

Primary Molar Pulpectomy Using Two Different Obturation Techniques: A Clinical Study

Abstract

Context: A major goal in pediatric dentistry is preservation of the integrity of primary teeth and their supporting tissues until physiological process of exfoliation takes place. Pulpectomy serves such a purpose using various materials and techniques to fill the canals of primary teeth. **Aims:** The aim of this *in vivo* study was to determine the efficacy of modified disposable syringe technique in root canals of primary molars using digital radiography when obturated with endoflas. **Settings and Design:** A clinical study was undertaken for a period of 6 months. **Subjects and Methods:** A total of 60 primary maxillary and mandibular molars were selected in the age group of 4–8 years and randomly divided into two groups. The teeth were obturated with handheld lentulospiral and a modified disposable syringe techniques. Postoperative radiographic evaluation was done for quality of fill and voids using digital radiography. Statistical Analysis Used: Results were assessed using Chi-square test and Mann–Whitney U-test. **Results:** No statistically significant difference between quality of obturation using hand-held lentulospiral and modified disposable syringe ($P < 0.05$) was observed. Optimal obturation was achieved in both techniques; however, voids in obturation were not significant. **Conclusions:** Both the hand-held lentulospiral and modified disposable syringe technique are effective in the obturation of primary molar root canals in terms of quality of fill.

Keywords: Disposable syringe, lentulospiral, obturation techniques, primary teeth, pulpectomy

Introduction

Pulpectomy is a root canal procedure for pulp tissue that is irreversibly infected or necrotic. The root canals are debrided and shaped and canals are dried and obturated with a resorbable material.^[1] In pediatric endodontics, zinc oxide eugenol is commonly used obturation material although it fails to meet the ideal requirements of an obturating material. Endoflas is a combination of three materials, i.e., zinc oxide eugenol, calcium hydroxide, and iodoform and has gained popularity in the recent past as an obturating material in primary teeth. The rationale behind incorporating these three materials into endoflas is to compensate for the disadvantage of one individual material with the advantages of the other.^[2] Aseptic root canal preparation and hermetic seal of the root canal system determine the success of pulpectomy procedure in necrotic primary teeth.^[3] For an effective obturation, the technique plays a very influential role. Various obturation techniques have been described in the pediatric endodontic

literature such as incremental filling technique^[4] and lentulospiral technique which are hand held or motor driven.^[5,6] The syringe technique involves injection of the material into the root canals. In literature, syringe techniques such as mechanical syringe, endodontic pressure syringe, tuberculin syringe, insulin syringe, local anesthetic syringe, and NaviTip syringe^[7] have been used with zinc oxide eugenol with hardly any reports employing the use of endoflas with this technique. All these syringe techniques make use of a metal needle which may instill anxiety in a child thus altering the chair-side behavior and questioning the success of the procedure. Premixed syringe containing a mix of calcium hydroxide and iodoform paste (Vitapex and Metapex) is presently available in the market.^[8,9] Premixed syringe has a viscous mix of iodoform and calcium hydroxide in syringes which are available with disposable tips. Since the paste is already available in a certain consistency, the operator cannot alter it to suit his/her needs or replace the material with one having different antimicrobial efficacy. With

**C. Nagarathna,
Soundarya
Vishwanathan,
Navin H.
Krishnamurthy,
Prasanna K. Bhat**

*Department of Pedodontics
and Preventive Dentistry,
Rajarajeswari Dental College
and Hospital, Bengaluru,
Karnataka, India*

Address for correspondence:
Dr. Soundarya Vishwanathan,
Department of Pedodontics
and Preventive Dentistry,
Rajarajeswari Dental
College and Hospital,
Bengaluru, Karnataka, India.
E-mail: drsoundarya13@gmail.
com

Access this article online

Website:

www.contempclindent.org

DOI: 10.4103/ccd.ccd_826_17

Quick Response Code:



How to cite this article: Nagarathna C, Vishwanathan S, Krishnamurthy NH, Bhat PK. Primary molar pulpectomy using two different obturation techniques: A clinical study. *Contemp Clin Dent* 2018;9:231-6.

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: reprints@medknow.com

the advent of new obturating materials in the market and the quest for new and better obturating techniques, we believe that a replacement of the metal needle in the disposable syringe with a plastic disposable tip using endoflas as the material for obturation would prove to be efficient. Hence, the objective was to determine and compare handheld lentulospiral technique and modified disposable syringe obturating technique in root canals of primary molars. Thus, the purpose of this *in vivo* study was to determine the efficacy of modified disposable syringe technique in root canals of primary molars for obturation with endoflas using digital radiography.

Subjects and Methods

This clinical study was undertaken in the Department of Pediatric Dentistry, Rajarajeswari Dental College and Hospital, Bengaluru, for a period of 6 months. Before the study, ethical clearance was obtained from of the Institutional Review Board (RRDCH/152/2017–2018). Participation in the study was voluntary and prior written consent was obtained from the parents or guardians. The sample size was estimated using the software GPower Software Version 3.1.9.2. Released 2014. (Kiel University, Germany). Considering the effect size to be measured (d) at 80%, power of the study at 85%, and the margin of the error at 5%, the total sample size needed was sixty. Sixty normal and healthy children aged 4–8 years were included in the study. Standardized intraoral periapical radiographs showing all the roots and their apices were taken. A detailed case history was recorded and oral examination was done by one of the investigators and enrolled children with the following inclusion criteria for the study. Children with the history of persistent pain, clinically nonvital tooth with pus discharge, continuous bleeding after amputation of coronal pulp tissue, radiographs showing interradiolar or periapical radiolucency were included in our study. Any nonrestorable tooth, tooth with pathological lesion extending to the successor tooth germ, tooth with evidence of external and internal root resorption were excluded from the study. Only one tooth per child was included in the study. In case the patient had more than one tooth meeting the inclusion criteria, tooth with a more severe complaint was included [Table 1] Based on technique of obturation,

two groups were made. A computer-generated randomized sequence list was used to randomly allocate thirty patients in each group. All other contributors to the study were blinded to the group allocation.

All root canals were prepared and filled by a single investigator. The tooth was anesthetized and isolated with rubber dam. Before gaining access, all caries were excavated by a large round bur. The pulp chamber's roof was removed with a no. 330 carbide bur (Dentsply Professional) in a high-speed handpiece. The pulp chamber was cleaned using a slow-speed no. 4 round bur. A tentative length was obtained by measuring the tooth on the preoperative radiograph and subtracting 1–2 mm. A diagnostic radiograph with a K-file placed in each canal was taken to ascertain the length of the root canal. The working lengths were established radiographically and kept 1 mm short of the radiographic apex. Standard hand files (Mani Co., Tokyo, Japan) were used to enlarge the root canals to size 35. Saline and 1% sodium hypochlorite solution were used alternatively for irrigation.^[9] Canals were dried with absorbent paper points (Diadent) and obturated using one of the randomly assigned techniques using a computer-generated randomized sequence list. The obturating technique to be used for the tooth was revealed to the operator only at this stage.

A mix of endoflas (Sanlor and Cia. S. en C.S., Cali, Colombia) was used for obturating the root canal. Endoflas is composed of triiodomethane and iodine dibutylorthocresol (40.6%), zinc oxide eugenol (56.5%), calcium hydroxide (1.07%), barium sulfate (1.63%), with a liquid consisting of eugenol and paramonochlorophenol.^[6,9] Powder-liquid ratio was adjusted to suit the respective technique.

Control group: Handheld lentulospiral technique

The creamy mix of endoflas was obtained by mixing one scoop of powder with two drops of liquid. A rubber stop was placed at the predetermined working length. A lentulospiral of size 25, length 21 mm (Handy Lentulo, Dentsply) was held by hand; it was inserted into the canal with clockwise rotation, accompanied by a vibratory motion to allow the material to reach the apex, and then withdrawn from the canal, while simultaneously continuing the clockwise rotary motion. A wet cotton pellet was used to lightly press the material.

Test group: Modified disposable syringe technique

One scoop of endoflas powder was mixed with three drops of liquid to obtain thin, flowable consistency. A disposable 2 ml syringe (Dispo Van, Hindustan Syringes and Medical Devices Ltd., India) was modified by fitting with disposable tips (Meta Biomed) [Figure 1]. Approximately 1 ml of the material was loaded in the syringe, which was then tapped on a solid surface till the bubbles entrapped were removed. The disposable tip was fixed and flow of the material was checked. A rubber stop was placed at the predetermined

Table 1: Distribution of primary molars according to technique of obturation in the age group of 4-8 years belonging to either gender

Primary molars	Handheld lentulospiral group	Modified disposable syringe	Total
Maxillary 1 st molar	2	5	7
Maxillary 2 nd molar	7	8	15
Mandibular 1 st molar	10	7	17
Mandibular 2 nd molar	11	10	21
Total	30	30	60

working length. The tip was inserted into the prepared canals until wall resistance is encountered. The tip was gradually withdrawn while pushing the material. A wet cotton pellet was used to lightly press the material.

A postoperative radiograph using phosphor imaging plate system and Vista scan (Durr dental, Germany) was taken immediately. To ensure reliability and repeatability of film positioning during the radiographic analysis, Rinn XCP instrument (Rinn Corp., Elgin, USA) was customized with a silicon registration and used with a paralleling technique. The phosphor image plates of a digital X-ray system (Durr Dental) were exposed to an X-ray source set at 70 kVp, 10 mA, and 0.20 s exposure time. Each radiograph was mounted in a slide frame and projected onto a screen. Only palatal canals in maxillary molars and distal canals for mandibular molars were considered for assessment. The quality of obturation was assessed based on the modification of the criteria put forth by Coll and Sadrian^[5,10] [Figures 2 and 3]. These canals were chosen for evaluation as they are wider, generally large, uniform canal outline and are not overlapped by other roots. The obturation was assessed by two investigators who were blinded to the group allocation and technique of obturation. In cases of disagreement, the lower score was selected.

- a. Underfilling (score 1) – Canal filled more than 2 mm short of the apex
- b. Optimal filling (score 2) – Canal filling ending at the radiographic apex or up to 2 mm short of apex
- c. Overfilling (score 3) – Any canal showing filling outside the root apex.



Figure 1: Disposable syringe with disposable tip used for obturation

Evaluation of voids was based on their presence/absence and their number in each third of the root canal. The data were assessed using Statistical Package for Social Sciences Software (SPSS), Version 22 Released 2013. (Armonk, NY: IBM Corp). Chi-square test was used to compare the proportional difference in the distribution of quality of obturation between test and control group. Mann–Whitney U-test was used to compare the difference in the mean number of voids between test and control group in different areas of root canal. The level of significance (*P* value) was set at *P* < 0.05.

Results

Independent Chi-square test to compare the results revealed no statistically significant results in regard to quality of obturation and voids. A relatively increased percentage of optimal fillings in the test group (66.7%) was seen as compared to the control group (60%). In contrast, test group showed decreased overfilling as compared to control group [Table 2].

Voids in obturation were found in both the groups. According to the Mann–Whitney U-test, significant difference was found in the apical third of root canal (*P* = 0.01) while coronal and middle thirds showed no statistical difference for voids [Table 3].

Discussion

In the present study, the modified disposable syringe performed in par with the traditionally used handheld



Figure 2: Underfilling, optimal filling, and presence of voids in disposable syringe obturation

Table 2: Comparison of quality of obturation between two groups using Chi-square test

Variables	Categories	Control group, n (%)	Test group, n (%)	<i>C</i> ²	<i>P</i>
Depth of Fill	Underfill	3 (10.0)	3 (10.0)	0.355	0.84
	Optimal	18 (60.0)	20 (66.7)		
	Overfill	9 (30.0)	7 (23.3)		
Voids	Present	20 (66.7)	15 (50.0)	1.714	0.19
	Absent	10 (33.3)	15 (50.0)		

lentulospiral in achieving optimal obturation. In a study by Guelmann *et al.*,^[11] the premixed Vitapex syringe used showed good clinical results. They reported 66% of optimal fillings in primary incisors. Authors also reported thick consistency of the paste and could not be expressed through a narrow lumen. In our study, a similar plastic disposable tip used showed 66.7% of optimal fillings in the curved root canals of primary molar teeth. Other studies by Bhandari and Prajapati^[12] reported the use of a local anesthetic syringe with 25/26-gauge needle. This method was described as simple, economical, easy to master and can be used with almost all obturating materials. However, according to Memarpour *et al.*,^[7] the quality of root canal filling with the local anesthetic syringe was inferior to that of the lentulospiral and NaviTip.

Handheld lentulospiral showed good results in terms of quality of obturation in our study. Bawazir and Salama^[5] evaluated *in vivo*-mounted lentulospiral and handheld lentulospiral in primary teeth and concluded that there was no statistically significant difference between the two techniques in terms of quality of the root canal filling. Sigurdsson *et al.*^[13] reported that lentulospiral presented best results when comparison of endodontic file, syringe, and lentulospiral was made. In an *in vivo* study by

Vashista *et al.*,^[14] the handheld lentulospiral technique performed better in terms of optimally filled canals.

In the present study, both techniques led to voids in the obturation – a finding consistent with other reports.^[4,7,15,16] In a study by Hiremath and Srivastava,^[17] local anesthetic syringe and insulin syringe showed the presence of voids. Voids in obturation using the modified disposable syringe is due air entering the barrel while loading the material or the use of a relatively thick plastic tip. In the present study, mean number of voids in the apical third was significantly less in the test group. The material was injected into the root canals ensuring a good apical seal while air entrapment could have occurred in the middle and coronal regions while withdrawing the syringe. Air bubbles may be entrapped during the manipulation of the material or during the repeated removal and reinsertion of the lentulospiral.^[7] The presence of voids in both the apical and coronal parts of the root filling may provide pathways for leakage allowing bacterial regrowth, reinfection, and culture reversal, leading to posttreatment disease.^[18] All teeth in this study were restored with glass ionomer cement and a stainless steel crown cemented in the subsequent appointment.^[8] No follow-up was done; however, all individuals were reported to be asymptomatic in the subsequent appointment where stainless steel crown was placed. Evaluation of the amount of apical or coronal leakage in root-filled teeth determines the quality of obturation.^[19] However, if the cleaning and shaping is ideal with a good coronal seal, the presence of voids in obturation will not be the primary criteria to determine the success or failure of pulpectomy.

There were several benefits with the use of the modified disposable syringe. The operator could check the flow of the material owing to the translucency of the tip, and there is no tendency for fracture. The disposable tip could be cut to a desirable length for obturating the root canals. Another advantage associated with the modified disposable syringe is there is no fear of cross contamination as these tips and the syringes are for single use only and can be safely disposed. The child was more comfortable during the final procedure of obturation. The reasons for underfilling are due to limited flexibility of the plastic tip and lack of operator experience. Handheld lentulospiral shows difficulties with fitting the rubber stop, a tendency for extrusion beyond the apex and instrument fracture. Handheld lentulospiral is designed with consistently spaced spirals which evenly distribute



Figure 3: Underfilling, optimal filling, overfilling, and presence of voids in handheld lentulospiral obturation

Table 3: Comparison of mean values for number of voids in root canals between two groups using Mann-Whitney U-test

Area	Group	n	Mean	SD	Mean rank	Z	P
Coronal one-thirds	Control	30	0.6	0.9	29.8	-0.378	0.71
	Test	30	0.5	0.5	31.3		
Middle one-thirds	Control	30	1.0	1.1	32.3	-0.872	0.38
	Test	30	0.7	0.8	28.7		
Apical one-thirds	Control	30	0.7	0.7	35.5	-2.563	0.01*
	Test	30	0.3	0.5	25.5		

*Statistically Significant. SD: Standard deviation

the material throughout the root canal. The design and flexibility of the lentulospiral allows the paste to be carried throughout the narrow, curved canals in primary molars^[7,20] and provides better control as it is held by hand.^[21] Though lentulospiral is a widely accepted successful technique for delivery, even experienced operators need to reinsert material to ensure better filling quality. There are reports that indicate if a lentulospiral separates in the root canal system, retrieval could be very difficult or impossible.^[22]

The limitations of this present study is that only the distal canals and palatal canals were taken into consideration for assessment and the efficacy of the modified disposable tip in obturating small, narrow, and torturous canals of primary teeth is a challenge for any dentist and further research is recommended on a larger population.

In our study, we have used the disposable tips which are available along with metapex. We believe that the current study will be a boon for further research in the pursuit of better obturating techniques. The external validity of this study is limited, due to the fact that the pulpectomy was performed by specialists in a hospital, with patients identified mainly following referral. Patient selection, procedure, and evaluation were carried out by different pediatric dentists in order to eliminate any potential bias. The group allocation was informed only after the root canal preparation was completed; however, there is a possibility of bias due to difference in consistency of the pastes used for obturation. An attempt by the authors was made to use a similar powder-liquid ratio as the control group, due to the narrow lumen the paste could not be expressed and hence the difference in the consistencies. The quality of fill depends on the ability of material to adapt to canal walls which in turn can depend on the delivery system used to carry the obturating material to the canals. Other studies^[9,23] have shown success rates of 93.3%–95.1% with endoflas. As per our study, endoflas using the modified disposable syringe technique showed 66.7% optimal fillings. Thus, long-term *in vivo* studies are suggested to evaluate efficacy of this technique in all the root canals of primary teeth with follow-up.

Conclusions

Both the above techniques of obturation showed optimum number of optimal fillings although no overfills were seen with modified disposable syringe technique. Modified disposable syringe can be recommended as a technique of obturation as it is simple, easy to use, less threatening to the child and relatively less time-consuming when compared to the handheld lentulospiral technique.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Thomas AM, Chandra S, Chandra S, Pandey RK. Elimination of infection in pulpectomized deciduous teeth: A short-term study using iodoform paste. *J Endod* 1994;20:233-5.
2. Rewal N, Thakur AS, Sachdev V, Mahajan N. Comparison of endoflas and zinc oxide eugenol as root canal filling materials in primary dentition. *J Indian Soc Pedod Prev Dent* 2014;32:317-21.
3. Rodd HD. UK national clinical guidelines in paediatric dentistry. *Int J Paediatr Dent* 2006; Suppl 1:15-23.
4. Dandashi MB, Nazif MM, Zullo T, Elliott MA, Schneider LG, Czonstkowsky M, et al. An *in vitro* comparison of three endodontic techniques for primary incisors. *Pediatr Dent* 1993;15:254-6.
5. Bawazir OA, Salama FS. Clinical evaluation of root canal obturation methods in primary teeth. *Pediatr Dent* 2006;28:39-47.
6. Fuks AB, Eidelman E, Pauker N. Root fillings with endoflas in primary teeth: A retrospective study. *J Clin Pediatr Dent* 2002;27:41-5.
7. Memarpour M, Shahidi S, Meshki R. Comparison of different obturation techniques for primary molars by digital radiography. *Pediatr Dent* 2013;35:236-40.
8. Nurko C, Ranly DM, Garcia-Godoy F, Lakshmyya KN. Resorption of a calcium hydroxide/iodoform paste (Vitapex) in root canal therapy for primary teeth: A case report. *Pediatr Dent* 2000;22:517-20.
9. Subramaniam P, Gilhotra K. Endoflas, zinc oxide eugenol and metapex as root canal filling materials in primary molars – A comparative clinical study. *J Clin Pediatr Dent* 2011;35:365-9.
10. Coll JA, Sadrian R. Predicting pulpectomy success and its relationship to exfoliation and succedaneous dentition. *Pediatr Dent* 1996;18:57-63.
11. Guelmann M, McEachern M, Turner C. Pulpectomies in primary incisors using three delivery systems: An *in vitro* study. *J Clin Pediatr Dent* 2004;28:323-6.
12. Bhandari SK, Prajapati U. Root canal obturation of primary teeth disposable injection technique. *J Indian Soc Pedod Prev Dent* 2016;30:13-8.
13. Sigurdsson A, Stancil R, Madison S. Intracanal placement of calcium hydroxide: A comparison of techniques. *J Endod* 1992;18:367-70.
14. Vashista K, Sandhu M, Sachdev V. Comparative evaluation of obturating techniques in primary teeth: An *in vivo* study. *Int J Clin Pediatr Dent* 2015;8:176-80.
15. Subba Reddy V, Shakunthala B, Reddy S, Subba R. Comparative assessment of three obturating techniques in primary molars an *in vivo* study. *Endodontology* 1997;9:13-6.
16. Walia T, Ghanbari AH, Mathew S, Ziadlou AH. An *in vitro* comparison of three delivery techniques for obturation of root canals in primary molars. *Eur Arch Paediatr Dent* 2017;18:17-23.
17. Hiremath MC, Srivastava P. Comparative evaluation of endodontic pressure syringe, insulin syringe, jiffy tube, and local anesthetic syringe in obturation of primary teeth: An *in vitro* study. *J Nat Sci Biol Med* 2016;7:130-5.
18. Peters CI, Koka RS, Highsmith S, Peters OA. Calcium hydroxide dressings using different preparation and application modes: Density and dissolution by simulated tissue pressure. *Int Endod J* 2005;38:889-95.
19. Akman M, Akman S, Derinbay O, Belli S. Evaluation of gaps or voids occurring in roots filled with three different sealers. *Eur J Dent* 2010;4:101-9.

20. Mahajan N, Bansal A. Various Obturation methods used in deciduous teeth. *Int J Med and Dent Sci* 2015;4:708-13.
21. Nagaveni NB, Yadav S, Poornima P, Reddy VS, Roshan NM. Volumetric evaluation of different obturation techniques in primary teeth using spiral computed tomography. *J Clin Pediatr Dent* 2017;41:27-31.
22. Torres CP, Apicella MJ, Yancich PP, Parker MH. Intracanal placement of calcium hydroxide: A comparison of techniques, revisited. *J Endod* 2004;30:225-7.
23. Ramar K, Mungara J. Clinical and radiographic evaluation of pulpectomies using three root canal filling materials: An in-vivo study. *J Indian Soc Pedod Prev Dent* 2010;28:25-9.