

*Uday Patel, ** Shraddha Chokshi, ***Rupal Vaidya, ****Purav Mehta, *****Zarna Sanghvi, *****Pruthvi Patel

ABSTRACT

The ultimate goal of root canal treatment is to make patients symptom free and maintain asymptomatic condition.

Aim: To evaluate the incidence and measure the intensity of pain after root canal obturation done by using two different obturation techniques.

Materials and method: Root canal treatment was performed in total 70 patients using K-Files. Group 1 (control group) had 35 patients for cold lateral compaction technique and group 2 (intervention group) had 35 patients for E N Q Plus (META, Korea) system for thermo plasticized gutta percha delivery system. Post-operative IOPA were scored from 0 to 3 according to their extension. The questionnaire was given that contained visual analogue scale (VAS) to assess the discomfort and the pain experienced by the patient at 6 hours and after 1st, 2nd, 3rd, 4th, 5th and 6th days of the treatment. The completed questionnaire was returned by the patient a week later, when the patients were recalled for the follow up. Statistical analysis was done using chi-square test.

Result: Though the pain incidence was higher for cold lateral compaction group after 24 hours post operatively, the VAS declined by the fourth post-operative day and on seventh post-operative day there was no incidence of pain for group 1(0%), while 4 out of 35 (11.42%) cases from group 2 still reported mild pain. Immediate post treatment root canal associated pain prevalence was high but dropped moderately within fourth day and substantially to minimal level in seven days in the current study

Conclusion: Cold lateral compaction technique, though a widely used, tried and tested method; requires more clinical time. Hybrid technique of warm gutta percha obturation technique is quick and safer than purely injectable method.

Keywords: Cold lateral compaction, Thermo plasticized gutta percha, visual analogue scale

Received: 02-03-2014; **Review Completed:** 02-08-2014; **Accepted:** 04-12-2014

INTRODUCTION:

The ultimate goal of root canal treatment is to make patients symptom free and maintain asymptomatic condition.¹ Ingle and Beveridge have shown that the most frequent cause of failure after root canal treatment is inadequate obturation of the root canal system.² Cold lateral compaction is regarded as the benchmark against which other obturation techniques are evaluated.³ This technique has some advantages including low cost and the ability to control the length of the fill.⁴ However, its ability to confirm to the internal surface of the root canal has been questioned due to voids, spreader tracts, incomplete fusion of gutta percha cones and lack of surface adaptation.⁵ Thermo plasticized gutta percha allows it to be used in difficult cases such as internal resorption, curved canals, open apices (blunderbuss), perforations, along with routine cases. Length control is however a disadvantage with higher chances of overextended obturation in this technique. Though large number of studies

have been conducted to compare the outcome of root canal obturation done by warm gutta percha technique with that done by cold lateral compaction technique, conclusions have been inconsistent or contradictory.^{6,7,8}

From the patient's perspective, a treatment can be successful as long as it makes them feel comfortable, after treatment has been carried out. So, we have decided to evaluate the incidence and measure the intensity of pain over a period of 7 days after root canal obturation done by using two different obturation techniques, which will give us more idea about superiority of one technique over another from patient's viewpoint in terms of post operative pain incidence.

Materials and method:-

The study was conducted at department of Conservative Dentistry and Endodontics at Ahmedabad Dental College and Hospital, Gandhinagar. Approval for the same is obtained from the Ethics committee of institute.

*PG Student, **Professor, ***Prof. & HOD, ****Sr. Lecturer, *****Reader, *****Reader

DEPARTMENT OF CONSERVATIVE & ENDODONTICS, AHMEDABAD DENTAL COLLEGE AND HOSPITAL, TA. KALOL, DIST. GANDHINAGAR GUJARAT, INDIA.

ADDRESS FOR AUTHOR CORROSPONDENCE : DR. RUPAL VAIDYA, TEL: +91 9879918187

Sample Size

Total 70 patients were enrolled for the study. Group 1 (control group) had 35 patients for cold lateral compaction technique and group 2 (intervention group) had 35 patients for E N Q Plus (META, Korea) system for thermo plasticized gutta percha delivery system.

Patient enrollment and group allocation

Group allocation was done on an alternate basis. Patients attending outpatient department, satisfying the inclusion criteria were included in the study. Informed consent was obtained from all the patients and data was collected on the prescribed proforma. The individual diagnosis was obtained from the dental history and clinical examination by thorough palpation, percussion, and vitality tests followed by a periodontal evaluation. History of previous analgesic or antibiotic medication was recorded. Preoperative intraoral periapical radiograph of the tooth in question was taken.

INITIATION OF THE ROOT CANAL THERAPY (ENDODONTIC PROTOCOL)

Before the commencement of the root canal therapy, every patient was administered local anesthesia using Lidocaine HCl 2% concentration with 1:80000 epinephrine (Lignox 2%, Indoco Remedies, India). Each tooth to be treated was isolated using a rubber dam (GDC Dental Products, India).

Appropriate access cavity preparation was then done. Cleaning and shaping of the root canal was performed by the Hybrid technique. Initially, canal patency was established with a no. #10 K file (MANI Inc., Japan). This was followed by the coronal flaring using Gates Glidden drill (Sizes no 2, 3 Dentsply Maillefer, Ballaigues, Switzerland). The irrigation was done copiously with 3% Sodium Hypochlorite solution (Vishal Dentocare PVT. Ltd., India.) and normal saline, alternatively. Working length was then determined using an electronic apex locator (Root ZX-II, J Morita, Japan, IIIrd Generation) and the same was confirmed with intraoral periapical radiograph. The apical preparation was then completed using the step back

technique at 1 mm increments, using hand K-files (MANI Inc, Japan). Recapitulation was done after every new file with a smaller size file. The final instrumentation size was determined as the three sizes larger than the first file binding at the working length. The master apical files selected study ranged from #25 to #50 depending on the root anatomy and initial diameter of the root canal. EDTA (RC Help, Prime Dental Product) was used as a lubricating agent. Once complete cleaning and shaping was ensured, intracanal Calcium Hydroxide Ca(OH)_2 (RC Cal, Prime Dental Products) medicament was placed for one week. After one week when initial symptoms subsided the patients were recalled and the intracanal medicament was removed by copious irrigation of 3% NaOCl and use of master apical file. Liquid EDTA (Dent wash, Prime Dental Products) was used as an irrigant for removal of the smear layer and any residual Ca(OH)_2 . Final rinse of the root canal system was done with Normal Saline.

OBTURATION IN GROUP 1 [COLD LATERAL COMPACTION (CONTROL GROUP)]

Firstly, the master gutta percha point was tried and verified with an intraoral periapical radiograph. The master cone tip was selected according to the diameter of the prepared canal. A paper point corresponding to the master apical file was used to dry the canal thoroughly. The walls of the root canal were first liberally coated with the resin sealer (Resino Seal, Ammdent) using lentulo spiral (MANI Inc., Japan). Gutta Percha Point is coated with the sealer and inserted in the canal up to the working length. Finger spreader was used to displace the primary point laterally and apically. The accessory cone was then slid promptly to proper length with a light coating of the sealer. Heat was applied with the hand plugger at or 2-3 mm below the level of the canal orifice to achieve the coronal seal and the gutta percha filling was then compacted apically with the help of a cold plugger. A provisional coronal restoration was then done with Cavit G (3M ESPE, Germany) to complete the endodontic therapy.

OBTURATION IN GROUP 2, [THERMO PLASTICIZED INJECTABLE GUTTA-PERCHA TECHNIQUE (INTERVENTION GROUP)]

Teeth to be obturated in group 2 were prepared for thermo plasticized injectable gutta percha obturation technique (E N Q Plus, META, Korea). Firstly, the master gutta percha point was tried and verified with an intraoral periapical radiograph. The master cone tip was selected according to the diameter of the prepared canal. A paper point corresponding to the master apical file was used to dry the canal thoroughly. A hand plugger, one size smaller than the master apical file with a rubber stop to adjust the length of the hand plugger 2mm short of the working length was selected. The walls of the root canal were first liberally coated with the resin sealer using lentulo spiral (MANI Inc., Japan). The master cone was then coated with the resin sealer and inserted into the canal. It was severed off leaving 5-6 mm of master apical gutta percha point in the apical portion of the canal using an electronically heated device (E N Q Plus, META, Korea) and the apical segment was then compacted quickly to form a plug of gutta percha using a hand plugger of the corresponding size of the prepared canal. The rest of the canal was back filled using heat softened gutta percha technique. It was then compacted using hand plugger dipped in alcohol. Excess gutta percha was severed off at or just below the canal orifice to achieve the coronal seal. A provisional coronal restoration was then done with Cavit G (3M ESPE, Germany) to complete the endodontic therapy.

RADIOGRAPHIC ASSESSMENT OF OBTURATION

Post-operative intraoral periapical radiograph was obtained immediately after the obturation was completed. The radiographs were examined under illumination to assess the apical extension of the obturation material.

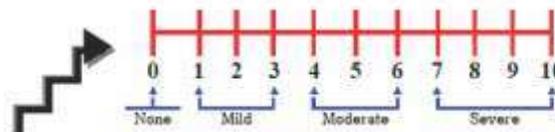
Table: Criteria for apical extension of the obturating material.

Rating	Criteria
0	No filling material up to the apical constriction
1	Filling material up to the apical constriction but not at the radiographic apex.
2	Filling material at the radiographic apex
3	Filling material beyond radiographic apex

Each patient individually received an instruction manual on how to use the questionnaire for the numeric and the verbal evaluation of pain and discomfort. The questionnaire contained a 10-cm visual analogue scale (VAS) to assess the discomfort and the pain experienced by the patient at 6 hours and after 1st, 2nd, 3rd, 4th, 5th and 6th days of the treatment. The completed questionnaire was returned by the patient a week later, when the patients were recalled for the follow up. However, patients were instructed to report back to the dental college in case of severe pain before the proposed duration of seven days.

Here we have divided 10 – cm VAS into four categories no pain, mild pain, moderate pain and severe pain for better objective assessment by patients.

0 – 10 Numeric Rating Scale (page 1 of 1)



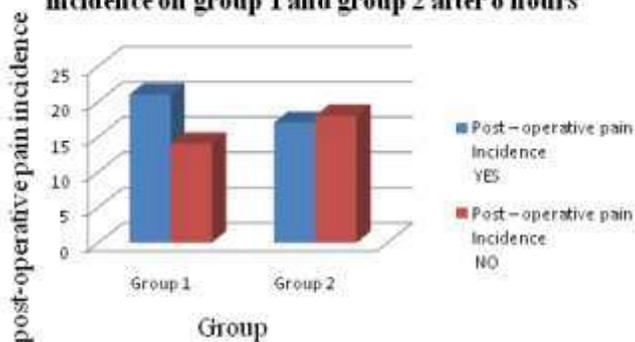
Indications: Adults and children (> 9 years old) in all patient care settings who are able to use numbers to rate the intensity of their pain.

Result:-

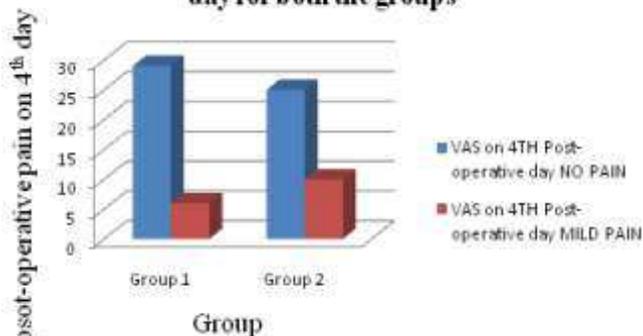
A total of 70 patients, 35 patients in each group were selected. Out of 35 patients in each group, 14 were male and 21 were females. With age range from 18 to 65 years with mean age of 38.11 years. SPSS (Statistical Package for Social Sciences) 12.0 for windows (SPSS, Inc., Chicago, IL) was used for all analysis. Comparative evaluation for pain incidences between two obturation techniques were made by chi-square test. P value less than 0.005 was considered to be of significant value. Line diagram was plotted to evaluate the co-relation between post operative pain incidences between each group.

Group 1:- Cold lateral compaction (Control group)
 Group2:- Thermo plasticized gutta percha obturation (Intervention group)

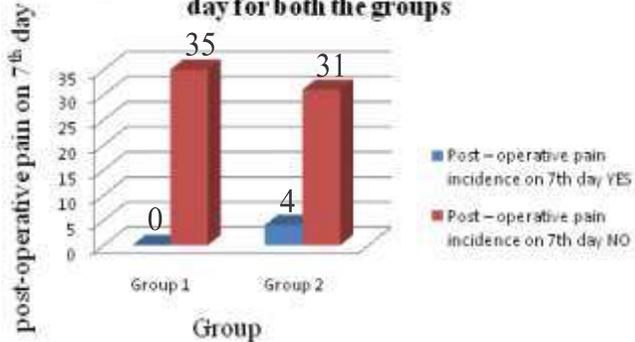
Graph I: Immediate post operative pain incidence on group 1 and group 2 after 6 hours



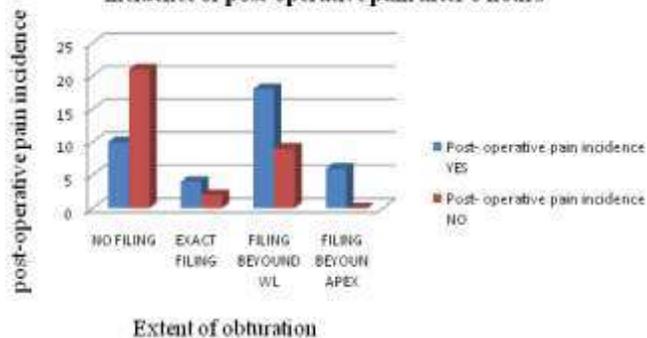
Graph II:- Post operative pain incidence on 4th day for both the groups



Graph III: post-operative pain incidence on 7th day for both the groups



Graph IV :Apical limit of obturation and immediate incidence of post-operative pain after 6 hours



Discussion:-

The purpose of this study was to compare the differences in post obturation pain incidence after endodontic therapy using two different obturation techniques. Mild discomfort after root canal treatment is a common experience for patients. The reasons for post-operative pain can be many. The main causes are mechanical, chemical and microbial injuries to the periapical tissue that induces inflammation. In a clinical investigation, it is difficult to determine whether a single or multiple factors are responsible for eliciting the pain.

In the present study great care was taken to rule out all the avoidable factors during the course of the treatment and to minimize any unavoidable cause which may induce post-operative pain. All the teeth included in the study were divided into three groups, based on morphological variations: anterior, premolars and molars. Meticulous aseptic protocol was maintained to reduce the risk of exacerbation by residual microorganisms or the introduction of bacterial contamination.

The apical extension is the main parameter used in evaluating the quality of root canal filling in present study. However, there are discrepancies regarding the ideal distance between the end of the root filling and radiographic apex. Here in this study, the apical limit of root canal obturation is considered to be an ideal when it is 0.5 – 1.5 mm short of the radiographic apex based on the following rationale: 1) The apical preparation of the root canal and filling should be confined to the root, 2) The main apical constriction on average, 0.5 mm short of the anatomic apex of the root and 3) A better histologic repair occurs if the apical extension of the root filling is located about 1 mm short of the apical foramen.^{9,10}

Much lower incidence of gutta percha extrusion was found in present study as compared to previous in vitro studies. This may be due to hybrid technique of obturation, where apical plug was created by down packing the apical segment of master apical gutta percha point and backfilling was done with

injectable gutta percha technique, which is considered to be a safe and effective technique.^{11,12}

Ibuprofen (600mg/day to 1200mg/day in divided doses) was prescribed as a medication for the patients who felt moderate to severe pain in both the groups, as it is considered to be the effective anti-inflammatory analgesic drug for post – endodontic treatment pain relief.¹

A visual analogue scale has been used in this study to measure the pain incidence. This 10 mm scale was divided into four categories including: no pain, mild pain, moderate pain and severe pain for better understanding and record by the patients.

The overall pain levels immediately experienced by the patients after 6 hours of obturation in our investigation was very high (54.28%), The high prevalence of pain experienced after root canal obturation in this study was consistent with some other studies as well. (Fox et al. 1970, Harrison et al. 1983, Morse et al. 1987).^{13,14,15} However, the pain incidence in the current study was much higher than that reported by other studies (Alac, am 1985, Pisano et al. 1985, Fava 1989, 1991).^{16,17,18} This discrepancy could be attributed to differences in the treatment protocol, pain threshold and the amount of pain severity included for analysis. The studies selecting post-obturation pain levels moderate or severe (Fava 1989) or pain that required analgesics (Pisano et al. 1985, Fava 1991) have reported much lower prevalence of post-obturation pain.

In our study, 20 out of 70 patients (28.57%) reported with mild pain, while 18 out of 70 (25.71%) reported with moderate pain after 6 hours of obturation. No case was however reported with severe pain. Incidence of pain immediately after 6 hours of obturation was higher (55.3%) for group 1 (cold lateral compaction group) as compared to group 2 (thermo plasticized gutta percha group) which had reportedly lower (44.7%) incidence of pain. The difference in pain experience between the patients of the two groups was not statistically significant though. This result was supported by a

study done by Jenifer Martin (2012).¹⁹ The higher pain incidence with CLC technique may be attributed to relatively lengthy procedure which increases patient fatigue, repeated spreader insertion and interpersonal variables in regards to pain threshold. However the result is in contradiction to studies done by Glennon et al (2004), Li Peng et al (2007).^{20,21} Obturation technique had no influence on post – operative pain incidence, if root canal systems have been obturated within the confines of the root canal system and other variables were controlled, the finding that was consistent with results of the studies done by C. H. Chu, C. M. Lo (2005).⁴

Though the pain incidence was higher for cold lateral compaction group after 24 hours post operatively, the VAS declined by the fourth post-operative day and on seventh post-operative day there was no incidence of pain for group 1 (0%), while 4 out of 35 (11.42%) cases from group 2 still reported mild pain. Immediate post treatment root canal associated pain prevalence was high but dropped moderately within fourth day and substantially to minimal level in seven days in the current study; a result which was correlating with the studies by Jaclyn G. Pak, Shane N. White (2011). However, Henry et al (2001) showed increase in severity of post-operative pain as duration of follow up increases from day 1 to day 7 in their study, the results of which not correlating to the present study. The prolonged duration of post-operative pain can be attributed to the actual extrusion of the material beyond the apex with heat softened gutta percha technique, which might act as an irritant. However, with radiographic examination only we cannot be sure whether actual extrusion of gutta percha has occurred or it is the sealer extruded beyond the apex. In the current study, even with overfilled cases flare up did not occur which was also reported by Gutman L (1987) in his studies.

One of the major shortcomings of thermo plasticized gutta percha technique is the lack of adequate length control compared to the cold lateral

compaction technique.^{22,23} More apical displacement of gutta percha was found with thermo plasticized gutta percha technique (11.4%) as compared to cold lateral compaction group (5.71%). However, as long as the obturation material remains within the confines of root canal system it doesn't have significant influence on occurrence of symptoms. In any clinical study one or two factors cannot be considered alone as in terms of pain incidence. Even with all the precautions taken, one cannot be sure whether pain is coming from the single factor under investigation. All possible sources of pain can never be controlled completely. To eliminate maximum incidence of pain, obturation should be undertaken once the tooth is asymptomatic.

Conclusion:-

Under the particular circumstances of the current study, post-operative pain was related to apical inflammatory reaction induced by over extended obturation material. It is suggested that accurately defining working length, avoiding destruction of apical constriction during cleaning and shaping, and using appropriate insertion rate of warm gutta percha can decrease the rate of over extension with warm GP technique. Cold lateral compaction technique, though a widely used, tried and tested method; requires more clinical time. Hybrid technique of warm gutta percha obturation technique is quick and safer than purely injectable method. However, still further studies are needed to claim the superiority of one technique over other.

REFERENCES:

1. Cohen S, Hargreaves KM. Pathways of the pulp. St. Louis: Mosby Elsevier; 2005.)
2. Ingles textbook of endodontics. 6th Edition.
3. Weine FS. Endodontic therapy. St. Louis: Mosby; 2004.
4. Chu CH, Lo EC, Cheung GS. Outcome of root canal treatment using Thermafil and cold lateral condensation filling techniques. *Int. Endod J.* 2005;38:179–85.
5. Guigand M, Glez D, Sibayan E, Cathelineau G, Vulcain JM. Comparative study of two canal obturation techniques by image analysis and EDS microanalysis. *Br Dent J.* 2005;198:707–11.
6. Anantula K, Ganta AK. Evaluation and comparison of sealing ability of three different obturation techniques - Lateral condensation, Obtura II, and GuttaFlow: An *in vitro* study. *J Conserv Dent.* 2011;14:57–61.
7. Friedman S, Torneck CD, Komorowski R, Ouzounian Z, Syrtash P, Kaufman A. In vivo model for assessing the functional efficacy of endodontic filling materials and techniques. *J Endod.* 1997;23:557–61.
8. Yilmaz Z, Deniz D, Ozcelik B, Sahin C, Cimilli H, Cehreli ZC, et al. Sealing efficiency of BeeFill 2 in 1 and System B/Obtura II versus single-cone and cold lateral compaction techniques. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 2009;108:e51–5.
9. Ricucci D, Langeland K. Apical limit of root canal instrumentation and obturation, part 2. A histological study. *Int Endod J.* 1998 ;31(6):394-409.
10. Ronaldo AraújoSouza, João da Costa PintoDantas, SuelyColombo, on endodontic treatment of a mandibular molar: 11-year follow-up *Oral Surgery Oral Med Oral Rad and Endod* 2011;112(1):48– 50.
11. Valli KS, Rafeek RN, Walker RT. Sealing capacity of *in vitro* thermoplasticized gutta percha with solid core endodontic filling technique. *Endod Dent Traumatol* 1998;14(2):68– 71.
12. AviadTamse, AlexanderKatz, Barry H.Korzen. Evaluation of the apical seal produced by a hybrid root canal filling method, combining lateral condensation and thermatic compaction. *JOE.* 1984;10(7):299 – 303.
13. Fox J, Atkinson JS, Dinin AP. Incidence of pain following one visit endodontic

- treatment. *OOO*.1970;30:123-30.
14. Harrison JW, Baumgartner JC, Avec TA. Incidence of pain associated with clinical factors during and after root canal therapy. Part 2. Post obturation pain, *Journal of Endodontics* 1983;9:434-8.
 15. Morse DR, Furst ML, Sideman BH. Infectious flare up and serious sequelae following endodontic treatment; a prospective randomized trial on efficacy of antibiotic prophylaxis in cases of asymptomatic pulpal-periapical lesion. *OOO* 1987;64:96-109.
 16. Alcam T. Incidence of postoperative pain following use of different sealers in immediate root canal filling. *Journal of Endodontics* 1985;9:135-7.
 17. Pisano J, Foley DB, Weine FS. A survey of post-operative pain associated with endodontic therapy. *Compendium of Continuing Education* 6,1985;533-7.
 18. Fava LRG. One appointment root canal treatment: Incidence of post operative pain using modified double flare technique. *IEJ* 24, 248-62.
 19. Martín-González J, Echevarría-Pérez M, Sánchez-Dominguez B, Tarilonte-Delgado ML, Castellanos-Cosano L, López-Frías FJ, Segura-Egea JJ. Influence of root canal instrumentation and obturation techniques on Intra-operative pain during endodontic therapy. *Med Oral Pathol Oral Cir Bucal*:2012 Sep;17(5):912-8.
 20. Peng L, Ye L, Tan H, Zhou X. Outcome of root canal obturation by warm gutta-percha versus cold lateral condensation: A meta-analysis. *J Endod*. 2007;33:106-9.
 21. Y-L Ng, Glennon, D.j. Setchell, K. Gulabiwala. Prevalence of and factors affecting post - obturation pain in patients undergoing root canal treatment. *International Endodontic Journal*. 2004;37:381-391.
 22. Ritchie G.M., D.M. Andersson et al. Apical extrusion of thermoplasticized gutta percha used as a root canal filling material. *J Endod* 14(3):128-32
 23. Alan H. Gluskin. Mishaps and serious complications in endodontic obturation. *Endodontic Topics* 2005, 12, 52-70