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# A Clinical and radiographic assessment of pulpectomized primary molar teeth obturated by zinc oxide eugenol and Endoflas through different obturation techniques - An in vivo study

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## Abstract

**Aims:** The purpose of the study was to assess and compare the success of Endoflas and ZOE as obturating material clinically and radiographically by employing 3 different obturation techniques using Endodontic Pressure syringe, past inject system, Navi Tip syringe.

**Methods and Material:** Ninety (90) Primary Mandibular Second Molar teeth were selected from children of both sexes within the age range of 4 to 8 yrs. After pulpectomy produres teeth were obturated by employing 3 different obturation techniques like Endodontic Pressure syringe, Past inject system and Navi Tip syringe with Endoflas (N-45) and ZOE (N-45) as obturating materials. Outcomes were evaluated both clinically and radiographically.

**Statistical analysis used:** To prevent bias clinical and radiographic evaluation were assessed by another investigator and all the results were then subjected to Biostatistical analysis by Microsoft excel worksheet (2007) and statistical analysis was done using Statistical Package for Social Sciences, version 20.0 (SPSS, Chicago, IL, USA).

**Results:** A significant difference in length of obturation was found among 3 obturation techniques within the Endoflas group with maximum optimal fillings in past inject with Endoflas group. Within Endoflas group, maximum voids were seen in 28(93.33%) cases with Endodontic Pressure syringe and Navi Tips each compared to 23 (76.7%) cases in past inject group in apical third of mesial and distal canals.

Maximum voids were seen in 28(93.33%) cases in Endodontic Pressure syringe compared to 22(73.33%) cases in Navi Tip group and 11(36.67%) cases in past inject group in middle third of mesial and distal canals with Endoflas as obturating material.

**Conclusions:** Past inject was found to be a better obturating technique regardless of the obturating materials used.

**Keywords:** Biostatistical Analysis, Pressure Syringe, high density

**Introduction**

Dental caries is considered to be a disease of modern civilization and despite of great achievements in oral health of populations it is still a major oral health problem in most industrialized countries, affecting 60-90% of school children leading to early loss of primary teeth.[1]The most common cause of premature loss of primary teeth is dental caries leading to involvement of pulp and per radicular tissue causing pain and infection. Premature loss of primary teeth may result in space loss leading to crowding, ectopic eruption of permanent teeth, speech defects, development of deleterious oral habits and masticatory problems thus affecting normal growth and development of orofacial region. Following premature loss of primary teeth maintaining the integrity of the primary dentition until its normal exfoliation is a major goal of Paediatric dentistry which is aimed at restoring the normal occlusal function, esthetics, and normal Facio-maxillary growth. The infected non vital primary teeth with or without periapical pathology can be successfully treated by pulpectomy procedures.

Different techniques and materials have been advocated for obturation of pulpectomized root canals of the primary teeth.

An ideal obturating technique should ensure complete filling of the canal without overfill and with minimal or no voids. Traditionally Lentulospiral mounted on a slow-speed handpiece has been used successfully, which is found to be superior in filling both straight and curved narrow canals of primary teeth.

New specifically designed paste carrier device, past inject (Micro Mega, Besancon, France) was introduced recently that differs from Lentulospiral by its design. It works similarly to the lentulospiral, provides good placement of the obturating material, while eliminating voids and providing a high density of the obturating materials into the root canals.

Considering above facts the present study was designed to assess and compare the success of Endoflas and ZOE as obturating material clinically and radiographically by employing 3 different obturation techniques using Endodontic Pressure syringe, past inject system, Navi Tip syringe.

**Methodology**

Ninety (90) Primary Mandibular Second Molar teeth were selected from children of both sex within the age range of 4 to 8 yrs.

**Inclusion criteria**

1. History of spontaneous pain and tenderness on percussion
2. Signs of chronic irreversible pulpitis and pulpal necrosis
3. Presence of gingival abscess or sinus tract
4. Tooth that has been planned for pulpotomy and excessive haemorrhage is encountered following amputation of coronal pulp
5. Presence of inter - radicular or periapical radiolucency
6. Tooth having adequate bone support with at least two third intact root length

**Exclusion criteria**

1. Grossly decayed unrestorable tooth

2. Tooth with pathological lesion extending to the succedaneous tooth germ
3. Tooth with evidence of any internal or external pathological root resorption

**Clinical Procedure**

All pulpectomy procedures followed same standardized protocol and done by a single operator. After anaesthetizing and proper isolation access opening was carried out using a large round bur. The roof of the pulp chamber was removed with a no. 330 tungsten-carbide bur in high speed hand piece. All canals were checked radio graphically for apical patency and root canal conditions by inserting a no. 10 K-file (Mani Co, Tokyo, Japan). First the working length was recorded as the length of the initial file at the apical foramen minus 1mm. After obtaining working length chemo-mechanical debridement with selective filing was done sequentially up to maximum size of 35 or 40 K-file (Mani Co., Tokyo, Japan) in a pull-back direction. The root canal preparation was aided with copious irrigation with 3%NaOCl (Par can, Septodont Healthcare India Pvt. Ltd., India) and normal saline. After biomechanical preparation all the root canals were irrigated with normal saline.

Then the root canals were dried out with appropriately sized sterile absorbent paper points and subjected to obturation (Fig-1,2) using any one of the six techniques as followed,

**Group-I:** Endodontic pressure syringe (A 25-gauge pressure syringe, Pulp dent, Watertown, Mass, USA) with ZOE (2 scoops of powder to 2 drops of liquid) as obturating material.

**Group-II**: past inject (Micro Mega SA, Besancon Cedex, France, 1000 rpm) was selected two size smaller than the final size file used for root canal preparation with ZOE (1 scoops of powder to 2 drops) as obturating material.

**Group III:** Navi Tip (Ultra dent products Inc; South Jordan, Utah, USA) with 29- gauge, 21 mm length canula was used with 3 ml luerlock disposable syringe (BD Precision Glide ™, Singapore) with ZOE (1 scoops of powder to 3 drops of liquid) as obturating material.

**Group IV:** Endodontic pressure syringe (Similar to group I) with Endoflas (2 scoops of powder to 2 drops of liquid) as obturating material.

**Group V**: past inject (Similar to group II) with Endoflas (1 scoops of powder to 2 drops of liquid) as obturating material.

**Group VI:** Navi Tip (Similar to group III) with Endoflas (1 scoops of powder to 3 drops of liquid) as obturating material.

After obturating the canals, the access cavities were restored with quick setting Zinc oxide and Eugenol cement. Immediate post-operative radiographs were obtained following obturation. All the pulpectomized teeth were restored with semi-permanent restoration (stainless steel crown) in follow up visits.

**Criteria for clinical evaluation**

All the samples were subjected to clinical evaluation pre-operatively and post-operative 3, 6 and 9 months follow up by following criteria:

1. Presence or absence of spontaneous pain
2. Presence or absence of tender on percussion
3. Presence or absence of gingival swelling
4. Presence or absence of draining sinus/fistula

**Scoring criteria for Clinical Evaluation**

**Score 0:** symptoms absent

**Score 1:** symptoms present

**Criteria for radiographic evaluation**

**Reduction or absence of pre-existing pathological furcal radiolucency**

Score 0: decreased size of furcal radiolucency

Score 1:no change or same size furcal radiolucency

Score 2: increased size of furcal radiolucency

To prevent bias clinical and radiographic evaluation were assessed by another investigator and all the results were then subjected to bio statistical analysis by Micro soft excel worksheet (2007) and statistical analysis was done using Statistical Package for Social Sciences, version 20.0 (SPSS, Chicago, IL, USA).

**Observations**

A total of 90 children (M=47, F=43) with a mean age of 6.40 ± 1.19 years participated in the present study in which pulpectomies were carried out in the mandibular primary second molars. Graph 1, 2 shows demographic distribution of study groups according to age and gender. As regards to Spontaneous Pain and Tenderness on percussion, Gingival Swelling and draining sinus or fistula, following pulpectomy no sample in any group presented with any spontaneous pain and tenderness on percussion post-operatively in 3, 6 and 9 months follow up visits. Furcal radiolucency was compared among all the techniques for each of the material at each follow up visit. None of the cases presented increase in the size of furcal radiolucency, so not presented in the table. Length of obturation was compared among all the techniques for each of the material at each follow up visit. Within ZOE group significant difference was compared among 3 obturation techniques and found to be non-significant. ($\chi^2$= 3.1p = 0.54) A significant difference was found among 3 obturation techniques within the Endoflas group with maximum optimal fillings in group V. ($\chi^2$= 15.60 p = 0.003)

Completeness of filling was compared among all the techniques in terms of presence or absence of voids in each third of mesial and distal root canals (apical, middle and coronal). Within Endoflas group, maximum voids were seen in 28(93.33%) cases in group IV and VI each compared to 23(76.7%) cases in group V in apical third of mesial and distal canals. Maximum voids were seen in 28(93.33%) cases in group IV compared to 22(73.33%) cases in group VI and 11(36.67%) cases in group V in middle third of mesial and distal canals.

Maximum voids were seen in 15(50%) cases in group IV compared to 4(13.33%) cases in group V and 9(30.0%) cases in group VI in coronal third of mesial and distal canals.

**Discussion**

Pulpectomy is an endodontic procedure to salvage the primary teeth when pulp becomes irreversibly infected or necrotic due to caries, trauma or other causes. The rationale of this treatment is near total elimination of microorganism from the root canal and prevention of subsequent reinfection.

Since 1930's Zinc Oxide Eugenol is one of the most widely used materials for root canal filling of primary teeth. Despite having certain disadvantages like slow resorption, irritation to the periapical tissues, necrosis of bone and cementum and altering the path of eruption of succedaneous tooth, high success rates have been reported after obturating with Zinc Oxide Eugenol cement in previous studies.

was used as one of the obturating material because of its easy availability and cost-effectiveness as compared to any other filling material used. Endoflas (Sanlor Laboratories, Miami, FL, USA) being another successful material available was also included in the present study.

Along with the composition and mixing of obturating materials the various technique of obturating the primary root canals play a major role in the success of the pulpectomy procedure. Various techniques for the obturation of primary teeth have been tried clinically to achieve these goals namely; Endodontic pressure

syringe, Mechanical syringe, Tuberculin syringe, Jiffy tube, Incremental filling technique, Endodontic plugger, Navi Tip and Lentulospiral technique.

The Lentulospiral is the most traditional and commonly used rotary instrument to carry obturating material into the primary root canals with the help of micro motor handpiece.[13]The past inject (Micro Mega SA, Besancon Cedex, France) is a newly and specifically designed paste carrier device that works similarly to the Lentulospiral. past inject was proved to be a good alternative for transportation of the obturating materials, while eliminating voids and providing a high density of the obturation.

On the other hand, Endodontic pressure syringe is one of the novel traditional technique of delivering the desired material into the root canal that consists of a syringe barrel, threaded plugger, wrench and threaded needle. Recently, a thin and flexible metal tip was introduced viz., Navi Tip (Ultra dent products Inc. South Jordan, Utah, USA) to deliver root canal sealer and available in different lengths with reported success rate in previous studies.

A need has always persisted to evaluate the optimum technique of obturation of primary teeth, so as to obtain a compact and dense filling of the root canal. Hence, the purpose of this study was to compare the efficiency of Endodontic pressure syringe with Navi Tip and past inject as obturation techniques using ZOE or Endoflas as obturating material in primary teeth.

In the present study, all the pulpectomized teeth were evaluated clinically for spontaneous pain, tenderness on percussion, gingival swelling and draining sinus or fistula preoperatively and post-operatively at 3, 6 and 9 months follow up. At the end of the study no clinical failure was observed in any of the study samples indicating that Zinc Oxide Eugenol and Endoflas can have its clinical application for obturation of primary root canals using any of the obturating techniques described. The reason for complete clinical success in the present study may be attributed to thorough bio mechanical preparation and copious irrigation of root canals at multiple visits.

Radio graphic assessment of furcal radiolucency showed no significant difference between both the obturation materials but maximum cases with reduction in the size of furcal radiolucency was found within Endoflas group at the end of 9 months follow up. This finding may be attributed to the broad-spectrum antibacterial efficacy of Endoflas because of its iodoform content.

In the present study when length of obturation was compared among 3 obturating techniques, significant difference was found with Endoflas only ($p = 0.003$). past inject system gave maximum optimal fillings with both the obturating materials. This finding is in accordance with the study by Gandhi et al and Grover R et al., where past inject exhibited the highest number of optimally filled canals. Success of this technique can also be attributed to the fact that past inject is a specially designed paste carrier with flattened blades, which improves material placement into root canal, causing a lower occurrence of under filled and overfilled canals regardless of the obturating materials used.

In the present study, all the techniques used to obturated the root canals led to voids in the filling material, a finding consistent with earlier reports. This observation was perhaps due to radiographs taken in two directions only in RVG, so it was not possible to find exact measurement and location of all the voids present and this could be a drawback of this study.

Completeness of filling (voids) in different canals after obturation and subsequent radiological examination revealed maximum voids with Endoflas using Endo

dontic pressure syringe and Navi Tip at each third of root canals compared to ZOE. However, significant difference was found only at middle third of root canals between both the obturating materials. [18] ($p = 0.002$, $p = 0.01$) The possible reason for maximum voids with Endo flas in present study was attributable to the thicker consistency of the Endoflas which is difficult to flow within thin canula of the Endodontic pressure syringe and NaviTip compared to ZOE paste which is smooth and easily passed inside the canula. Difficulties in placing the rubber stop correctly and removing the needle (because of the need to refill the hub of the syringe several times during the procedure) may lead the clinician to remove and reinsert the syringe repeatedly, which, in turn, may displace the paste, create voids, and thus decrease filling quality. On the other hand, past inject presented least voids in each third of the root canals but a significant difference was found only in middle and coronal third of the root canals with Endoflas only. This finding is in accordance with study by Grover et al, Oztan et al and Gandhi et al in which minimum number of voids was observed in canals filled with past inject technique.[14,17]Fewer voids in past inject system is attributed to its flatter blades which favors a better intracanal placement of obturating materials minimizing the entrapment of voids.

**Conclusion**

Based upon the radiographic assessment, it was observed that both Endodontic pressure syringe and past inject gave maximum number of optimal obturations. We found that pressure syringe gave a compact filling but it was time consuming. On the other hand, past inject was easy to use. Considering above facts, in the present study past inject system along with Endoflas or ZOE obturating material was found to have maximum optimal fillings with comparable voids at each third of root canals suggesting past inject to be a better obturating technique regardless of the obturating materials used. Further clinical trials with larger sample size and evaluation in 3-D (CBCT) are needed to validate the results of present study.

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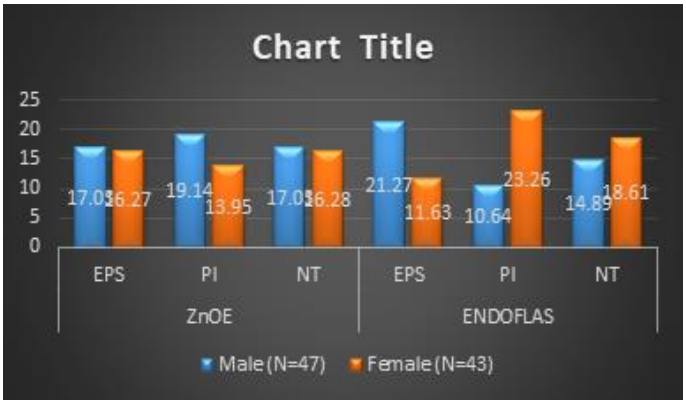
**Legend Figure**

Graph 1: Gender distribution of samples according to obturation techniques




Graph 2: Age distribution of study participants (Mean ± Standard Deviation) according to obturation materials

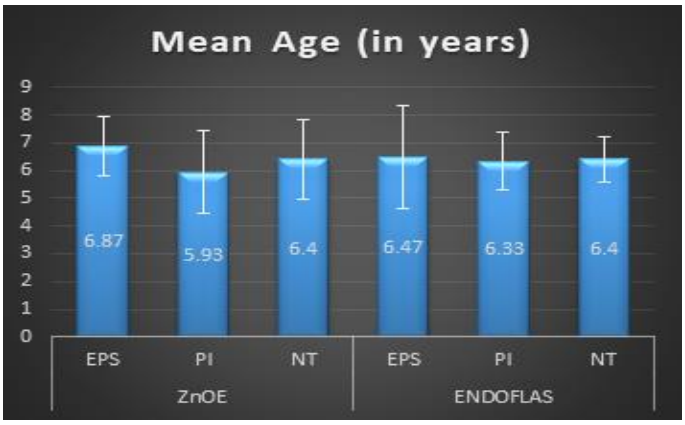



Figure 1: Armamentarium and materials used

Figure 2: (A) Obturation endodontic pressure syringe, 2 (B) Obturation using past inject 2 (c) Obturation using Navi Tip

Figure 3: Endo dontic pressure syring and zoe.

(A) : immediate post- oprative

(B) : 3 monthes follow up

(C) : 9 months follows up.

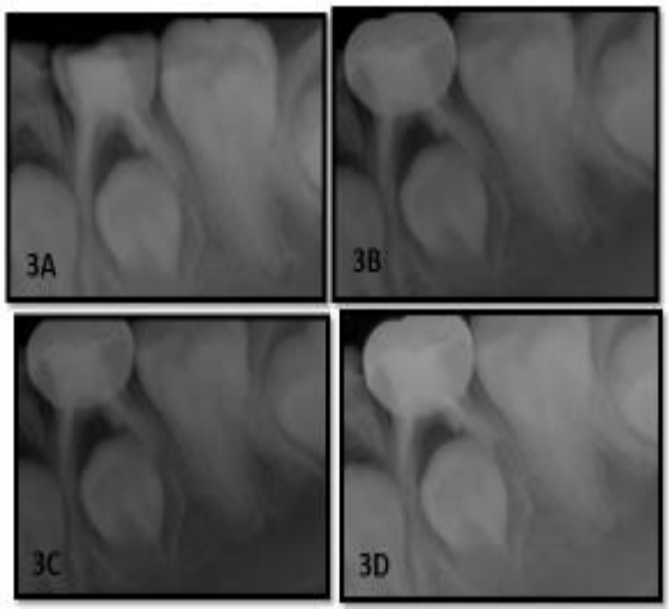



Figure 4: Past inject and ZOE.

(A): immediate post- oprative 4

(B): 3 monthes follow up

( C) : 6 months follows up.

(D): 9 months follows up.

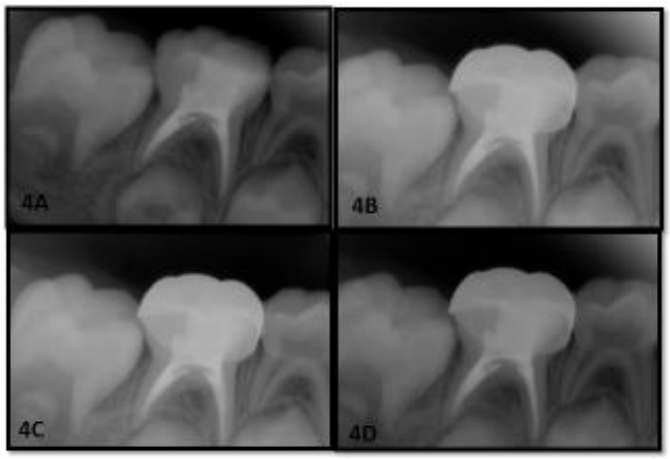



Figure 5: Endo dontic pressure syring and endoflas.

(A) : immediate post- oprative 6

(B) : 3 monthes follow up

(C) : 6 months follows up.

(D) : 9 months follows up.