

Thrill to Fill: Advent of Newer Obturating Systems Following Concept of Monoblock

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ABSTRACT

A three dimensional obturation of the root canal have remained an important goal of endodontic treatment. A carefully and properly achieved obturation will lead to the formation of “fluid tight seal” onto which success of an endodontically treated tooth depends. Though the goal of endodontic obturation have remained unchanged for decades, however, the science and practice of root canal therapy has changed dramatically on evidence based protocols to develop highly advanced obturation materials and techniques. Cold lateral compaction of gutta percha is the benchmark technique against which all other techniques are evaluated. It is the most commonly used technique by dentists. But it has very big disadvantage that it does not fill the root canal three dimensionally. To overcome this various thermoplasticized gutta percha obturation methods have been introduced.

Keywords: Thrill to Fill, Advent of Newer Obturating Systems, Concept of Monoblock

INTRODUCTION

The aim of root canal treatment is proper cleaning and shaping of the canal with three dimensional obturation thus preventing reinfection and maintaining the integrity of periodontium further achieving healing of lesion.¹ During endodontic treatment the tooth becomes dehydrated and the loss of dentin by different chemomechanical preparation increases the strength of the tooth which becomes liable to fracture. The clinical goal of a root canal obturation is to fill the empty spaces and achieve hermetic sealing further preventing any bacterial contamination into the periapical tissues.² The possibility to create monoblock effect is the prime aim of endodontic science. To achieve this different materials and techniques are available to obturate the root canal system. Gutta percha along with root canal sealers is the gold standard of root canal fillings because of its biological compatibility, lack of toxicity or allergic effects, and easy removal from the root canal.¹ Grossman et al have described the properties of an ideal obturation material, however, no single material can currently satisfy all these requirements.³ Cold lateral condensation with gutta percha serves as a gold standard for obturation and is being used since long by many dentists.⁴ Vertical condensation technique is being used for continuously and progressively carrying a wave of warm gutta percha along the length of master cone, starting coronally and ending in apical part.⁵ This lodges the gutta percha to dentinal walls which decreases the possibility of voids and increases the possibility of filling lateral and

accessory canals. Thermoplasticized gutta-percha obturation methods have been introduced and number of studies have evaluated the apical seal achieved by these techniques. It has been shown that the thermoplastic techniques have certain superiority in producing well dense gutta-percha, compared to cold techniques.⁴ This current review is focused on the sealing abilities of different 3D gutta percha techniques to rule out the sealing ability of various techniques for achieving tertiary monoblock effect.

Concept of monoblock in obturation

- Monoblock (a single unit) is the term used in endodontic obturation to get a desired root filling material that bonds to dentin and form a homogeneous mass within the root canal.
- Endodontically treated teeth are liable to fracture because of dehydration and reduced amount of remaining teeth. Strength of treated tooth is proportional to amount of remaining sound tooth structure. As tooth structure decreases potential to fracture increases.
- In order to reinforce the canal, modulus of elasticity of root filling material should be comparable to dentin that is, 14000 Mpa. Different concepts of monoblock have been implemented to understand the chemistry between materials in the canal with the root dentin.

Primary monoblock

In this kind of monoblock, there is only one interface between root filling material and root dentin. Canal filled with MTA is classic example of primary monoblock.⁶ But the inability of MTA to bond to dentin and its insufficiency to strengthen the roots led to the development of secondary monoblock.⁷

Secondary monoblock

Secondary monoblocks are those which have two circumferential interfaces, one between the cement and dentin, the other between the cement and the core material.

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The two criteria applied in this are, firstly, that material should have ability to bond strongly and mutually to one another. Secondly, the modulus of elasticity should be similar to substrate. The increase in stress concentration in these kind of monoblock is redistributed to cement layer. It is classically perceived in the restorative and endodontic literature. Root canal obturations, are the indirect fillings of the root canal space created by cleaning and shaping, may be regarded as secondary monoblock systems. However, the conventional root canal sealers do not bond strongly to dentin and gutta-percha and they also do not behave as mechanically homogenous units with the root dentin.⁷ Interest in utilizing the classical monoblock concept for sealing and reinforcing was highlighted in 2004 with advent of bondable filling material.

Tertiary monoblock

Third circumferential interface is introduced between bonding substrate and obturating material. An interface with the coating and post. To achieve this monoblock different materials are being introduced to strengthen the weak endodontically treated dentin.⁶

RECENT OBTURATION TECHNIQUES TO ACHIEVE THREE DIMENSIONAL OBTURATION

1. Smart seal: unique obturation system in dentistry

Newly introduced root canal obturating system "SmartSeal" is established on the polymeric technology. The hydrophilic nature of the obturating points can absorb surrounding moisture and expand which fill voids and spaces. Ever since its introduction, Smartseal has been extensively stated to be efficaciously used in endodontic treatment.

Smartseal is a two-part system comprising of: Propoint and Smartpaste/Smartpaste Bio.

- **Propoint**

Propoint, best known as the 'C points', these obturation points are fabricated in two parts: Central Core and the Outer Layer. The central core comprises of a blend of two branded nylon polymers, Trogamid T and Trogamid CX. The Outer Polymer Layer: comprises of a cross-linked copolymer of acrylonitrile and vinyl pyrrolidone that has been cross-linked using allyl-methacrylate and a thermal initiator. This layer is hydrophilic, having a hydrogel coating, that allows swelling up of the points to acclimatize the corollaries of the root canal system. This covering is planned to swell sideways, thus self-sealing the root canal. As there is no axial swelling, no length change is present and radiated swelling halts as soon as a seal is formed. It is available in following sizes:

- 6% taper - ISO tip sizes 25 to 45
- 4% taper - ISO tip sizes 25 to 45
- ProTaper™ - F1, F2, F3, F4 & F5
- Sendoline™ S5 - S2, S3, S4.

- **Smartpaste**

Smartpaste is a resin based sealer which is dispensed in a

syringe to ensure an accurate ratio of sealer components.

- **Smartpaste Bio**

It is a resin based sealant intended to swell up, by the addition of ground polymer. The sealant is delivered in a pre-mixed syringe and it absorbs water from within the canal and after set produces a radiopaque biocompatible cement.

Accessories

Smart-trim

Comprises of a kit consisting of 2 long flame gold burs and 2 pear diamond burs, for trimming the superfluous amount of propoints.

How to use?

Flame bur should be used on a high-speed for removing the additional and then forcing down on the top with the pear bur until the propoint is flush with the orifice. As the Smart paste is hydrophilic, water can be kept on it when used. If using smartpaste bio, burs must be kept dehydrated or else the water may wash away much of the sealer.

Smartgauge

It is a measuring block designed to slender the 4% and 6% taper propoints to the apical wanted size. It diminishes the necessity to transmit large stocks of pre-trimmed points and thus allowing a custom fit.

Directions of use

The manufacturer has acclaimed the trimming to one size small to that which is being prepared, i.e. if a size 35 has been prepared, then the propoint can be sheared to a size 30.⁸

2. Woodpecker Obturation Pen System

Woodpecker Obturation Pen System is newer introduced three dimensional obturating system which is light weight and portable. It transfers heat to working tip. This pen helps to easily cut the gutta percha points. Used for warm vertical compaction during root canal treatment so that softened gutta-percha can flow and fill the entire root canal system. It has advanced temperature control system which heat up to preset temperature within 0.5 sec. Automatic timeout protection ensures safety. The range of preset temperature is 150°C – 230°C.

3. Calamus dual 3d obturation system

The Calamus Dual 3D Obturation System is one unit that conveniently combines both Calamus "Pack" and Calamus "Flow" handpieces. The Calamus Pack handpiece is the heat source that, in conjunction with an appropriately sized Electric Heat Plugger (EHP), is utilized to thermosoften, remove, and condense gutta percha during the down pack phase of obturation. The Calamus Flow handpiece is utilized, in conjunction with a one-piece gutta percha cartridge and integrated canula, to dispense warm gutta percha into the preparation during the backpacking phase of obturation. The temperature of the thermoplasticized gutta percha as it is extruded through the needle tip ranges from 38°C to 44°C. The gutta-percha remains able to flow for 45 to 60 seconds, depending on the viscosity.²

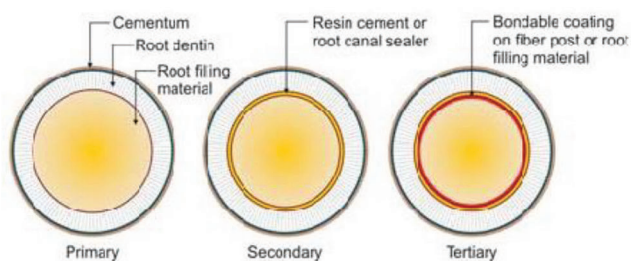


Figure-1: Cross-sectional illustration demonstrating the types of monoblocks⁷



Figure-2: Woodpecker Obturation Pen System



Figure-3: Calamus dual 3d obturation system²

4. BeeFill system

Recently, a new thermoplasticized injection device, the BeeFill system, was introduced to simplify obturation after canal preparation. BeeFill 2 in 1 is a recently introduced warm vertical obturation system that includes downpacking and backfilling equipment in one unit. It is a high temperature gutta-percha injection unit with 2 pluggers; the gutta-percha cannula is set in a handpiece with a 360° operation angle. Heated pluggers are used to thermoplasticize and downpack the gutta-percha at the apical third. The remaining part of the root canal is then backfilled using Obtura 2, which delivers thermoplasticized gutta-percha that is compacted vertically



Figure-4: BeeFill system⁹



Figure-5: Elements™ IC Fill/Obturation

by pluggers. According to the manufacturer, canal obturation by the BeeFill system results in reliable obturation of lateral canals, minimal risk of root fracture, gutta-percha filling to the desired level for immediate placement of a fiber post, and adhesive restoration in 1 appointment.⁹

5. NeoSealer™ Flo obturation system

Avalon Biomed's™ new NeoSealer™ Flo is simplifying endodontic obturation. This technique is generally termed, "the single-cone technique." Unlike the other techniques, single-cone obturation is sealer-centric — relying on the hydraulics imparted by the gutta-percha cone and the sealer's flowability to three-dimensionally fill the canal space.

After preparing with instruments and irrigants, canal is dried. Gutta percha cone is selected one size smaller than the master apical file. The slightly undersized cone permits adequate space for the NeoSealer Flo.

Next, the NeoSealer Flo is applied directly into the canal space using the Flex Flo Tip™. This unique application tip flexes and minimizes binding while the rubber stopper helps to gauge the appropriate canal depth. Pre-fitted gutta-percha cone is then slowly inserted through the NeoSealer Flo to the desired length. This does equal distribution of the Neosealer Flo throughout the entire canal following

hydraulic motion. After insertion of the gutta-percha cone, the canal's obturation is complete.

One common error is inadequate NeoSealer Flo application. An insufficient volume of NeoSealer Flo will not provide optimal hydraulics and will result in voids within the obturation.

6. Elements™ IC Fill/Obturation

Powered obturation with no strings attached. It is manufactured by Kerr company. The new cordless elements™ IC is the latest complete and reliable obturation system that combines a Downpack heat source with a Backfill extruder.

CONCLUSION

To achieve successful endodontic outcome, three dimensional obturation is the critical step. The closure of apical as well as coronal part is important. Choosing the right obturation material and techniques depends on experience and situation of root canal morphology. Advancements in materials such as Smartseal may ascertain to be an unwilling changer in the field of endodontics. One of the main benefits of this obturating system is the resourcefulness of the product, thus allowing the conception of points to equal most of the available different file systems that are presently used in daily practice.

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