Differences on the Obturating Quality in Primary Teeth Between Undergraduate and Postgraduate Students - A Comparative Study

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ABSTRACT

Early childhood caries is one of the most common serious public health diseases in most of the countries across the globe. When left untreated dental caries will progress into the dentin followed by pulpal inflammation. In primary teeth, when the pulpal tissue is irreversibly inflamed or necrotic, pulpectomy is the treatment of choice where the primary root canals are debrided off the infected tissues and shaped to receive a suitable obturation material. Managing dental caries successfully in a pediatric population involves many challenges and requires efficient skills and knowledge in framing a treatment plan with good prognosis. The purpose of this study was to determine the differences in the clinical skill and efficiency in primary teeth root canal obturation between undergraduate and postgraduate students. This comparative study was carried out retrospectively by verifying the case reports and post-operative radiographs for pulpectomy procedures in primary teeth done by the undergraduate and postgraduate students. 50% of the cases done by the postgraduates were optimally obturated whereas only 20% were found to be optimally obturated in the procedures done by the undergraduate students. In conclusion the Obturation quality was found to be better in the procedures done by the postgraduate students, when compared with that of undergraduates

KEY WORDS: PULPECTOMY, PEDIATRIC ENDODONTICS, OBTURATION QUALITY.

INTRODUCTION

Early childhood caries is one of the most common serious public health diseases in most of the countries across the globe. When left untreated dental caries will progress into the dentin followed by pulpal inflammation. In primary teeth, when the pulpal tissue is irreversibly inflamed or necrotic, pulpectomy is the treatment of choice where the primary root canals are debrided off the infected tissues and shaped to receive a suitable obturation material. In recent times, a new pediatric rotary file system was introduced which extended

the purview of pediatric endodontics (Thomas et al., 1994; Jeevanandan, 2017; Jain et al., 2019; Jose et al., 2020;).

Regarding obturation materials in primary teeth, zinc oxide eugenol was commonly used despite its failure to fulfill the requirements of an ideal obturation material from primary teeth. A combination of zinc oxide eugenol, calcium hydroxide and iodoform had gained popularity as a successful obturating material in primary teeth. This combined material is referred to as endoflas and the disadvantage one material will be compensated with the advantage of the other. The success of the pulpectomy procedures in necrotic teeth is determined by the aseptic root canal preparation and the hermetic seal obtained (Kindelan et al., 2008; Rewal et al., 2014; Samuel et al., 2019; Sathish and Karthick, 2020).

For an effective obturation, the technique of obturation plays a very influential role. Various obturation techniques have been described in the pediatric endodontic literature such as incremental filling technique and lentulo spiral technique

Biosc Biotech Res Comm P-ISSN: 0974-6455 E-ISSN: 2321-4007

Identifiers and Pagination

Year: 2021 Vol: 14 No (10) Special Issue

Pages: 76-82

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DOI: <http://dx.doi.org/10.21786/bbrc/14.10.13>

Article Information

Received: 09th Aug 2021

Accepted after revision: 21th Oct 2021

which are hand held or motor driven. The syringe technique involves injection of the material into the root canals. In literature, syringe techniques such as mechanical syringe, tuberculin syringe, insulin syringe, local anaesthetic syringe and navitip syringe have been used with zinc oxide eugenol with not much reports with 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 behaviour and questioning the success of the procedure. Premixed syringe containing a mix of calcium hydroxide and iodoform paste is presently available in the market with the commercial name of vitapex or metapex (Dandashi et al., 1993; Nurko et al., 2000; Bawazir and Salama, 2006; Memarpour et al., 2013; Sharma et al., 2019; Samuel et al., 2020;).

Pre mixed syringe has a viscous mix of iodoform and calcium hydroxide that are available with disposable tips. Since the paste is already available in a certain consistency, the operator cannot alter it to suit his or her needs or replace the material with one having different antibacterial efficacy. The objective of this present study is to compare the obturation quality in primary teeth between the procedures done by undergraduate students and postgraduate students in a dental hospital. Previously our team has a rich experience in working on various research projects across multiple disciplines (Gheena and Ezhilarasan, 2019; Ke et al., 2019; Malli Sureshbabu et al., 2019; Mehta et al., 2019; Samuel et al., 2019; Sharma et al., 2019; Varghese et al., 2019; Venu et al., 2019; Vignesh et al., 2019; Jain et al., 2019; Jose et al., 2020; Krishnaswamy et al., 2020; Muthukrishnan et al., 2020; Samuel et al., 2020; Sathish and Karthick, 2020). Now the growing trend in this area motivated us to pursue this project.

MATERIAL AND METHODS

The study was conducted as a retrospective study in a university setting in the department of Pediatric and preventive dentistry. Ethical approval was obtained from the institutional ethical committee (ethical approval number: SDC/SIHEC/2020/DIASDATA/0619-0320). The study was conducted retrospectively using the patient record software. The procedures included were carried out in the year June 2019 to March 2020. Data collection and analysis was done by a single person. A total of 50 postgraduate cases and 50 undergraduate cases were reviewed for pulpectomy obturation and cross verification was done by postoperative radiographs. Sampling bias was minimized by simple random sampling. The number of visits for the procedures were randomly included as 25 single visit cases and 25 multi visit cases in each group. In single visit pulpectomy procedure, local anaesthesia was achieved followed by rubber dam isolation. Access opening was done using number 4 round bur, working length determination was done using preoperative radiographs and the pulp canals were shaped and cleaned using hand H and K-files (Mani, Inc, Tochigi, Japan) by undergraduates and pediatric rotary endodontic files, Kedo-SG (Reeganz Dental Care Pvt. Ltd. India) by postgraduates. Obturation was done using Metapex followed by placement of stainless-steel crown in the same visit. In multi visit pulpectomy, the same steps

were followed with placement of intracanal medicament for one week. Patient was recalled after one week followed by obturation and stainless-steel crown. Post obturation radiographs were taken to check obturation quality.

The obturation quality was analysed by using the coll and sadrian criteria - optimal, over and under obturation. According to coll and sadrian, optimal obturation is where the obturation material is at the radiographic apex of the root or up to 2mm short of the apex; over filling is where the obturation material is extending beyond the radiographic apex and under filling is where the obturation material is more than 2mm short of the apex. Examples for the levels of obturation were shown in Fig.1. Statistical analysis was done using SPSS software version 23. Descriptive statistics was done for both the groups for age and gender. All the findings and analysis of the data are reported by means of bar charts and pie charts. Chi-square test was used to analyse the significance of difference between the two groups.

RESULTS AND DISCUSSION

Among the procedures done by undergraduates, 50% were under obturated; 20% were optimally obturated and 30% were over obturated. Among the procedures done by postgraduates, 20% were under obturated; 50% were optimally obturated and 30% were over obturated (p value = 0.18) (Figure 2). Majority of the cases treated by the undergraduates were 7 to 9 years old (Figure 3). Majority of the cases treated by the postgraduates were 4 to 6 years old (Figure 4). Optimal obturation and under obturation were more commonly seen in multi visit procedures done by the undergraduates (p value=0.09) (Figure 5). Optimal obturation and over obturation are encountered more in single visit procedures done by postgraduates (p value = 0.24) (Figure 6).

Figure 1: According to coll and sadrian, under filling (a) is where the obturation material is more than 2mm short of the apex; optimal obturation (b) is where the obturation material is at the radiographic apex of the root or upto 2mm short of the apex; over filling (c) is where the obturation material is extending beyond the radiographic apex

In this present study, the obturation quality was assessed using coll and sadrian criteria using post operative radiographs. Under obturation was the most common error done by undergraduates and over obturation is the commonly encountered error done by post graduates. All the cases that were included in this study were obturated using metapex and the root canal preparation was done using rotary endodontic files for primary teeth. When compared

with that of hand files, these rotary files for primary teeth have proved to be efficient in reducing the instrumentation time for canal preparation. They are used similarly like an adult endodontic rotary file using an endo motor and along with suitable root canal irrigant. The root canal irrigants used in all the cases included in this present study was EDTA and saline. These files have also proved to be effective in improving the obturation quality when contrasted with that while using hand files (Coll and Sadrian, 1996; Govindaraju et al., 2017a; Govindaraju et al., 2017; Jeevanandan and Govindaraju, 2018; Panchal et al., 2019; Samuel et al., 2019; Sathish and Karthick, 2020).

Figure 2: Figure representing Percentage of various levels of obturation comparing Undergraduates and Postgraduates; X axis represents the students (undergraduates and postgraduates), Y axis represents the percentage of the observations; Blue represents under obturation, Green represents optimal obturation, Beige represents over obturation; The Obturation quality was found to be better in the procedures done by the postgraduate students, when compared with that of undergraduates; No statistically significant difference obtained between the obturation quality of postgraduates and undergraduates (p-value = 0.18)

This proven fact supports our present study as the majority of the cases were found to be optimally obturated using this exclusive rotary file system for pediatric endodontics. Reciprocating files when compared to these pediatric rotary files were found to involve more instrumentation time and an inferior obturation quality. Many general dentists and especially pediatric dental practitioners are well equipped with the technique and knowledge of these rotary files for primary teeth. Early Childhood caries ought to be forestalled no matter what and that ought to be the main goal of each pediatric dental specialist and the parent thereby preventing numerous negative conditions in the essential dentition and furthermore saving numerous horrible and obtrusive treatment systems in kids (Govindaraju et al., 2017b; Nair et al., 2018; Lakshmanan et al., 2020).

Fluoride is the most regularly utilized preventive methodology against dental caries, particularly in kids. School water fluoridation, community water fluoridation, topical application of fluoride over the teeth regularly were

Figure 3: PIE CHART Representing various age groups treated by Undergraduates; Blue represents the patients who are 6 years old, Green represents 7 years old, Grey represents 8 years old, Violet represents 9 years old, Yellow represents 10 years old, Red represents 11 years old; Figure 3 shows majority of the cases treated by the undergraduates were 7 to 9 years old. No statistical test was carried out to analyse the age of the patients.

Figure 4: PIE CHART – Representing the age groups treated by Postgraduates; Dark Blue represents the patients who are 3 years old, Green represents 4 years old, Beige represents 5 years old, Violet represents 6 years old, yellow represents 7 years old, Red represents 8 years old, Light blue represents 9 years old, Grey represents 10 years old; Figure 4 shows that majority of the cases treated by the postgraduates were 4 to 6 years old. No statistical test was carried out to analyse the age of the patients.

the proven techniques to prevent dental caries using positive effects of fluoride. Effectiveness of fluoridated toothpastes have been concentrated throughout the years and it has been demonstrated to be a viable and effectively available preventive methodology. As the dispersion of packaged drinking water is expanding over the world, the fluoride substance of such packaged drinking waters has been concentrated to improve the preventive arrangement against dental caries (Somasundaram et al., 2015; Ramakrishnan and Bhukri, 2018).

Youngsters normally think that it's troublesome and exhausting to follow oral cleanliness rehearses like brushing twice every day and flossing routinely, and consequently another innovative examination utilizing chewable toothbrush was completed to decide its adequacy in keeping up their oral cleanliness. Deciding biochemical markers in

the salivation at an early age, clears approach to consider the hereditary framework of the kid and furthermore in rendering a preventive arrangement against early childhood caries (Govindaraju and Gurunathan, 2017; Subramanyam et al., 2018).

Figure 5: FIGURE – Showing the levels of obturation done by Undergraduates comparing single and multi-visits; X-axis represents the number of visits taken for the procedure, Y-axis represents the number of procedures; Blue represents under obturation, Green represents optimal obturation, Beige represents over obturation; Figure 5 shows that Optimal obturation and under obturation were more commonly seen in muti visit procedures done by Undergraduates. However, no statistically significant difference obtained between the optimal obturation done in single and multiple visits by undergraduates (p-value = 0.09)

Figure 6: Showing the levels of obturation done by Postgraduates comparing single and multi-visits; X-axis represents the number of visits taken for the procedure, Y-axis represents the number of procedures; Blue represents under obturation, Green represents optimal obturation, Beige represents over obturation; Figure 6 shows that Optimal obturation and over obturation are encountered more in single visit procedures done by postgraduates. However, No statistically significant difference obtained between the optimal obturation done in single and multiple visits by postgraduates (p-value = 0.24)

In a study by Geulmann et al, the premixed vitapex syringe used showed good results. He reported 66% of optimal fillings in primary incisors. Authors have also reported that thick consistency of the paste could not be expressed

through a narrow lumen. In this study, a similar plastic dispensable tip used showed 66.7% of optimal fillings in the curved root canals of primary molar teeth. Other studies by Bhandari and Prajapathi reported the use of a local anaesthetic syringe with a 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, the quality of root canal filling with the local anaesthetic syringe was inferior to that of the lentulo spiral and navi tip (Guelmann et al., 2004; Bhandari et al., 2012; Memarpour et al., 2013; Vijayashree, 2019; Mathew et al., 2020).

Handled lentulo spiral showed good results in terms of quality of obturation in their study. Bawazir and Salama in 2006, evaluated mounted lentulo spiral and handheld lentulo spiral in primary teeth and concluded that there were no statistically significant differences between the two techniques in terms of quality of root canal filling. Sigurdsson et al reported that lentulo spiral presented best results when comparison of endodontic file, syringe and lentulo spiral was made. In an in-vivo study by Vashista et al, the hand held lentulo spiral technique performed better in terms of optimally filled canals (Sigurdsson et al., 1992; Bawazir and Salama, 2006; Vashista et al., 2015; Hiremath and Srivastava, 2016; Vijayashree, 2019; Mathew et al., 2020).

In a study by Hiremath and Srivatsava, local anaesthetic syringe and insulin syringe showed the presence of voids. In the present study, presence or absence of voids in obturation were not taken into consideration but only the level of obturation was studied. The presence of voids in both the apical and coronal parts of the root filling may provide pathways for leakage allowing bacterial regrowth and re-infection leading to post treatment disease. In the procedures done by postgraduates, lots of over obturation were noted. Evaluation of the amount if apical or coronal leakage in a root-filled teeth determines the quality of the treatment.

In a study done by Nagarathna et al, a modified disposable syringe was used. There were several benefits with the use of the modified disposable syringe. The operator can check the flow of the material owing to the translucency of the tip, and there is no tendency for fracture. The disposable tip can be cut to a desirable length for obturating the root canals. Another advantage associated with the modified disposable syringe is that there is no doubt of cross contamination as the syringes and tips are safely discarded. The reasons for underfilling are due to limited flexibility of the plastic tip and lack of operator experience. All these pulpal treatments are rendered to preserve the natural tooth till its natural exfoliation. This thereby prevents the space loss that occurs due to premature extraction of the tooth and also to spare the child from the getting a space maintaining appliance. Anyhow, interdental spacings in permanent dentition because of formative distortions like high frenum connection must be rectified through careful intercession (Christabel and Gurunathan, 2015; Nagarathna et al., 2018; Vijayashree, 2019; Mathew et al., 2020).

Not just pediatric dental patients are experienced with dental caries and pulpal irritation yet in addition, with much more awful pathology like dental abscess, cysts and tumors and also traumatic dental injuries. There were many case reports and research papers distributed with respect to surgeries done in the field of pediatric dentistry. Rewarding a kid subsequent to securing dental caries is basic in forestalling further hindering movements however forestalling early childhood caries must be the primary objective for the guardians, pedodontists and furthermore the overseers of the youngsters. Since, dental caries are not considered as a genuine medical problem by numerous guardians till they are asymptomatic which will in the end lead to a suggestive issue. Dental disregard is a significant issue and more mindfulness is required among indian guardians in regards to the dental strength of their kids (Gurunathan and Shanmugaavel, 2016; Ravikumar et al., 2017; Packiri et al., 2017; Vijayashree, 2019; Mathew et al., 2020)

The advantages of this study were that the efficacy and skills of the undergraduates and postgraduates has been analysed thereby helping in improvisation of the same. The limitations of this present study were that a very low sample size was included; the efficiency of the students, both undergraduates and postgraduates could not be judged by limited procedures. Another major drawback in this study is the age group of the patients. The wide difference in the patient age group treated by two groups acts as a confounding factor as the elder children treated by the undergraduates would have been more co-operative than those who were treated by postgraduates. Our institution is passionate about high quality evidence based research and has excelled in various fields (Pc et al., 2018; Ramesh et al., 2018; Ezhilarasan et al., 2019; Ramadurai et al., 2019; Sridharan et al., 2019; Vijayashree, 2019; Mathew et al., 2020).

CONCLUSION

The Obturation quality was found to be better in the procedures done by the postgraduate students, when compared with that of undergraduates. Under obturation was the most common error done by undergraduates. Over obturation was the most common error done by the post graduates.

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