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Original Research

Utility of Obturation materials and Techniques amongst Endodontists: A Qualitative Research

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ABSTRACT:
Aim of the Study: The purpose of the study was to assess the preferences of obturation materials and techniques employed by Endodontists in their clinical practice to achieve a harmonious seal in root canals. **Methodology:** A questionnaire survey was done over the period of 1 year in which questions were posed to 56 Endodontists having minimum of 2 years of clinical experience. The questions were based upon which obturation technique according to them fits the criteria of generating a tight and harmonious seal during obturation with minimum effort and technique sensitivity as well as which obturation material do the prefer in their normal clinical practice. **Results:** Many were of opinion that even though there has been recent advancement in obturation techniques, but they were mostly using lateral compaction (34%) and single cone technique (15%) often as they are less technique sensitive and have stood the test of time. The material of choice for most Endodontists was still Gutta Percha (65%). Resilion (22%) was also widely used as these have similar handling properties to GP and are size-matched to multiple filing systems. **Conclusion:** Without doubt, sealing of root canals three-dimensionally contributes to the success of root canal treatment. However, the quest for a clinically relevant model for evaluating the seal of the root canal system has evolved along a topsy-turvy path of intellectual discourse to become an intangible philosophical ideal.
Key words: Obturation, Sealer, Root canal treatment.

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INTRODUCTION

The goal of Obturation is to seal the cleaned, shaped and disinfected root canal system and to avert re-infection. It has been accentuated that decent obturation should create a good seal; this contains apical and coronal seal as well as lateral seal.[1] Success in root canal treatment was instituted upon the triad of detailed canal debridement, proper disinfection and obturation of the canal space.[2]

Novel obturation biomaterials have been presented over the past decade to improve the seal of the root canal system. Consequently, one has to recourse to clinical outcomes to examine whether there are actual benefits linked with the use of recently introduced materials for obturating root canals. Yet there is no simple answer because endodontic treatment outcomes are predisposed by a host of other predictors that are more probable to take priority over the influence of obturation materials.[3]

Obturation of the canal space to the working length has been represented as the most perilous component of root canal treatment for sealing and isolating the canal space from irritants that remain after suitable shaping and cleaning, and for eradicating ensuing leakage from the peri-radicular tissues or oral cavity into the filled canal space.[4] Results from these early works are reinforced by recent studies that show the contribution of root filling quality to the success of primary and secondary root canal treatment.[5] However, contemporary research proves that shaping and cleaning are tactically more significant than obturation of the canal space for eradicating root canal infections as well as to find an ideal obturating material.[6] (**Table 1**)

Historically, gutta-percha, the trans-isomer of polyisoprene, has been the material of choice as a solid, inert core filling material for root canal obturation, starting with Bowman's overview of the material into endodontics in 1867.[7] Diverse gutta-percha obturation techniques have been in use, including single-cone technique, solvent softening techniques, cold or warm lateral compaction, warm vertical compaction, continuous wave compaction, thermoplastic injection techniques and thermomechanical compaction techniques, as well as core-carrier techniques.[8] Of noteworthy mention is that the single-cone obturation technique, developed in the 1980s for standardization of endodontic instruments and filling points, has been invigorated with the introduction of some contemporary filling techniques.[9]

An inadequacy of gutta-percha-based root filling materials is their deficiency of adhesiveness to canal wall dentin. Because of this constraint, a sealer or cement has to be used with gutta-percha to achieve a fluid-tight seal, and to fill the space between the canal wall dentin and the obturating material interface. Sealers also fill voids and loopholes in the root canal, lateral and accessory canals and spaces between gutta-percha points used in lateral condensation techniques. Diverse types of sealers are presently available, including zinc oxide eugenol and non-eugenol sealers, calcium hydroxide sealers, glass ionomer sealers, epoxy-resin based sealers, silicone sealers, medicated sealers and the more recently presented methacrylate resin-based sealers and calcium silicate-based sealers.[10]

Several obturation techniques exist with little difference in their long-term outcome results and there is no technique that prevents leakage.[11] There is some evidence to suggest that warm vertical compaction is superior to lateral compaction.[12]

Single cone technique-refers to the use of a size-matched greater taper cone to fit the preparation of the canal precisely. Such an approach is often used in conjunction with specific filing systems. [13]

Lateral compaction or cold lateral compaction -where a master cone corresponding to the final working length (FWL) and canal shape is chosen, coated in sealer and compacted laterally with finger spreaders. Accessory cones will be used until the obturation is complete. This technique does not produce a homogeneous mass and the core material and the accessory cones remain separated. As a result, sealers should be used to fill in the gaps. [13]

Warm vertical compaction- A master cone corresponding to the correct working length and canal size is chosen. Once confirmed, the cone is coated with sealer and placed in the canal and compacted vertically using a heated plugger until the apical 3−4 mm segment of the canal is filled. The canal system is then backfilled using warm pieces of core material. [13]

Warm lateral compaction- A master cone corresponding to the working length and canal shaper is coated with sealer and inserted. A warm spreader or Endotec II device is then used to compact the core material laterally. The heat results in adhesion of the accessories to the core material and a more homogeneous mass of GP is produced within the canal. [13]

Carrier-based thermo-plasticized technique- Warm GP or 'Resilon'-coated plastic core carriers are inserted into the canal to the working length. the canal should be lightly coated with sealer and the point is placed in an oven to heat before being carefully but quickly inserted within the canal. [13]

Thermomechanical compaction- A master cone coated with sealer is fitted to working length and is

compacted by hand spreader and then with a rotary instrument running between 5,000 and 10,000 rpm. [13]

Plasticized GP injection techniques- the material can flow within the canal space. Injection techniques alone without a cold cone or plug of GP at the apical constriction. [13]

AIM OF THE STUDY

The purpose of the study was to assess the preferences of obturation materials and techniques employed by Endodontists in their clinical practice to achieve a harmonious seal in root canals.

METHODOLOGY

A questionnaire survey was done over the period of 1 year in which questions were posed to 56 Endodontists having minimum of 2 years of clinical experience. The questions were in open-ended format and in English language which were sent by Email to the survey participants. Their responses were recorded on a spreadsheet and then analysed with the help of descriptive statistics.

The questions were based upon which obturation technique according to them fits the criteria of generating a tight and harmonious seal during obturation with minimum effort and technique sensitivity as well as which obturation material do the prefer in their normal clinical practice.

RESULTS

Table 1 – Ideal properties of an Obturation material

Easily introduced into the root canal system	Should seal the canal laterally as well as apically
Should not shrink after being inserted	Should be impervious to moisture
Should be bacteriostatic or at least not encourage bacterial growth	Should be radio-opaque
Should not stain tooth structure	Should not irritate periapical tissue
Should be sterile or easily and quickly sterilized immediately before insertion	Should be easily removed from the root canal, if necessary

The survey participants comprised of 13 female Endodontists and 43 male Endodontists, of which around 60% had over 4 years of clinical experience in handling endodontic cases. Many were of opinion that even though there has been recent advancement in obturation techniques, but they were mostly using lateral compaction (34%) and single cone technique (15%) often as they are less technique sensitive and have stood the test of time. Though they also believe that these obturation techniques have their own set of drawbacks. (**Table 2**)

Carrier-based thermoplasticized technique like Thermafil, Successfil, Simplifill etc. also accounted for a major share (28%) in preferences of the Endodontists as a technique of choice since it gives better three-dimensional seal during obturation in root canal and they also less time consuming.

The material of choice for most Endodontists was still Gutta Percha (65%) as it has minimal toxicity, easy to manipulate as well as radio-opaque which is easily visualized in radiographs. Also, it can be easily removed with the help of heat or solvent, so that corrective manipulation can be done without hassle. Resilion (22%) was also widely used as these have similar handling properties to GP and are size-matched to multiple filing systems. 10% of endodontists also use Pro-points, which undergo hygroscopic expansion within the canal to fill voids and are currently termed as Smart sealing systems. (**Table 3**)

Table 2- Obturation techniques preferred by various Endodontists

Lateral compaction	34%
single cone technique	15%
Warm vertical compaction	12%
Warm lateral compaction	4%
Thermoplasticized techniques	28%
Apical barrier	5%
Others	2%

Table 3- Choice of Obturation material favoured by survey Endodontists

Gutta Percha	65%
Resilion	22%
Pro-points	10%
Coated cones	3%

DISCUSSION

Current commercially-accessible root filling materials which entitle improvement of their seal of the root canal system may be classified by function into those that: I. Adhere to canal wall dentin and root filling materials to remove interfacial gaps; II. Effort to self-seal gaps by setting or hygroscopic expansion; III. Augment flow and adaptation of the root filling material to canal walls; and IV. Employ bioactive reaction products to recover a compromised seal.

Dentin adhesive technology has been revised from restorative dentistry and applied to obturating materials. As far as adhesion to intra-radicular dentin is concerned, similar mechanism of hybrid layer formation that has been stated for bonding to crown dentin is repeated in intra-radicular dentin with the usage of etch-and rinse adhesives, or methacrylate resin-based sealers that use a separate self-etching primer component or self-adhesive sealers that include acidic resin monomers.[14]

As gutta-percha does not stick well to root canal sealers, one way to accomplish this goal is to chemically bind or mechanically put a coating over the surface of gutta-percha cones by methacrylate resin-based sealer. A vital issue that endangers the seal of root canals that are filled with these relatively rapid-polymerizing, resin sealer systems is their lengthy setting shrinkage behaviour, and the incapacity of the long narrow root canals to cope with the relief of polymerization shrinkage stresses created by these systems on the bonded interfaces.[3]

Expansion of obturation materials to improve the seal of root-filled canals has been described even for classic obturation materials. Gutta-percha expands in the company of eugenol which may help to decrease gaps within canals obturated with zinc oxide-eugenol sealer-filled canals caused by the release of eugenol from the set sealer, shrinkage or disbanding of sealer over time. Apart from eugenol-induced expansion, closure of interfacial gaps in gutta-percha-filled root canals may also occur by sluggish, hygroscopic expansion of gutta-percha, due to sorption of some moisture present within the canal space.[15]

Coating metal cores such as gold wire, silver points and endodontic files with heat-softened gutta-percha for three-dimensional obturation of the canal space has long been before the commercialization of diverse prefabricated gutta-percha core-carrier systems that are claimed to augment adaptation of the gutta-percha to the canal wall, and flow of the gutta percha into lateral canals. There are two new modifications to the classic core-carrier systems. The first modification comprises of replacement of the gutta-percha carrier with a coating of the polycaprolactone based filling material which is chemically unified with a resin-based core. The second modification includes replacing the Vectra or polysulphone plastic carriers in a classic gutta-percha-based system with cross-linked thermoset gutta percha that does not melt by heat used in an obturator oven, and is not soluble in common organic solvents employed for root canal retreatment.[3]

The result of root canal treatment depends on a assembly of factors and not simply on materials or techniques of obturation. While specific filling materials have been keenly promoted, there is little clinical data that supports the dominance of one material over another. In the past, treatment outcome studies have infrequently examined the contribution of obturation materials to clinical success. Even for obturation techniques (vertical vs lateral condensation), their contribution to treatment outcome is weak and of dubious significance, and then only in cases with preoperative apical periodontitis.[12]

CONCLUSION

The sealing of root canals three-dimensionally backs the success of root canal treatment. Yet, the quest for a clinically pertinent model for assessing the seal of the root canal system has changed along a confused path of intellectual sermon to become an imperceptible philosophical ideal. It makes sense to get oneself familiar with one or two commonly used techniques and materials, respecting the principles of good root canal treatment, in order to create steady, radiographically well-adapting, homogeneous root canal filling at the right length. It is important to understand that no filling material or technique can recompense for inadequate asepsis and disinfection procedures.

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