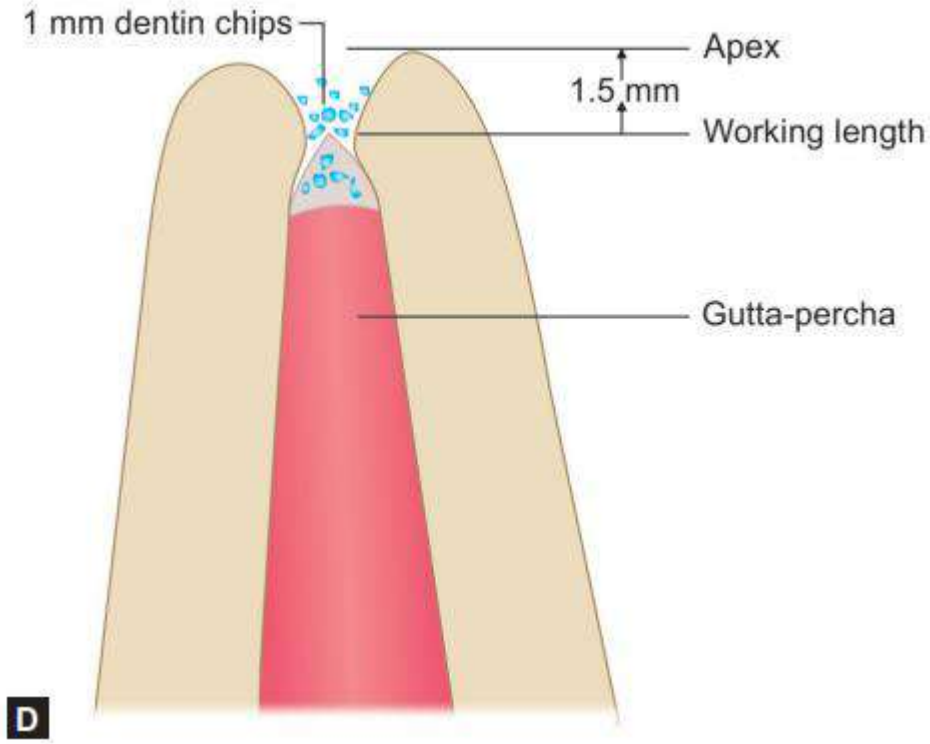
Dentin chip filling

- Occurs inadvertently
- Forms a plug, against which other materials are compacted
- To do this deliberately constitutes the “new technique,” a “biologic seal” rather than a mechanochemical seal
- The premise that dentin filings will stimulate osteo or cementogenesis is well founded





- Completeness of density is tested by resistance to peroration by a No. 15 or 20 file.
- The final gutta-percha obturation is then compacted against the plug (Figure 86).

Author	Studies
Gottlieb and Orban	Noted cementum forming around dentin chips in the PDL
Mayer and Ketterl	Filled 1,300 canals with apical dentin chips and reported 91% success
Waechter and Pritz	Reported “osteocementum” apical closing in 20 human cases
Baume et al.	Described “osteodentin” closings but incomplete calcification across all of their histologic serial sections
▪Dentin chip obturation undoubtedly prevents overfilling	
El Deeb et al.	Found that, “The presence of the apical dentinal plug was significantly effective in confining the irrigating solutions and filling materials to the canal space.”
Oswald et al.	Observed that dentin chips lead to quicker healing, minimal inflammation, and apical cementum deposition, even when the apex is perforated

Calcium Hydroxide Apical Filling

- Cementogenesis stimulated by dentin filings, appears to be replicated by calcium hydroxide as well

Method of Use

- Dry calcium hydroxide powder deposited in the coronal orifice with the help of amalgam carrier
- Bolus forced apically with a premeasured plugger, tapped to place with the last size apical file
- 1 to 2 mm must be well condensed to block the foramen
- Blockage should be tested with a file that is one size smaller
- Serve not only as a stimulant to cemental growth but also as a barrier to extrusion of well-compacted gutta-percha obturation

Premixed Bioceramics for Obturation

The use of bioceramic root canal sealers for obturation of the root canal system: A review

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Kulliyyah Of Dentistry, IIUM Kuantan, Jalan Sultan Ahmad Shah, 25200 Kuantan, Pahang

EndoSequence BC Sealer (Brasseler USA): Premixed ready-to-use injectable bioceramic cement paste

iRoot (Innovative BioCeramix Inc., Vancouver, Canada): is an injectable, ready-to-use, insoluble, radiopaque paste

Bio-C (Angelus)

Premixed bioceramics are developed for permanent root canal filling applications

Can be used to obturate the root canals as well as in conjunction with GP points as sealers

MUSTAFFA M. THE USE OF BIOCERAMIC ROOT CANAL SEALERS FOR OBTURATION OF THE ROOT CANAL SYSTEM: A REVIEW. IIUM JOURNAL OF OROFACIAL AND HEALTH SCIENCES. 2021 FEB 28;2(1):14-25.

- Uses the moisture within the dentinal tubules after canal irrigation to initiate and complete the setting reaction
- Tricalcium Silicate and Dicalcium Silicate in presence of water form Hydrated Calcium Silicate gel + Calcium Hydroxide
- Canals are dried with a single paper point
- Premixed bioceramic is injected into the canal with the syringe applicator
- Setting time may be extended in overly dry canals

MUSTAFFA M. THE USE OF BIOCERAMIC ROOT CANAL SEALERS FOR OBTURATION OF THE ROOT CANAL SYSTEM: A REVIEW. IIUM JOURNAL OF OROFACIAL AND HEALTH SCIENCES. 2021 FEB 28;2(1):14-25.
AL-HADDAD A, CHE AB AZIZ ZA. BIOCERAMIC-BASED ROOT CANAL SEALERS: A REVIEW. INTERNATIONAL JOURNAL OF BIOMATERIALS. 2016 MAY 3;2016.

Conclusion

- With the evolution in the field of endodontics & a better understanding of the root canal system, researchers have attributed failure of root canal therapy largely to incomplete sealing of the root canal system

- The quality of obturation has a great role to play in the success of endodontics

- The so called problems with obturation are actually the problems of instrumentation

- The obturation is in essence an “impression” of what the canal looks like after it has been instrumented

References

- Cohen's Pathways of Pulp – 11th Edition
- Ingle's Textbook of Endodontics – 5th Edition
- Ingle's Textbook of Endodontics – 7th Edition
- Grossman's Endodontic Practice – 13th Edition
- Nisha Garg Textbook of Endodontics – 4th Edition

References

- Tomson RM, Polycarpou N, Tomson PL. Contemporary obturation of the root canal system. British dental journal. 2014 Mar 21;216(6):315-22.

- Mustaffa M. The use of bioceramic root canal sealers for obturation of the root canal system: A review. IIUM Journal of Orofacial and Health Sciences. 2021 Feb 28;2(1):14-25.

- Al-Haddad A, Che Ab Aziz ZA. Bioceramic-based root canal sealers: a review. International journal of biomaterials. 2016 May 3;2016.

Thank You!