



Evaluation of Quality of Obturation using Two Different Root Canal Drying Methods during Pulpectomy: A Randomized Clinical Trial

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KEYWORDS	ABSTRACT:
Root canal drying methods; Paperpoints; Pulpectomy; Coll and Sadrian criteria; Novel suction aspirator	<p>Introduction: Drying the root canals in pulp therapy is often ignored, but is essential for a successful clinical outcome. Due to certain shortcomings of various root canal drying methods, a new Novel suction aspirator with apical broach was designed.</p> <p>Objectives: To compare the effectiveness of drying the prepared root canals by Novel suction aspirator with apical broach and conventional paper points on quality of obturation using Coll and Sadrian criteria.</p> <p>Methods: 20 children aged 5-8 years with prepared primary molar root canals indicated for pulpectomy were randomly divided into two groups based on drying method employed, Group 1- Novel Suction aspirator with apical broach and Group 2- Absorbent Paper points. After obturation with Metapex, the quality of obturation was determined using Coll and Sadrian criteria in both the groups. Chi-square test was used for comparing difference in proportions in two independent groups for qualitative variables.</p> <p>Results: 80% teeth showed optimal filling with group 1 compared to 30% teeth in group 2 (p value=0.025). 90% teeth in group 1 showed no voids in obturation compared to 60% teeth in group 2 (p=0.021).</p> <p>Conclusions: Significant results were found in Coll and Sadrian's criteria of apical filling and voids criteria, concluding that a Novel suction aspirator with apical broach can be used as a more cheaper and effective alternative root canal drying technique to absorbent paper points.</p>



1. Introduction

The primary goal of pulp therapy in pediatric dentistry is to preserve the integrity of primary dentition until natural exfoliation. Maintaining healthy primary teeth is crucial for the growth and development of the facio-skeletal complex. Dental caries is the leading cause of early tooth loss, which can be prevented through pulpectomy treatment.¹

A well-prepared root canal system, combined with a three-dimensional (3D) seal, is key to clinical success.² The obturation phase of pulp therapy aims to prevent reinfection in cleaned, shaped, and disinfected root canals through effective instrumentation, irrigation, and medication. Successful obturation relies on materials and techniques that ensure dense filling of the entire root canal system. Studies show that the success of pulp therapy depends on both the quality of obturation and the final restoration.³

Properly drying the root canal after instrumentation and irrigation is a crucial step before obturation in endodontic treatment, which is often ignored. If moisture remains in the root canal, achieving high-quality obturation becomes impossible, as it hinders the establishment of a primary bond between the dentinal walls and the obturation material.⁴ Additionally, residual moisture can increase the risk of reinfection and lead to pulpectomy failure.⁴

Various materials and methods, such as paper points, alcohols (ethyl alcohol, isopropyl alcohol), EndoVac, Luer vacuum adapters, CANAL CLEAN, and Endo Aspirator, have been used to achieve proper drying of the root canal system. Absorbent paper points, typically matching the size of the master apical file, are commonly used for drying root canals (Bence 1976, Edwards & Brandyopadhyay 1981).⁵ However, this method has certain limitations: producing absorbent points chairside is challenging, commercially available ones can be costly when used in large quantities, and they may not always reach the apical end in long, curved roots.⁵

A new, cost-effective, and more efficient technique for root canal drying, incorporating a suction aspirator and an apical broach, was developed. The aim of this study is to compare the effectiveness of this novel suction aspirator with an apical broach against absorbent paper

points in drying prepared root canals, evaluating the quality of obturation using Coll and Sadrian's criteria.

2. Objectives

The objective of this study was to evaluate and compare the efficacy of a newly developed Novel Suction Aspirator with Apical Broach against conventional absorbent paper points in drying root canals of primary molars prior to obturation. Effective drying is a critical, yet often overlooked step in pediatric pulp therapy that significantly influences the quality and success of root canal obturation. This study aimed to determine whether the novel device could enhance clinical outcomes by improving obturation quality, as assessed using the Coll and Sadrian criteria.

3. Methods

This randomized control trial study was analyzed and approved by the SDKSDCH Institutional Ethics Committee, Nagpur, India. 20 children aged 5-8 years with prepared mandibular first and second primary molar root canals indicated for pulpectomy with Frankle's Positive and definitely positive behaviour rating and molars with more than 1/3rd root left after resorption were included in this study. Special care children and children with systemic conditions, mandibular molars with swelling, fistula, sinus or any other signs of mobility, severe root resorption indicated for extraction were excluded from this study.

Complete case history of patients was taken and parent consent was obtained. After local anaesthesia administration and rubber dam isolation, access opening was done with a round and safe end bur followed by irrigation with normal saline and cleaning and shaping of root canal with 25,4% Pro AF baby gold rotary file. Materials required for the study include Novel suction aspirator, apical broach, paper points, cotton, rubber dam. (Fig.1) Children were randomly divided into two groups, Group 1- Novel suction Aspirator with Apical broach (10) and Group 2- Absorbent paper points (10).



Fig. 1- Armamentarium required for the study

In group 1, the Novel suction aspirator was fabricated chairside using 25 gauge, 2 ml Dispo Van syringe replacing plunger with a suction aspirator at the rear end and replacing the needle and hub with an aspirating tip at the anterior end (suction aspirator) along with one size smaller sterilized master apical k file with absorbent cotton wound evenly (apical broach). (Fig. 2) The suction aspirator was inserted into the pulp chamber and was used to dry the orifice and coronal third of the root canal effectively. (Fig. 3-A, B) Apical broach was rotated in a clockwise direction inside the root canal, extending to the working length and withdrawn in an anticlockwise direction along with unwinding cotton using alcohol-wetted cotton. The procedure was repeated until the middle and apical thirds were thoroughly dried. (Fig. 3-C)

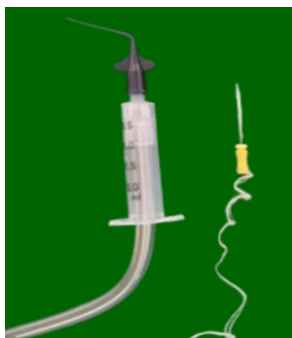


Fig. 2- Novel suction aspirator with apical broach



Fig. 3- Root canal drying with A, B-Novel suction aspirator and C-apical broach

In group 2, the canals were blot dried with consecutive paper points until complete dryness of the last point was confirmed visually. (Fig. 4)

After thorough drying, metapex obturation was done in both the groups. Radiographic examination was done based on Coll and Sadrian's criteria.(Fig. 5) Scorings were allocated to the radiographs based on apical filling and voids sub criteria. (Fig. 6,7) After obturation, GIC restoration was done followed by Stainless steel crown placement.

Data was coded and analysed with the statistical software, STATA, version 10.1 by StataCorp, Texas, USA. Descriptive statistics was done using mean, standard deviation for quantitative variables while frequency and percentages was used for qualitative variables. P-values <0.05 was considered statistically significant. Chi-square test was used for comparing difference in proportions in two independent groups for qualitative/categorical outcome variables.

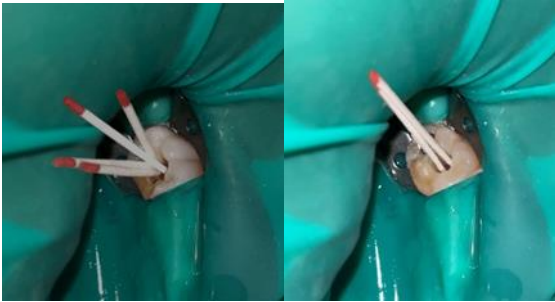


Fig. 4- Root canal drying with Absorbent paper points

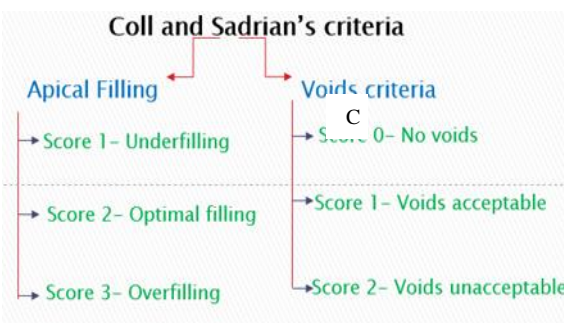


Fig. 5- Coll and Sadrian's criteria

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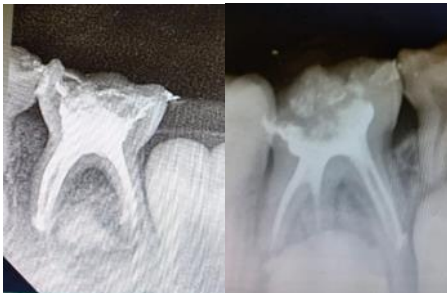
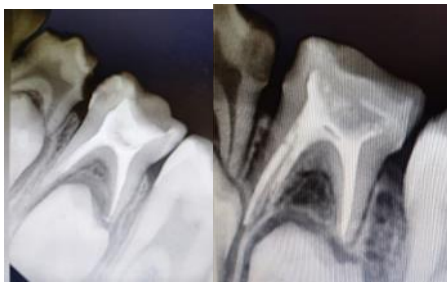


Fig. 6- Scoring given to obturation done in group 1 based on Coll and Sadrians criteria.



Score- 1,1

Score- 2,2

Fig. 7- Scoring given to obturation done in group 2 based on Coll and Sadrians criteria

5. Results

In terms of gender, no significant difference was found in both the groups. (Table 1)

Table 1: Gender comparison between two study groups respectively

Table 1	Frequency (n)	Percentage (%)
	Males	Females
Group 1 (Novel Suction aspirator with apical broach)	6 (60%)	4 (40%)
Group 2 (Paper Points)	7 (70%)	3 (30%)
Chi square test =0.220, p=0.639		

In terms of age, no significant difference was found in both the groups. (Table 2)

Table 2: AGE comparison between two study groups respectively

Table 2	Mean	SD
Group A (Novel Suction aspirator with apical broach)	6.1	0.99
Group B (Paper Points)	6.6	0.84
Unpaired t test	t=-1.213, p=0.241	

In terms of filling criteria based on Coll and Sadrian's criteria, 80% children in Group 1 showed optimal filling compared to 30% in Group 2, with a significant p value of 0.025. (Table 3)



Table 3: Obturation filling score comparison between two groups

	Score 1 (Under Filling) N (%)	Score 2 (Optimal Filling) N (%)	Score 3 (Over Filling) N (%)
Group 1 (Novel Suction aspirator with apical broach)	01-Oct -10%	08-Oct -80%	01-Oct -10%
Group 2 (Paper Points)	05-Oct -50%	03-Oct -30%	02-Oct -20%
Chi square test value	Chi = 7.41		
P value, Significance	p=0.025		

In terms of voids criteria based on Coll and Sadrian's criteria, 90% children in Group 1 showed optimal filling compared to 60% in Group 2, with a significant p value of 0021. (Table 4)

Table 4: Void score comparison between two groups

	Score 0 (Good) N (%)	Score 1 (Voids accepted) N (%)	Score 2 (Voids unaccepted) N (%)
Group 1 (Novel Suction aspirator with apical broach)	9/10 (90%)	1/10 (10%)	0/10 (0%)
Group 2 (Paper Points)	6/10 (60%)	3/10 (30%)	1/10 (10%)
Chi square test value	Chi = 5.33		
P value, Significance	p=0.021		

6. Discussion

Epley⁶ emphasize that the success of a thoroughly cleaned and well-prepared root canal system depends on proper obturation. Variations in residual moisture within the root canal have been shown to impact the sealing effectiveness of both conventional sealers and obturating materials.⁷ Consequently, the adhesion quality between root canal dentin and obturating materials may be influenced by moisture levels present before the obturation process.⁸

Conventionally, a series of paper points are used to dry the canal which is expensive. Wakabayashi⁵ observed that canals dried using paper points retained moisture at the apical stop and along the apical third of the canal wall. In some cases, they may not effectively reach the apical end of the canal, particularly in long, curved roots, which is overcome with the use of novel suction aspirator with apical broach.

Assessing the quality of obturation is the primary method for evaluating the success of any new instrument, material, or technique used in pulpectomy for primary teeth. Coll and Sadrian's criteria (1996) was used in this study because it is considered as gold standard.⁹

This study assessed the effectiveness of Novel suction aspirator with apical broach compared to conventional paper points, and found statistically significant results in terms of both apical filling (p= 0.025) and Voids criteria (p= 0.021), thus showing Novel suction aspirator with apical broach to be more effective root canal drying method than absorbent paper points.

Novel suction aspirator with apical broach can be made chairside and is more convenient, economical, cheaper, cost effective, readily available and easy to use method of root canal drying compared to paper points. Since, this is an innovative technique, no relevant articles and literature is available.

Novel suction aspirator is used to dry the pulp chamber and coronal 1/3rd of root canal while apical broach is used to dry middle and apical 1/3rd of root canal, reducing the sequential number of cotton changes on k file, thus it is less time consuming. Initially, the authors attempted to dry the apical portion of the canal by wrapping absorbent cotton around a reamer. However, this method proved inconvenient due to the presence of flutes. Challenges included finger injuries while applying or removing the



cotton, difficulty in extracting the cotton, and frequent breakage of instruments smaller than size 30.⁵ In tapered canals, the cotton-wrapped Apical Broach conforms to the canal's shape, allowing it to reach the apical seat—even in long teeth like the maxillary canine. This method is also effective for drying wide canals in young patients. Furthermore, the cotton-wrapped instrument helps assess the presence of blood, exudate, or pus in the apical region of the root canal and can be used for material introduction.⁵

This method has no side effects or does not cause any harm to developing permanent tooth buds and tissue fixation compared to other root canal drying methods like alcohol.¹

The limitations of this study include small sample size, further studies using Novel suction aspirator with apical broach with large sample size are warranted to improve the reliability of the results.

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