REVIEW ARTICLE

Flare-ups in Primary Teeth Before, During, and After Pulpectomy: A Systematic Review and Meta-analysis

M Srinivas Moudgalya[1], Parimala Kulkarni[2], Shilpi Tiwari[3], Shikha Mali[4], Anoop Kumar Shrivas[5], Shubhrata Shrivastava[6]

Abstract

To determine the pain prevalence and severity of flare-ups associated with before, during, and after pulpectomy procedure in children through systematic review and meta-analysis. Pain associated with root canal is a crucial source of fear for patients (especially child patients) and an important concern of dentists. Pain experienced at pretreatment, during treatment, and posttreatment is foreseen and recalled by child patients.

A hand search of relevant journals and defined searching of Medline/PubMed, Cochrane, and EBSCOhost databases identified 2,635 articles reporting flare-ups at different intervals. After further filtering and applying inclusion criteria, three articles were identified for meta-analysis. From three recognized articles in the pretreatment phase, 51.2% of cases reported flare-ups; during treatment, there were 19.8% of cases; and in the posttreatment phase, 100% success rate was seen (i.e., no flares were present). The three included studies were heterogeneous according to I^2 and τ^2 statistics (p <0.001, I^2 = 92.64). Pretreatment pulpectomy-associated flare-ups were high, then dropped significantly to minimal levels in 3 days (during treatment) and continued to drop to lowest levels in 7 days (posttreatment).

Keywords: Flare-ups in primary teeth, Postobturation complications in primary teeth, Postoperative pain after pulpectomy.

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Introduction

Pulpectomy is a painful dental treatment and widely feared procedure by children. Meticulous systematic reviews have shown that pulpectomy helps in retaining primary teeth having pulpal or periradicular diseases that, if not treated, would require extraction.[1]

Flare-ups can be defined as pain/swelling of the soft tissues of the face and oral mucosa in the infected tooth before, during, and after pulpectomy, which has yet not been put through any systematic review or meta-analysis.

Flare-ups can happen after pulpectomy/root canal treatment, which is usually an exaggeration of asymptomatic pulpal/periradicular pathology. Causes for interappointment pain consist of any chemical, microbial, and mechanical injury to the pulp or periapical tissues. These changes are caused by microorganisms in cases of extrusion of debris apically, secondary intraradicular infections, and incomplete cleaning and shaping of canals. Pain during appointments is due to an acute exacerbation in the periapical tissues in response to an injury in the root canal system.

The purpose of this systematic review was to determine the prevalence and severities of flare-ups experienced before, during, and after pulpectomy procedure.[2]

Materials and Methods

Literature Search

Primary sources of the reviewed studies are (Table 1):

- Hand search of relevant journals (literature) published from 2000 to 2018 in English language.
- Electronic databases namely:
  - PubMed advanced/Medline.
  - Cochrane database.
  - EBSCOhost database.

[1–5]Department of Pedodontics and Preventive Dentistry, People's College of Dental Sciences and Research Centre, Bhopal, Madhya Pradesh, India

[6]Department of Pedodontics and Preventive Dentistry, Rishiraj College of Dental Sciences and Research Centre, Bhopal, Madhya Pradesh, India

Corresponding Author: M Srinivas Moudgalya, Department of Pedodontics and Preventive Dentistry, People's College of Dental Sciences and Research Centre, Bhopal, Madhya Pradesh, India, Phone: +91 7999832533, e-mail: moudgalya.king@gmail.com

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Inclusion Criteria[3]

- Randomized controlled trials.
- Incidence of flare-ups in pretreatment, during, and posttreatment pulpectomy.

Exclusion Criteria[3]

- Nonhuman studies/*in vitro* studies.
- Case–control and cohort studies.
- Case reports.
- Prospective/retrospective studies.
- Studies not meeting inclusion criteria.

Data Extraction and Quality Assessment

All data that met the inclusion criteria were further processed for extraction and entered in a computer database, which included first author name, year of publication, number of cases and teeth, type of

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teeth, and total number of follow-ups. Quantitative five-point Jadad scale was used for scoring, which involves randomization, blinding, and reasons for withdrawal to evaluate the quality of these included studies. Each investigation was evaluated based on its quality.

Results and Observations

Study Selection

Three studies that met the inclusion criteria were retrieved, showing flare-ups in pretreatment, during, and posttreatment phases. These studies showed 100% success rate for flare-ups in the posttreatment phase.

Design of Included Studies

The included studies (Fig. 1) were clinical randomized controlled studies that had control and intervention groups. The infected teeth that underwent single visit or multiple visit pulpectomy were randomly assigned to each group. The infected teeth that underwent single visit or multiple visit pulpectomy were randomly assigned to each group.

Study Characteristics

Two studies were conducted in India[4,5] and one in Turkey.[6] Features of these studies are mentioned in Table 2.

Quality Assessment of Included Studies

Using the scale by Jadad et al., the analytical quality of these included studies was assessed. By this scale, three points were to be determined which were:

- Randomization.
- Double blinding.
- Withdrawals and dropouts.

On determining these points, quality scores for the included studies were 4 for the study by Topçuoğlu et al.,[6] 3 for the study by Nair et al.,[4] and 2 for Sevekar et al.[5] (Table 3).

Meta-analysis

Forest plot (Fig. 2) was used to assess the success rate of flare-ups in pulpectomy procedure. Studies that showed flare-ups in pretreatment, during, and posttreatment phases were included in the forest plot. Forest plot was used to assess the changes that occurred during treatment, especially in heterogeneous studies where pretreatment values may vary widely. The three included studies were heterogeneous according to I^2 and τ^2 statistics (p <0.001, I^2 = 92.64). Among the studies, the heterogeneity was high, so a random effect model was used (Table 4).

Based on these data, the overall success rate of flare-ups was statistically significant [95% confidence interval (CI); $p < 0.001$], and the success rate of flare-ups in the posttreatment phase was highest (i.e., 100%). The mean percentage for all three included studies had the following success rate:

- In the pretreatment phase, 51.2% cases reported flare-ups.
- During treatment, there were flare-ups in 19.8% cases.
- In the posttreatment phase, no flare-ups were seen and a 100% success rate was present.

Discussion

Managing postoperative pain after pulpectomy is a vital part of the procedure,[7] having multifactorial etiology *via* interaction among the host immune response, any physical injury, and infection.[8]

As literature says, nonsteroidal anti-inflammatory drugs (NSAIDs) have both anti-inflammatory and analgesic properties in controlling postoperative pain, though not much effect on children.[9,10] In this systematic review, all data included were from the patients experiencing pain related to pulpectomy, while endodontic pain might differ according to its severity or may be due to pulpal or periapical pathosis.[11] The data generated from included studies used different methods to determine pain, including four-point intensity scale, visual analog scale, facial pain scale, periapical index (PAI), and one five-point scale was homogenized and combined, where applicable.

Articles which met the inclusion and exclusion criteria were as low as <1%. Studies that reported both pre- and posttreatment pain depicted the impact of pulpectomy on pain prevalence

Table 1: Keywords and number of publications retrieved

Keywords/search history	*No. of publications*
Flare-ups	217
Flare-ups in primary teeth	52
Postoperative pain	1,124
Postoperative pain after pulpectomy	926
Postobturation complications in primary teeth	316
Total articles searched	2,635

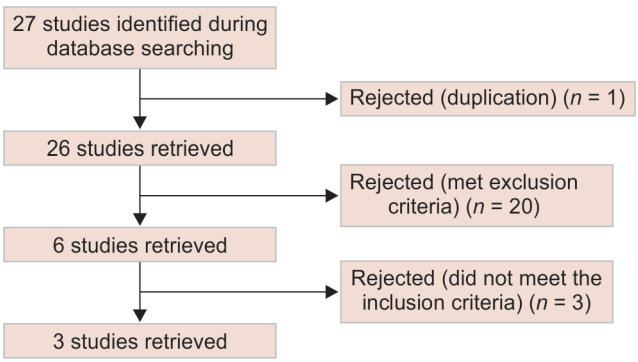

Fig. 1: Flow diagram of included studies

Table 2: Characteristics of important randomized controlled trial

Study	*No. of participants*	*No. of teeth*	*Age range (year)*	*Flare-ups percentage (%)*			*Follow-up period*	*Participants completed the follow-up*
				Pretreatment	*During treatment*	*Posttreatment*		
Sevekar et al.[5]	80	80	5–8	31.7	10	0	7 days	80
Topçuoğlu et al.[6]	110	110	6–8	69	42	0	1 month	106
Nair et al.[4]	60	75	4–6	76	1.3	0	3 days	60

Table 3: Methodological quality assessment of included studies

	Sevekar et al.[5]	*Topçuoğlu et al.*[6]	*Nair et al.*[4]
Randomization	1	1	1
Double blinding	1	2	2
Withdrawals and dropouts	0	1	0
Total score	2	4	3

Note: Quality assessment done using Jadad scale

Table 4: Random effect model for meta-analysis

I^2	τ^2	*Q (df = 6)*	*Het. p-value*
92.64	0.019	27.78	<0.001

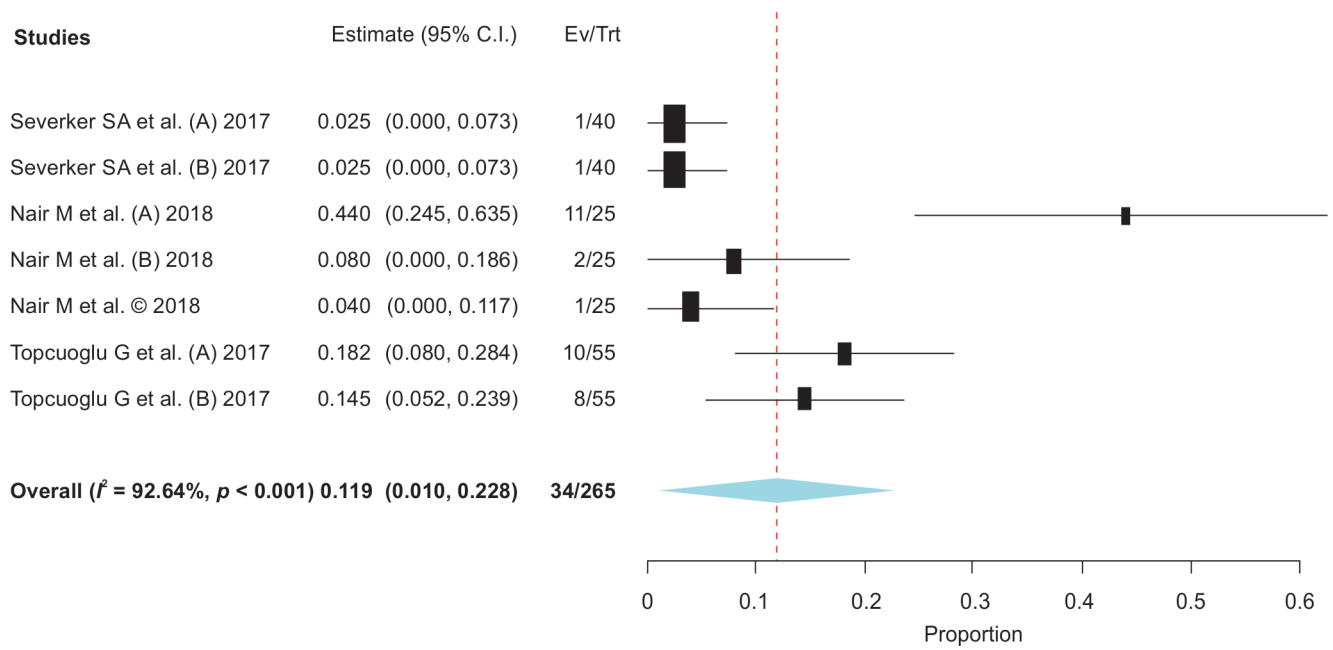

Fig. 2: Forest plot

seen in the forest plot in Figure 2. The pain prevalence in the pretreatment phase was compared with the posttreatment phase, which showed varying differences in the pretreatment phase while in the posttreatment phase pain prevalence saw a steep decline after pulpectomy.

Pretreatment pain prevalence was high while posttreatment pain prevalence was moderate to low. Three studies that were finalized for meta-analysis were heterogeneous, showing statistically significant results and confirming that using rotary (Kedo-S, Mtwo, Revo-S) files results in 100% success rate for flare-ups in the posttreatment phase.

In all three relevant studies, various rotary files and hand files were used for pulpectomy. The overall success rate (clinical and radiographical) was consistently better over a period of 3 days to 1 month for Kedo-S files, Mtwo files, and Revo-S files compared to hand files, and incidence of postoperative pain between single and multiple visit pulpectomy exhibited overall success rate of 100%.[4–6,12]

In a systematic review by Wong et al., it was suggested that there is no difference in incidence of flare-ups between single and multiple visit pulpectomy,[13] whereas Su et al. concluded in their study that single visit treatment results in less postoperative pain.[14]

Preoperative flare-ups are common due to cariously exposed primary teeth, presence of sinus or fistula, periapical pathosis, or furcal involvement, all of which require pulpectomy treatment. During the treatment phase, the reasons for flare-ups were over-instrumentation causing apical extrusion of debris, presence of pathogenic bacteria, incomplete instrumentation, and improper irrigation.[15]

According to the American Academy of Pediatric Dentistry (AAPD), 1% sodium hypochlorite (NaOCl) and/or chlorhexidine is recommended as an irrigating solution during pulpectomy because adequate irrigation with an ideal solution alone cannot significantly reduce the microbial load; therefore, filing and shaping of root canals with hand and rotary files is important in controlling microbial count. In recent times, using a rotary system to irrigate the canals in primary teeth has attained significant popularity because of many advantages such as reduced working time, uniform and apt filling of canals, and minimal errors when compared to hand files.[16] Sathorn et al. in their study concluded that rotary systems provide more cleaner canals and are less time-consuming during canal preparation in deciduous teeth when compared to hand files.[17] So, in the current review, it is shown that if proper protocol is followed for pulpectomy with right follow-ups, it will result in decreased

chance of flare-ups. Further research to assess more variables that affect postoperative pain following pulpectomy is required.

Risso et al. said that the limitations of the research evaluating flare-ups maybe due to the different study designs, protocol for the procedure performed, preoperative conditions of the tooth, and collection methods of results.[18]

Conclusion

- Pretreatment pulpectomy associated flare-ups were high but moderately decreased within 1 day, then significantly to lower count in 3 days and dropped to lowest levels within 7 days.
- Intense flare-ups were seen when canals were prepared using hand files compared to the rotary files.
- In deciduous teeth, rotary systems help in effective biomechanical preparation when compared to hand files, so the chances of flare-ups are decreased.
- Proper obturation protocol should be followed with proper irrigation using a side-vented needle and total drying of canals, which will cause no voids and help in optimum filling of the canals.

Clinical Considerations

- Proper designing and randomization of the studies.
- Proper intervention and control groups.
- Proper calibrations.
- CONSORT guidelines should be followed.

Why This Paper is Important to Pediatric Dentists?

- No systematic review with meta-analysis study has been done on flare-ups in pediatric patients undergoing pulpectomy.
- Knowledge of flare-ups during pulpectomy procedure helps in managing children by pediatric dentists.

Information on efficacy of rotary files in decreasing flare-ups compared to hand files allows operators to use rotary files on a regular basis and to overcome such drawbacks.

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