Obturation Techniques
Part II
Learning Objectives

- To understand various obturation techniques
- The advantages and disadvantages of various obturation techniques
Contents

- Thermoplasticized technique
- Continuous wave obturation
- Recent advancements in obturation
- Errors in obturation
Thermoplasticized techniques

SYRINGE INSERTION
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  - Inject-R-Fill
- With gun
  - Beta- Phase
    - Obtura
    - Obtura II
  - Alpha- Phase
    - Ultrafil

SOLID-CORE CARRIER INSERTION
- Pre coated carriers
  - Thermafil and Densfil
  - Soft core and Three Dee GP
  - One Step Obturator
- Operator coated
  - Alpha Seal
  - Successfil
  - Lateral Compaction
  - Trifecta
  - Modified Trifecta
Thermoplasticized Gutta Percha

- Gutta-percha may be softened and delivered to the prepared canal using a variety of instruments designed for injection that permits compaction.

- A needle or applicator tip designed to deliver the softened gutta-percha is introduced into the canal to the junction of the middle and apical thirds, with care taken to ensure that the needle does not bind against the canal walls.

- The gutta-percha is passively injected into the root canal system, avoiding apical pressure on the needle.
Thermoplasticized Gutta Percha

- In 5 to 10 seconds, the softened material will fill the apical segment and begin to lift the needle out of the tooth.

- During this lifting by the softened, flowing mass, the middle and coronal portions of the canal are continuously filled until the needle reaches the canal orifice.

Compaction of the material follows to adapt the gutta-percha to the prepared canal walls.
The Continuous Wave of Condensation Obturation Technique

Developed in 1987, the Continuous Wave of Condensation Obturation Technique was born out of Stephen Buchanan’s desire to simplify warm gutta-percha downpacking.

This technique is called the Continuous Wave Technique because it allows a single tapered electric heat plugger to capture a wave of condensation at the orifice of a canal and ride it, without release, to the apical extent of downpacking in a single, continuous movement.

L. STEPHEN BUCHANAN, The continuous wave of condensation Obturation Technique. In Endodontics, Vol 2, A
The Touch n Heat

- An electronic device specially developed for the warm gutta-percha technique

- Battery or AC models are available

- Consist of
  - Control unit
  - Heat Carrier
    - connected to the unit by a cord
    - tips are interchangeable with those of system B

Uses:
- heat carrier
- sear off excess gutta percha
- preparation of post space
- pulp testing tool for a response to heat
The System B

The intention was to make a series of variably-tapered electric heat pluggers that could replace three to five vertical condensation pluggers and a heat carrier with a single instrument.

- Thermostatically controlled
- Electric device that supplies heat.
- It has continuous /touch mode
- Temperature: 200°C
- Period of time - determined by the operator.

L. STEPHEN BUCHANAN, The continuous wave of condensation Obturation Technique. In Endodontics, Vol 2, A
Handpiece

- Holds the tips
- Connected to the heat source by a cord
- Has a ring switch which is pressed to activate the handpiece.
Pluggers /Tips

- Available in standardized sizes as well as non standardized sizes
- Medium system B tip 0.06 taper
- Medium /fine system B tip 0.04 taper

L. STEPHEN BUCHANAN, The continuous wave of condensation Obturation Technique. In Endodontics, Vol 2, A
Steps in the continuous wave technique

I. Cone-fitting
II. Plugger-fitting
III. Downpacking
IV. Backfilling

L. STEPHEN BUCHANAN, The continuous wave of condensation Obturation Technique. In Endodontics, Vol 2, A
Steps in the continuous wave technique

1. Selecting Plugger matching with taper of Master cone
2. Setting the stopper 4 mm short of length.
3. Sear off the cone at the orifice.
4. Plugger is pressed against the gutta percha at the CEJ level and is switched on, causing the plugger to immediately move into the canal 2-3 mm short of the plugger's binding point.
5. Release the switch but maintain apical pressure on the cooling electric heat plugger as it glides to a halt 1 mm from that binding point.
6. Seat the master cone, 0.5 to 1 mm short of length.
Steps in the continuous wave technique

After holding a sustained apical condensation force for five seconds, switch on the heat for at least one full second, pause for one second, and retrieve the plugger with surplus gutta-percha attached.

As soon as that canal space is filled, the needle will be felt to “bump back”.

It will take about five to ten seconds to backfill to the CEJ or orifice level.

The stainless steel end of the CW Hand PI is used to firmly condense the gutta percha a level.
Advantages:

- Clinician can control the amount of heat in the heat carrier by use of thermostat.
- Heat once activated is constant and is concentrated at the tip.
- Hence can soften gutta percha and apply vertical pressure in one continuous motion (continuous wave of condensation).
- Faster than traditional warm vertical compaction.
- Temperature at the tip of heat carrier plugger is monitored.
Disadvantages:

- Potential for extrusion.
- Potential for thermal damage to periodontal ligament and supporting alveolar bone.
Recent Advances
Syringe Injection Techniques

Jay Marlin - Injection Molding Device

- a) an injection molding syringe
- b) electrical control unit

- The injection molding syringe consisted of
  - needle (18, 20 and 25 gauge)
  - heating element
  - barrel
  - Plunger

- The syringe was fully insulated

- Conventional gutta percha cones were used to load the syringe.
This was later patented and made commercially available as Obtura (Unitek Corp U.S)
It consisted of

- Obtura gun
- Control unit

Obtura gun: Also called “gutta gun”

- It used a pistol grip syringe
- It used silver needles which were more flexible and retained heat to keep the gutta percha soft.
- It used pellets of gutta percha which were loaded in a chamber of the obtura gun.
This was later modified and commercialized as Obtura II (Texceed Corp. U.S.)
**Obtura (Unitek Corp.U.S)**

- Warmed at 160° C
- No digital display
- Needle size-18 gauge
- Uses gutta percha pellets

**Obtura II (Texceed Corp U.S)**

- Digitally controlled temperature 160°-200° C
- Digital display of temperature reading
- Disposable silver needles reduced to
  - 20 gauge (approximately equivalent to 60 size file)
  - 23 gauge (approximately equivalent to 40 size file)
  - 25 gauge
- Availability of gutta percha pellets that can flow at lower temperature.
Temperature:

- 160°C - 200°C

- Depends on the gauge of the needle (smaller the gauge of the needle higher the temperature needed)

- Extruded gutta percha has temperature of 62 °C - 65 °C and remains soft for 3 min.
The Ultrafil 3D system consists of an injection syringe, gutta-percha cannulas, and heating unit.

- Cannules are:
  - Prefilled with gutta percha
  - Has attached needles of 22 gauge (0.7 mm diameter)
  - Disposable
  - One Cannula contains enough gutta percha to fill at least one molar.
  - Available in 3 colours
Calamus (DENTSPLY, Tulsa Dental Specialties, Tulsa, OK)
Elements obturation unit (SybronEndo, Orange, CA)

- The Elements obturation unit consists of a System B heat source and plugger as well as a handpiece extruder for delivering thermoplastic gutta-percha or RealSeal from a disposable cartridge.

- The cartridges come with 20-, 23-, and 25-gauge needles for gutta-percha and 20- and 23-gauges for RealSeal.
The HotShot delivery system (Discus Dental, Culver City, CA)

It is a cordless thermoplastic device that has a heating range from 150°C to 230°C.

The unit is cordless and can be used with either gutta-percha or Resilon.

Needles are available in 20, 23, and 25 gauges.
Core carrier Gutta percha techniques
Principle

- Gutta-percha that has been previously coated on a metallic or plastic core (carrier), corresponding to standardized instrument sizes, is heated in a preset system or oven.

- After proper softening in a standardized heating oven, the coated gutta-percha core is placed to the working length, with the harder central core used as a compactor to carry the softened material apically and laterally.

- Once complete, the core is cut off with a bur at the orifice
Problem solving in endodontics. J.
Thermafil

- Commercialized in the beginning of the 90’s, the first Thermafil obturators were similar to steel K files with the file covered in a uniform layer of gutta-percha.

- This was then heated in the blue part of the bunsen burner flame (the coldest part)

- Placed in a canal already filled with sealer and sectioned at the level of the pulp floor.

Problem solving in endodontics. J.
Thermafil

- The Thermafil obturator consists of two parts, the carrier and the gutta-percha.
- The carrier is similar to a manual endodontic instrument without the blades, made from a special radio-opaque plastic.
- It is distinguished by a coloured grip and a 25 mm extension with a groove along its length which has two functions:
  - to increase the flexibility of the carrier while reducing its mass
  - facilitate retreatment by creating a space between the carrier and canal walls.

GIUSEPPE CANTATORE, W. BEN JOHNSON, The Thermafil system. In Endodontics vol 2 , Arnaldo Castelucci
The Thermafil obturators are available in two different versions based on the characteristics of diameter and taper:

– Classic Obturators, are available in 17 sizes with the tip diameter from 0.20 to 1.40 mm with taper between 4 and 5%.

– GT Thermafil Obturators were introduced by Buchanan to complement the GT Endodontic files. The GT Thermafil corresponds exactly to the GT rotary files with the only exception that the carrier taper is slightly less than that of the GT file.
Thermafil

- The Thermaprep oven enables one to thermoplasticize two Thermafil obturators in a few seconds.

- Once the obturators have been removed from the oven, one has to check that the gutta-percha appears swollen, shiny and sticky.
Thermafil

- The Therma Cut are steel burs for use with a high speed handpiece and are used to section the obturator after insertion in the canal.

- Available in 4 diameters, 25 mm long, they are tapered fissure burs with a perfectly smooth spherical and non cutting tip.

- Used dry and in contact with the obturator it sections it instantly, at the canal orifice level, with the heat generated through friction.

- Alternatively it is possible to section the obturator with the heat generated by the Touch’n Heat or System-B.
Steps in the Thermafil technique

- Verifying the preparation
- Preparing the carrier
- Sealer application
- Carrier insertion
- Carrier Separation
Other carrier based systems

- Densfil (Dentsply Dental Specialties, Tulsa, OK)
- Soft Core (SybronEndo, Orange, CA)
- One Step (CMS Dental, Copenhagen, Denmark)
Alpha Seal (The Cutting Edge, Chattanooga, TN)

Provides $\alpha$-phase percha in a syringe which is heated in a special oven
This system uses conventional K files or similarly sized carriers as the carrier.

Similar in concept to the thermafil system but in contrast the clinician does not “coating” of the carrier.
Advantages

- Use of master apical file or similarly sized titanium carrier is more effective in resisting slippage and displacement of the gutta-percha than pre-coated carriers
- Ability to try in the carrier prior to obturation
- Ability to precurve the carrier prior to coating

GIUSEPPE CANTATORE, W. BEN JOHNSON, The Thermafil system. In Endodontics vol 2, Arnaldo Castelucci
SuccessFil (Hygenic corp, Akron, OH)

- Consists of:
  - SuccessFil solid-core carriers
    - Titanium cores
    - Radiopaque plastic
  - SuccessFil syringes
    - Contain high viscosity alpha phase gutta percha
    - Heated in special heater oven
    - It sets in 2 minutes
  - SuccessFil heater

GIUSEPPE CANTATORE, W. BEN JOHNSON, The Thermafil system. In Endodontics vol 2, Arnaldo Castelucci
Technique

- The gutta percha syringe is warmed

- The carriers are inserted to the measured depth into the gutta-percha in the syringe and then extruded by forcing the plunger
  - Rapid withdrawal
    - Creates a tapered shape
  - Slower withdrawal
    - Creates a cylinder shape

- Inserted into the canal

- Core is separated by holding the handle and severing the core shaft 2mm above the orifice
**AlphaSeal** (The cutting edge, Chattanooga, TN)
- Uses conventional K-files
- Alpha phase of the gutta percha is processed through heat fractionization

**SuccessFil** (Hygienic corp, Akron, OH)
- Uses its own titanium cores
- Alpha phase of the gutta percha in processed through extensive milling
SimpliFill (LightSpeed Technology, San Antonio, TX/Discus Dental)

- SimpliFill is gutta-percha or Resilon manufactured for use after canal preparation with LightSpeed instruments.

- The carrier has an apical plug with 5 mm of gutta-percha. The technique involves fitting a carrier that is consistent with the master apical rotary file to within 1 to 3 mm of the prepared length.

- The apical gutta-percha plug can be modified by clipping the end in 1-mm increments to obtain an appropriate fit if the plug is too small. Once the cone is fitted it is withdrawn and sealer is applied to the canal walls. AH Plus is recommended.
The SimpliFill carrier is slowly advanced to the prepared length. This may require firm pressure.

With the plug at the corrected working length the handle is quickly rotated a minimum of four complete turns in a counterclockwise direction to separate the shaft from the apical gutta-percha.

The coronal space can then be filled using lateral compaction or the warm thermoplastic technique.
Conclusion

▪ The good dentist will master many, if not all obturation techniques, being married to a single technique – inability to deal with special cases.

▪ As endodontic success rates continue to increase, research has begun to focus on coronal seal and to the endodontic – restorative continuum.

▪ Perhaps one of the biggest challenges that faces endodontics is to find a gutta-percha replacement; a material that can form a leakproof seal, that is bionductive and promotes regeneration or a “smart” material that can adapt to the ever-changing microenvironment of the canal systems.
Take Home Message

- Cold lateral compaction is the most commonly used clinical technique.
- The main aim of obturation is to achieve a 3D hermetic seal.
Probable LAQs and SAQs

- Various Obturation techniques
- Thermoplastic obturation
- Continuous wave obturation