



EVALUATION OF THE SUCCESS RATE OF SINGLE VISIT PULPECTOMY VERSUS MULTIPLE VISIT PULPECTOMY IN SINGLE AND MULTIPLE ROOTED PRIMARY TEETH OF PEDIATRIC PATIENTS: A SYSTEMATIC REVIEW

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Abstract

Background: Various opinions persist regarding advantages and benefits of single- visit and multiple- visit pulpectomy based on their clinical and radiographic success.

Aim: The aim of the present study was to clarify whether performing pulpectomy in the primary tooth in a single visit or in multiple visits, makes any difference in term of efficacy or complications or both, based on the available literature.

Study Design: This systematic review has been registered at the international prospective register of systematic review – Prospero CRD42021268710. This review follows the guidelines of Preferred Reporting Items in Systematic Review and Meta-Analysis (PRISMA). Electronic databases (PubMed [MEDLINE], COCHRANE Library, EMBASE, EBSCO host, and Google Scholar database) were searched for corresponding references up to 2021. Risk of bias was assessed for individual studies according to the Cochrane Collaboration’s tool for assessing risk of bias (adapted from Higgins and Altman)

Results: In the initial electronic search, total of 124 studies were identified for data research. Out of the 124 publications identified out of which only 7 studies could be included in the qualitative review. Most of the studies found no significant difference between success rate of Single- visit pulpectomy and Multiple- visit pulpectomy.

Conclusion: It was found that Multiple- visit pulpectomy reduces chair time of treatment for uncooperative patients while single visit pulpectomy reduces the visit for the treatment which can be tiresome. However, couple of studies found SVP (Single-visit pulpectomy) to be better than MVP (Multiple visit pulpectomy) in reducing post operative pain.

Keywords: Pulpectomy, Single Visit, Multiple visit, Post-operative pain

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Introduction

Pulpectomy is a ordered clinical process in pediatric dentistry, which involves elimination of infected dental pulp followed by placement of appropriate medicament to obturate the canals. Pulpectomy is the procedure carried out to remove all the pulp from the crown and roots of a tooth.¹

The prime objective of performing pulpectomy in an infected deciduous teeth is to eliminate microorganisms and prevent reinfection, thereby creating a favorable environment for healing of periradicular tissues and reducing the pain and discomfort to the child. Elimination of microorganisms from root canal is achieved by cleaning and shaping, which could be done with two protocols (SVP and MVP).

Successful pulpectomy in deciduous teeth is categorized by the lack of signs and symptoms radiographically and clinically. Besides tooth status, its pathological state and clinician skill are the significant factors for the successful pulpectomy in primary teeth.

Generally, the pulpectomy process is done in various/multiple visits. This process was considered because of lesser chair time and much ease to both patient and the parent. But frequent visits and multiple frequencies for procedure may lead to discomfort to patient. Multiple visit pulpectomy (MVP) comprises extirpation of the pulp tissue and placement of various intra-canal medicament during first visit followed by obturation in the subsequent visit. If the underlying infection still persists it may require additional visits. Single-visit pulpectomy (SVP) includes removal of pulp and obturating the canals in the same visit.

Advantages of SVP in primary teeth are that its procedural steps are simple and it aims at cleaning of root canals. In contrast, MVP protocol in primary teeth needs 3–4 visits to perform, each visit involves anesthesia, absolute isolation, and temporary crown sealing, which can be lost between visits and MVP consumes more time. Less visits and minimal radiation exposures are added benefits of SVP and SVP in primary teeth was favored by few authors.

Figini et al., reported that, there is no significant difference between single-visit and a multiple-visit root canal treatment in the terms of clinical and radiographic success in permanent teeth.² A most recent meta-analysis on nonsurgical single-visit vs a multiple-visit endodontic treatment in permanent teeth showed that, postoperative complications of both the procedures similar. Furthermore, neither single-visit nor a multiple-

visit endodontic treatment had shown superior results in terms of healing or success rate in permanent teeth.³

In contrast some authors quoted that single-visit endodontic therapy is better than a multiple-visit in terms of clinical and radiographic success.^{4,5} Most of the pediatric dentists prefer to perform a multiple visit pulpectomy to ensure thorough sterilization of root canals prior to obturation.⁶

Treatment in single- visit certainly has many advantages. It is less time-consuming, resulting in less cost for the patient. In addition, various studies have shown that postoperative pain is equally low when the treatment is performed in single or multiple visits. In fact, an argument could be made that added discomfort due to local anesthetic or trauma from a rubber dam application experienced after a second visit makes single-visit endodontic treatment less painful than multi-visit treatment. With the apparent advantages of single-visit endodontic treatment, it is not surprising that this treatment mode has become pertinent.⁷

However, there is no evidence to support that weather single-visit or a multiple-visit pulpectomy treatment in primary teeth. Furthermore there is need to evaluate the studies published on single and multiple visit pulpectomy in primary teeth. The present review is conducted to compare the clinical and radiographic success rate of single versus multiple visit pulpectomy for the teeth with infected root canals in primary teeth.

Hence, the aim of the present study was to clarify whether performing pulpectomy in the primary tooth in a single visit or in multiple visits, makes any difference in term of efficacy or complications or both, based on the available literature.

Objectives:

- To assess various endodontic treatment techniques carried out in children.
- To assess the effectiveness of different endodontic treatment techniques carried out in children.

• Research question:

Which technique among the single- visit pulpectomy and multiple- visit pulpectomy show better clinical and radiographic success rate?

METHODOLOGY:

Protocol and Registration:

This systematic review has been registered at the international prospective register of systematic

review – Prospero CRD42021268710. This review follows the guidelines of Preferred Reporting Items in Systematic Review and Meta-Analysis (PRISMA).

Eligibility criteria:

The research question was focused using the “PICOS” framework. The research question was used to determine the inclusion and exclusion criteria.

Population – Children of both genders, in the age range of 3 - 12 years undergoing pulpectomy procedure

Intervention – primary teeth to be treated with single or multiple visit pulpectomy

Comparison- Multiple visit pulpectomy will be compared with Single visit pulpectomy based on clinical and radiographic evaluation

Outcome-

Outcome will be decided by evaluating clinical parameters like pain, presence sinus tract, Swelling etc and radiographic parameters like periapical pathology, furcal abscess, widening of PDL etc

Inclusion Criteria:

Studies rendering the randomized clinical trials that compared the pulpectomy procedure carried out either in single visit or multiple visits in multiple rooted or single rooted primary teeth were included for the review.

Exclusion criteria:

The following studies that were excluded for not meeting the inclusion criteria like:

- Case reports or case series
- In vitro studies
- In situ studies
- Reviews or letters

Information sources:

Articles retrieved using the search engines like Pubmed, Embase, Ebsco host, Cochrane, Ovid, Elsevier and Journal on web databases. In order to remove duplicates for the same type of article in more than one database the EndNote ver. 2.0 software was used.

Search Strategy:

Eight keywords were used for search: 1) Pulpectomy 2) Single visit, 3) Multiple visit, 4) Primary teeth 5) Single rooted teeth, 6) Multiple rooted teeth, 7) Clinical success 8) Conventional pulpectomy.

Boolean Operators:

Combination strategies using Boolean operator ‘OR’ and ‘AND’ were applied for searching the theme. Care was taken to use the combinations only once to avoid repetition of appearance of articles.

Search limits:

Searches were limited to the articles published from 2000- 2020 as final year. Articles published in English language were only included.

Data collection:

Two independent reviewers performed the selection of the articles in two phases. In phase one both the reviewers performed searches of titles and abstracts based on eligibility criteria independently. In case of discrepancies a consensus decision was taken by third evaluator, and then articles were included in the systematic review. In phase two, the same reviewers performed full text evaluation of the preselected articles for determining eligibility and extraction of relevant information.

Data items:

The data extraction table included Author name, year, Age of population, sample size, single or multiple visit pulpectomy and outcome measures. Outcome was decided by evaluating clinical parameters like pain, presence sinus tract, Swelling etc and radiographic parameters like periapical pathology, furcal abscess, widening of PDL etc.

Risk of bias in individual studies

Risk of bias assessed for individual studies according to the Cochrane Collaboration’s tool for assessing risk of bias (adapted from Higgins and Altman)

RESULTS:

Study Selection

In the initial electronic search, total of 124 studies were identified for data research. Out of the 124 publications identified, 47 were removed due to duplication, and 39 were excluded after the initial screening of titles and abstracts. Of the remaining 38 studies, the full texts were obtained and analyzed, discarding a further 31 articles. Finally, only 7 of these in vitro studies could be included in the qualitative review.

Study characteristics

Table 1 describes the main characteristics of the studies which are included in the review. All

included studies were observational cross-sectional studies, having full texts articles published in the English language till January 2021. Children's age ranged from 3 years to 12 years

Risk of bias in individual studies

Quality assessment of the studies was performed to influence the bias. The four criteria were analysed in the studies. This includes following criteria; (1) Eligibility criteria for the participants, (2) Randomization, (3) Sample Size calculation, and (4) Statistical analyses. However, outcome data was clear. Risk of bias is imprecise in the study by Triches et al.,⁸ as there is inadequate information about distribution concealment. As it is an in vivo bacterial study, blinding of personnel and blinding of clinical and radiological outcome assessment is not applicable in this situation. In a study by Sevekar, the risk of bias is unclear.⁹ Risk of bias is unclear in the study by Singla et al.,¹⁰ as there is unsatisfactory information about distribution suppression and blinding of samples and blinding of clinical and radiological result assessment. The risk of bias is low in the study by Bharuka and Mandroli as allocation concealment was done.¹² On the basis of the available studies for this review, bias is unclear to high. The quality of the existing studies is low to moderate follow-up only for 6 months;¹¹ another study is an in vivo microbial study that tested only microbial content reduction and it did not evaluate clinical or radiographic success, and the results may or may not have validity in clinical situations.

DISCUSSION

Many studies showed that even after proper and thorough mechanical and chemical preparation of root canal, it is difficult to achieve bacteria-free primary root canal system.¹⁴ The main premise behind MVP is that inter appointment dressing has the aptitude to reduce microbacterial load in primary teeth and in permanent teeth, but some researches in permanent teeth have shown that $\text{Ca}(\text{OH})_2$ fails to create sterile root canals and even allows regrowth in some cases. Similar results in primary dentition were obtained.¹⁵ Following root canal dressing, the prevalence of microorganisms inside the root canal did not change; however, there was a decrease in the number of bacteria.¹⁶ Even if inter-appointment dressing could reduce the microbial load, i.e. (negative microbial culture) it does not guarantee healing in all cases.¹⁷ There is no significant association between negative microbial culture and healing rates success in root canal of both primary and

permanent teeth.¹⁸ Few studies in permanent dentition reported MVP without intracanal medicament in the inter-appointment period and MVP with intracanal medicament was reported by few authors. MVP in primary dentition was favored by few authors.

Both SVP and MVP are carried out in one study. In the final included studies, selection of subjects was based on their age (mean age of 6) and status of dentition. In both studies, multi-rooted primary teeth were selected. Singla et al., selected patients that presented with dental carious involving pulp, showing no sign of abnormal mobility, swelling or sinus tract formation, and requiring pulpectomy. Duration between the first and subsequent appointments were not mentioned for MVP in other two studies. The number of canals were taken into consideration in Triches study but the number of tooth were considered in all the other studies. Sample size calculation was mentioned in two studies. However, sample size calculation was not mentioned in the other two studies.

Singla et al. observed no significant difference between clinical and radiographic success rates between SVP and MVP protocol ($p > 0.05$). Brazilian study indicates that there is a significant reduction in the bacterial load in the teeth that treated with SVP protocol when compared with MVP group and the results were statistically significant ($p < 0.05$). Whilst, Bharuka and Mandroli there was no statistically significant difference in clinical and radiographic outcomes between the SVP and MVP group (p value—0.66). Similarly Sewekar and Gowda also indicate that there is no significant difference in the post-operative pain and flare ups between SVP and MVP group ($p > 0.05$).

In the SVP group, after access opening irrigation was performed using sodium-hypochloride-based irrigants in both the studies. One study used 1% sodium hypochlorite as irrigant. Two studies used 2.5% sodium hypochlorite as irrigant, whereas the other used 0.5% NaOCl buffered with sodium bicarbonate and endo-c-prep. Sevekar and Gowda used 3% sodium hypochlorite followed by saline as irrigant.

In the MVP group, interappointment duration was similar for two studies (7 days) and other two studies did not specify an inter-appointment duration. However, MVP protocol differed in all the studies. In the study by Sevekar and Gowda two-visit protocol was used, with formocresol as inter-appointment medicament.

Two-visit protocol was also followed in two studies using calcium hydroxide as interappointment dressing. But three-visit protocol was adopted in other studies and they did not mention the exact inter appointment dressing. In three studies, inter-appointment dressing was given in the first visit after bio-mechanical preparation of root canal was accomplished; however, other study used interappointment dressing initially in the first visit followed by bio-mechanical preparation in the second visit.

Post-operative pain and flare-ups were evaluated in the study by Sevekar and Gowda.¹¹ Clinical and radiographic success rates were evaluated in two studies. Success and failure rates of this study can be due to a variety of factors such as the protocol used, the type of irrigant used, and also the obturating material used. Other studies were aimed at evaluating microbial load reduction between two protocols (SVP and MVP). The efficacy of protocols in this study is not dependent on the obturation material used. The role of obturation materials in the both studies cannot be compared because one study aimed at evaluating clinical and radiographic success rates and other study evaluated the microbial load reduction after these two protocols. When compared to the MVP protocol, where there was no clinical and radiographic failure rates (0/19), the SVP protocol in Singla et al., study revealed only one failure out of 19 subjects at 6 months (1/19) owing to the development of intra oral sinus tract, which was later treated by MVP protocol. So the difference in the failure rates was not statistically significant. In a study, SVP protocol outperformed MVP protocol in bacterial load reduction.

In an Indian study, clinical and radiographic success was evaluated after 1 week, 1 month, 3 months, and six months. In another study, follow-up evaluation is not applicable. One was dropped out in the SVP and one was dropped out in the MVP group in Singla's study. In Triches' study, primary root canals with pulp necrosis and periradicular lesion were divided into two treatment groups (SVP and MVP); they reported that SVP resulted in better reduction of bacterial load when compared to MVP, which was statistically significant. Sevekar and Gowda also favored the SVP protocol as there is no difference in postoperative flare-ups and pain in both SVP and MVP groups. Singla and Bharuka, on the basis of their *in vivo* study findings, reported that there is no significant difference between SVP and MVP in terms of clinical and radiographic success

for six months in primary dentition. Studies in permanent teeth reveal that irrespective of the condition of tooth, there is no significant difference in the healing and success rates between single-visit root canal treatment and multiple-visit root canal treatment. There is no significant difference in the post-operative complications between two groups; therefore, single-visit root canal treatment is efficacious and can be preferred over multiple-visit root canal treatment in permanent teeth. On the basis of the available studies for primary teeth, we can favor the SVP protocol over the MVP protocol in primary carious molars requiring pulpectomy.

Conclusion:

Most of the studies found no significant difference between Single visit pulpectomy and Multiple visit pulpectomy. It was found that Multiple visit pulpectomy reduces chair time of treatment for uncooperative patients while single visit pulpectomy reduces the visit for the treatment which can be tiresome. However, couples of studies found SVP to be better than MVP in reducing post operative pain.

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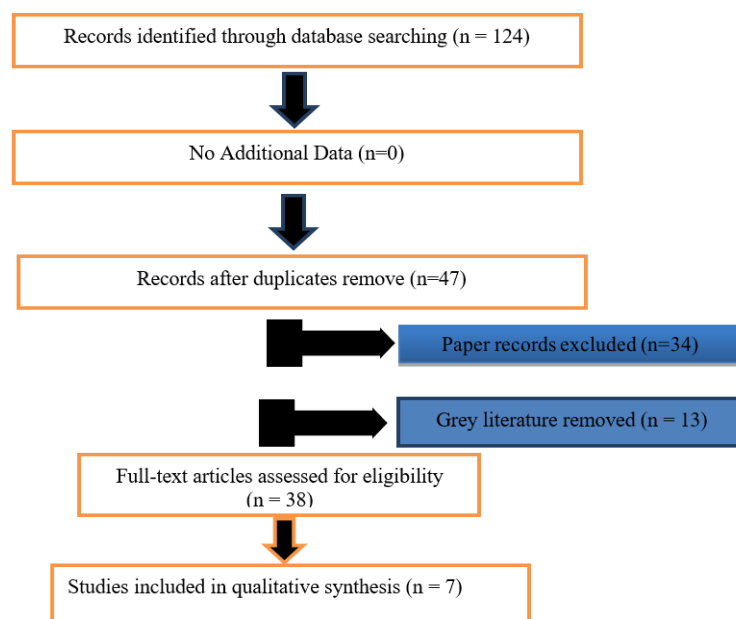


Figure1: PRISMA Flowchart explaining the synthesis of the data for systematic review

Table 1: Characteristic Table

Author name and year	Age	Sample size	Intervention (Single or multiple visit)	Outcome
Triches TC. et al, 2014	4-11 years	24 primary root canals	Both	Both protocols were capable of significantly reducing septic content in root canals of primary teeth with peri radicular lesion. Moreover, single visit protocol showed greater efficacy in reducing endodontic infection.
Sevekar SA et al, 2011	5-8 years	80 Primary teeth	Both	There were no differences between single- and multi visit treatment protocols with respect to the incidence of postoperative pain. No significant correlation could be found between pulp vitality and the incidence of postoperative pain
Singla R et al, 2008	4-7years	40 children	Both	Multiple visit and single visit root canal treatment demonstrated almost equal success but most important aspect for success in pulpectomy cases is the indication of each case and then its subsequent treatment, be it multiple or single visit root canal treatment.
Patel BS, 2020	4-8 years	60 Primary teeth	Both	Single-visit can be considered a viable alternative to multiple-visit pulpectomy considering its various advantages, especially in children.
Barukha S, et al; 2016	4-8 years	64 children	Both	Single-visit pulpectomy can be considered as a viable option for the treatment of primary teeth with apical periodontitis.
Sevekar SA et al, 2017	5-8 years	80 primary molars	Both	There were no differences between single- and multi visit treatment protocols with respect to the incidence of postoperative pain
Farokh-Gisour E et al; 2018	6-12 years	100 primary molar teeth	Both	No significant difference was found between pain felt by children during the first three days following one-visit pulpectomy and placement of SSC at the same appointment. Therefore, one-visit treatment of vital primary tooth is recommended.