

HYBROSONIC: Re-inventing Root Canal Obturation Technique using Heat + Sonic Vibration

Sameer D Jain

Abstract – HYBROSONIC : The name derives from Heat + Sonic Vibration. The invention relates to Root Canal Obturating Device for filling of Root Canal after removal of tooth pulp. Root canal treatment is the removal of tooth's pulp, a small thread like tissue in the centre of the tooth. Proper root canal filling should achieve three dimensional obturation of the root canal space to prevent micro organisms from entering and re-infecting the root canal system and to prevent tissue fluids from percolating back into the root canal system to provide a culture medium for any residual bacteria. It should seal all portals of exit to impede any sort of communication or exchange between the endodontium(within the tooth) and periodontium(outside the tooth). If the tooth is not sealed properly the root canal may leak and lead to failure of treatment. Conventional obturation techniques like cold lateral condensation technique and warm vertical condensation technique have limitations and are very technique sensitive hence a novel machine was developed which transforms gutta percha (root canal filling material) into alpha phase and using sonic vibrations the gutta percha is forced to flow into lateral canals(accessory canals in horizontal planes), thus achieving 3-Dimensional fluid tight hermetic seal and thus preventing any chances of re-infection, and fulfilling one of the main goals of endodontic treatment. Hence, an innovative, efficient, fast yet economical method to achieve perfect obturation thus, enhancing the prognosis of the tooth.

Index Terms: hybrosonic, heat +sonic vibratory obturation, Sameer D Jain, root canal obturating device

INTRODUCTION

Complete obturation of the root canal system with an inert filling material and creation of a hermetic, apical seal have been proposed as goals for endodontic treatment [1]. Since the most common cause of endodontic failure has been attributed to incomplete obturation, many different

- Sameer D Jain is currently pursuing *Bachelors of Dental Surgery (BDS)*

MGV's KBH Dental College & Hospital, Nashik
(Maharashtra University of Health Sciences), Maharashtra, India.

PH - +91 9892490644
E-mail - sam777_25@yahoo.co.in

- An academic scholar, active into endodontic research & inventor of *Hybrosonic root canal obturating device.*
- Awarded as *India's Youngest Innovator by Massachusetts Institute of Technology's (MIT's) (TR35 2010-11)*
- Represented **INDIA** and presented Research Poster at the **ADA-DENTSPLY STUDENT CLINICIAN PROGRAMME**, held at the **151st America Dental Association (ADA)-Annual Session, Orlando, Florida, USA.**
- **General Secretary of DSWAI (Dental student welfare association of india), Maharashtra state branch, India**
- Achieved many national & international awards at an undergra-duate level
- **MEMBERSHIPS**
 1. **Indian Dental Association.**
 2. **International Association of Student Clinician – American Dental Association (SCADA)**
 3. **International Association of Dental Research (IADR), USA**
 4. **Dental Student Welfare Association of India(DSWAI)**

obturation techniques have been developed in order to

increase the success of root canal treatment. Gutta-percha has been material of choice for obturation since 1867. Lateral condensation has proven to be a very popular gutta-percha technique. However, its ability to conform to the internal surface of the root canal has been questioned. Brayton et al [2] reported voids, spreader tracts and incomplete fusion of the gutta-percha cones and lack of surface adaptation. Also, this technique relies on sealer to fill accessory canals. Eguchi et al [3] reported that lateral condensation results in excessive amounts of sealer and apical voids. Peters [4] demonstrated that some sealer used in lateral condensation might resorb with time. This might decrease the effectiveness of the root canal obturation.

Studies have shown that softened gutta-percha can easily be moved into the canal irregularities, thus replicating the intricacies of the root canal system. The original warm vertical compaction technique [5] was modified by Buchanan [6] who introduced the single continuous wave of thermo plasticized gutta percha using System B heat source unit. When using different heat sources of warm vertical condensation techniques, better results were found by increasing the depth of heat application[7].

Another factor influencing the quality of root canal filling could be the use of vibrations. Ultrasonic vibration in association with the cold lateral condensation technique

produced more complete three dimensional filling than the cold lateral condensation technique alone [8]. Vibrations increased the flow of thermo-plasticized gutta percha & decreased the size and the number of voids [9]. These vibrations also help the gutta percha & the sealer to flow into lateral canals, as previous studies [10] evaluated the flow of gutta percha into lateral canals as the test of the ability of the material to effectively fill irregular spaces.

Cold lateral condensation technique is still the standard technique used since, it is easily accessible & economical. The use of ultrasonic vibrations in heat systems is commercially expensive thus making it elusive for common practitioners to harness its benefits for day to day root canal treatments. Hence, a root canal obturating device was designed which had adjustable temperature control & sonic vibrations.

The use of sonic vibrations not only achieves the benefits better than that of ultrasonic vibrations but also reduces the overall manufacturing price to a humbling level.

HYBROSONIC

It consists of a hand piece which has a working tip where removable plugger like tips can be inserted. The tips are easily detachable. Moreover, tips of varying lengths may be used similar to dimensions of different pluggers. They may be made of copper/nickel-titanium (flexible)/stainless steel/ any metal alloy according to need of the tooth morphology.

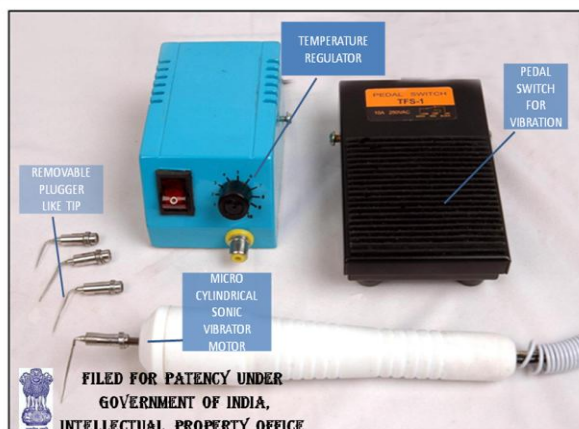


Fig 1 – The above Heat + Sonic Vibratory Obturation Device has been published in **The Official Journal of The Patent Office (Issue no.12/2010 Dated on 19/3/2010)**. The Indian Patent Application No. 2318/MUM/2009 in the name of **Sameer Dilip Jain**, Filed on 6/10/2009.

The hand piece has an integrated micro cylindrical sonic vibrator motor of 3V DC which helps to give the working end sonic vibratory property. It derives its power supply from a 12 W transistor in the main control unit. In order to synchronize the transistor and the vibrator motor a filter circuit was designed to give DC output to the vibrator from the AC source of the soldering iron. 4 Diodes were used to make the filter circuit in order to provide adequate output to vibrator motor.

The main control unit has a temperature regulator for the working tip, ranging from 35°C to 350°C. It also has a foot control that gives effortless control over the vibrations to be activated.

HYPOTHESIS –

Dental Gutta percha is present in beta form. On heat application there is transformation of beta phase to alpha phase (60 – 70°C). At the transition temperature i.e. alpha phase gutta percha flows best. Sonic vibrations produce a larger disturbance around the tip and the mode of vibration is less affected by wall contact than when ultrasonic devices are used, hence the sonic vibrations allow the formation of a homogenous mass devoid of any air spaces along with it the vibratory strokes enables the gutta percha to flow into lateral canals, achieving better lateral canal seal.

TECHNIQUE OF OBTURATION –



Fig 2 – Cross Section of a tooth demonstrating the technique of obturation using HYBROSONIC. Blue arrow indicates the flow of gutta percha into lateral canals.

1. The canal is thoroughly irrigated and dried.
2. Using a spreader a thin smear of sealer is applied in the apical region followed by a layer on the wall.

3. A master cone is selected and placed (with sealer) in the canal.
4. The PLUGGER-like tip is placed in the canal orifice with the heating switch already on at a temperature 200°C(392°F +/- 50°F)
5. Once the gutta percha starts melting and flowing down the vibration switch is put on.
6. This process is continued for 5-10 sec maximum.
7. A burst of heat is given for 2-5 sec maximum in order to facilitate the removal of the plugger tip
8. Using a cold plugger the homogenous mass is condensed in order to compensate for any shrinkage.
9. Using this segmental technique the the back filling of the canal is completed.

ADVANTAGES –

- Efficient & economical since sonic vibration has higher amplitude hence produces more disturbances around the tip, giving a better push in horizontal plane compared to ultrasonic vibrations.
- Ergonomically faster than conventional lateral and vertical condensation techniques, thus saves time.
- Can also be used for Irrigation procedure since NaOCl is more effective at higher temperatures & sonic vibration helps to remove debris more efficiently.

CONCLUSION – HYBROSONIC is a unique machine has more features than any available product yet economical and has highly efficient mechanism of action thus increasing the quality of root canal obturation, consequently helping to prevent any chances of re-infection.

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