

# Clinical and Radiographic Evaluation of One and Two Visits Endodontic Treatment with Apical Periodontitis: A Systematic Review and Meta-analysis

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## Abstract

**Background and Aim:** Investigating one-visit treatment regimens which would have the same biological effectiveness of a two-visit procedure is of considerable importance. The purpose of this systematized review was the Clinical and radiographic one-and two-visit endodontic treatment evaluation with apical periodontitis. **Method:** The Controlled Trials of Cochrane's (CENTRAL) Register was explored by applying the Endodontics, One, Two, Single, Multiple, Appointment, Visit Terms, with no language restriction. 196 studies were conducted using the primary analysis in total. 5 articles among the 196 studies were chosen to have more precise criteria. **Review methods:** Randomized controlled trials and controlled clinical trials of root canal treatment of Single-versus multiple-visit carried out in humans were identified. The obtained result was the healing of radiographically detectable lesions in where data extraction was independent. **Result:** The mean number of human teeth was 112.60, and the lowest 44 patients and the most 300 patients, the standard deviation was 106.45. The mean of human teeth in the single visit groups was 58.6 (54.94) and in the two visit groups 54 (51.53). Risk differences of included studies were combined. **Conclusion:** root canal treatment of two and single-visit represented approximately similar success in the periapical pathology endodontic treatment of teeth.

**Keywords:** Clinical and radiographic evaluation; Endodontics; Endodontic treatment

## Introduction

The conventional target of apical periodontitis endodontic treatment of teeth is the thorough elimination of the microbial invaders of the root canal system. Since the success rate of endodontic procedures predictably increased, teeth protection by endodontic therapy achieves a lot of popularity. The thorough understanding of endodontic pathology is the main cause of this popularity. Endodontic infection is basically the dental root canal system infection and the key etiologic factor of apical periodontitis.<sup>[1]</sup> Several chemical and physical factors are responsible for leading to periradicular inflammation. However, the major reason for the progression and perpetuation of different forms of apical periodontitis proved scientifically is microorganisms.<sup>[2]</sup> Studies have represented which although decreasing the number of cultivable microorganisms can be considered possible by instrumenting as well as irrigating of the root canal system; a total eradication cannot be obtained. Endodontic infection occurred by dental decay, manifest or trauma is the major reason of periapical lesions which is the host defense response to the microbial challenge which is emanating from the root canal system.<sup>[3-5]</sup> It is considered as host defenses and microbial factors dynamic conflict and at the infected interfaces. This leads to local inflammation, resorption of hard tissues and destruction of other periapical tissues. Thus, antibacterial dressings including calcium hydroxide (CH) can be useful to combat the persistent microbiota. CH application, despite its widespread acceptance and application, has clear disadvantages. One of its major disadvantages is not repeated killing the intracanal rest flora. To obtain optimal potential, at least two visits are required.<sup>[6]</sup> The efficacy of a clinical action is not to be assessed only from a biological standpoint. However, other factors including costs, patient comfort, and effort at the treatment are to be taken into

consideration in an ultimate assessment. Therefore, searching for one-visit treatment regimens having the same biological effectiveness of a CH-based two-visit procedure is essential.<sup>[7]</sup> The aim of this systematic review was the Clinical and radiographic assessment two different endodontic treatments of one-and two-visit with apical periodontitis.

## Methods

Controlled clinical trials and randomized controlled trials of the two mentioned root canal treatment carried out in humans were recognized. The Controlled Trials of Cochrane's (CENTRAL) Register was explored by applying the Endodontics, One, Two, Single, Multiple, Appointment, Visit terms, with no language restriction. 196 studies were conducted using the primary analysis in total. Two reviewers inspected all searched terms and abstracts where available and determined their relation to the of single-visit or multiple-visit healing rate of root canal treatment. The title and abstract information were automatically included in the next analysis in case it was not sufficient to specify the paper's relation. 5 articles among the 196 studies were chosen to have more precise criteria [Table 1].

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## Inclusion and exclusion

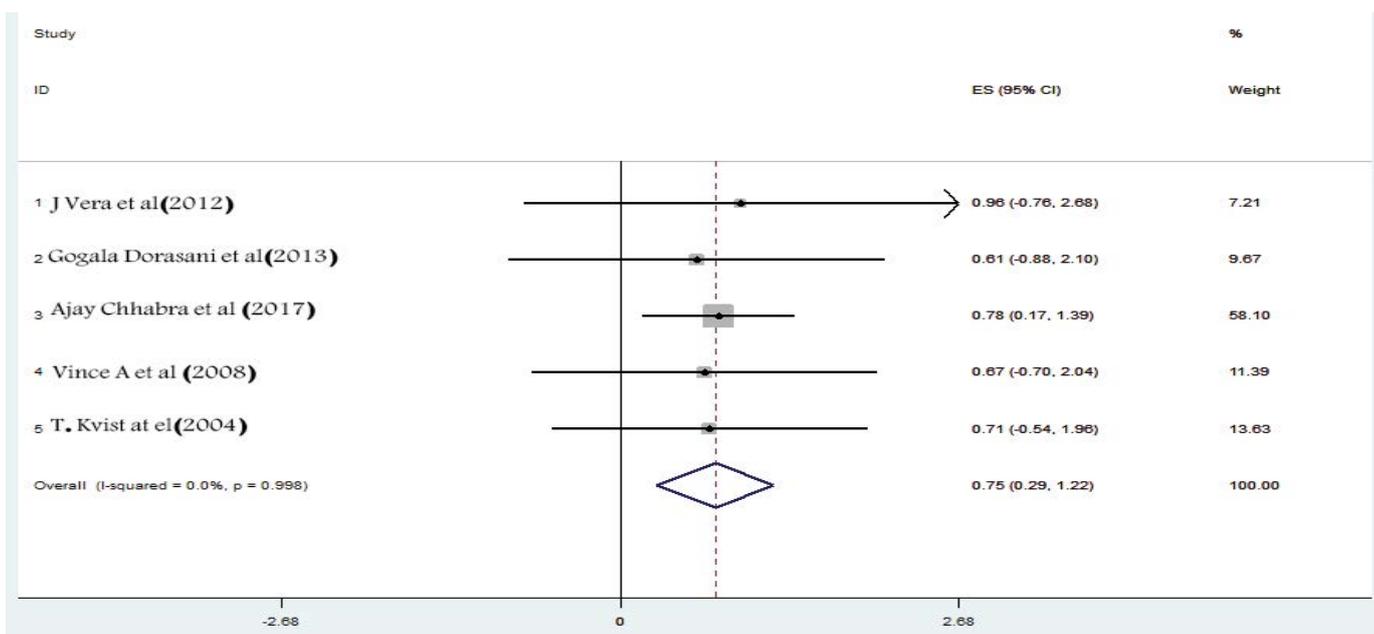
### Inclusion criteria

- Undergone subjects had a noncontributory medical history
- Undergone subjects had mature teeth with infected necrotic root canals and radiographic evidence of periapical bone loss (as a sign of preoperative canal infection)
- The whole chosen root canals had not gotten any endodontic treatment earlier
- Subjects had nonsurgical root canal treatment throughout the study

- The outcome measure was the number of teeth which indicated radiographic healing evidence

### Exclusion criteria

- The inclusion of test teeth without infected necrotic root canal systems and/or radiographic document of periapical bone loss (therefore no preoperative canal infection)
- Subjects were not randomly determined to single- or multiple-visit treatment
- The study conducted on failed, endodontically treated teeth (re-treatment cases)



**Figure 1:** Forest plot. The horizontal line illustrates the 95% interval of confidence; the accuracy of the study becomes higher by shortening the line. Tips showing 95% confidence interval, and the vertical tips showing pooled risk difference.

**Table 1: Selected studies after review.**

Studies	Year	Research title
J Paredes-Vieyra et al. [8]	2012	One-versus two-visit endodontic treatment of teeth with apical periodontitis: A histo- bacteriologic study
Gogala Dorasani et al. [9]	2013	Clinical and radiographic assessment of single-visit and multi visit endodontic treatment of teeth with periapical pathology: An in vivo study
Ajay Chhabra et al. [10]	2017	Clinical and radiographic evaluation of periapical pathology in single versus multi visit root canal treatment: An in vivo study
Vince A et al. [11]	2008	One-visit and Two-visit Endodontic Treatment of Necrotic Teeth with Apical Periodontitis result: A Randomized Controlled Trial with One-year assessment
T. Kvist et al. [12]	2004	Microbiological assessment of One- and Two-Visit Teeth Endodontic Treatment with Apical Periodontitis: A Randomized, Clinical Trial

**Table 2: Data summary of included studies.**

Citation	n (total)	Observation time	Number of teeth (not healed/total) in the two visit group	Number of teeth (not healed/total) in the two visit group	Healing rate (%), single versus two visit	The healing results statistical analysis p
J Vera et al. [8]	300	2 years	155	145	96.57% vs. 88.97%	0.05 (not show any notable difference between the groups)
Gogala Dorasani et al. [9]	44	1 year	23	21	61% vs. 76%	0.21 (no statistically notable difference between groups I and II)
Ajay Chhabra et al. [10]	60	6 month	30	30	78% vs. 31%	0.31 (no statistically notable difference between groups)
Vince A et al. [11]	63	1 year	33	30	67% vs. 70%	0.74 (No statistically notable the difference was observed between groups)
T. Kvist et al. [12]	96	1 year	52	44	71% vs. 64%	0.36 (not notable.)

- No comparison between single- and multiple-visit endodontics within the same study
- No healing rate presented

### Meta-analysis

A standard Q-statistic or chi-square test was used to evaluate between-study heterogeneity. Risk difference was the main measure of treatment influence. It was defined as the experimental group risk minus the control group risk. The risk difference for this study is presented as the healing rates difference between single and multiple-visit treatment. Risk difference is the amount of the treatment influence on the events amount (healing), which it takes into consideration the event prevalence.<sup>[8-12]</sup>

### Results

Between included and excluded studies only five studies satisfied the desired inclusion. Data abstraction of included studies Randomization might appropriately be the only principal design feature of a study evaluating the effectiveness of the therapy.

The mean number of human teeth was 112.60, and the lowest 44 patients and the most 300 patients, the standard deviation was 106.45. The mean of human teeth in the single visit groups was 58.6 (54.94) and in the two visit groups 54 (51.53).

### Healing assessment

To determine the healed lesion time, at least a minimum follow-up time of one year is required. Follow-up time in the total five studies was sufficient (12 months).

### Meta-analysis

The obtained results of individual studies, as well as a meta-analysis results summary, are tabulated in Tables 2, 3 and Figure 1. There is no statistically notable variation observed in the healing rate in studies (therapeutic effectiveness) between the two treatments. Meta-analysis was carried out on the combined data. Also, the healing rate is determined for the outcome measure which was whether healed or not healed. To have a better understanding, a comparison was provided between a single- and the two mentioned groups. Therefore, outcome measures were comparative dual outcomes.

Although one root canal treatment seemed to have lower efficacy than two visits, no statistically notable healing rate difference between the two treatment regimens was observed according to current best available evidence. According to the J Paredes-Vieyra et al.<sup>[8]</sup> study, the difference between the two treatment modalities was statistically negligible with the specified sample size. Also in the study Gogala Dorasani et al.<sup>[9]</sup> both groups had equal desirable healing after 12 months and no statistically notable differences were observed between

the two groups. In the Ajay Chhabra et al.<sup>[10]</sup> study, the root canal treatment of single-visit might be regarded as a possible option for teeth treatment by periapical pathology. In Vince A et al.<sup>[11]</sup> study showed, the two groups illustrated equal desirable periapical healing after 12 months, and no statistically notable differences were observed. In the T. Kvist et al.<sup>[12]</sup> study, no statistically notable differences between the groups were discerned.

### Discussion

Calcium hydroxide has been widely used as inter appointment dressing because of its proven antibacterial properties, periapical tissue healing stimulation, and capacity to detoxify bacterial lipopolysaccharides.<sup>[7,12-14]</sup> Successful endodontic therapy depends on many factors. One such important step in any endodontic treatment is obturation. The obturation needs to use the materials and techniques which are able to densely fill the whole system of the root canal. To prevent reinfection, a fluid-tight seal is required from the apical segment of the canal to the cavosurface margin. A hermetic seal cannot be achieved with gutta-percha alone; hence, a root canal sealer is vital.<sup>[15]</sup> Endodontic treatment attempts to eradicate microorganisms from the root canal system to advance periapical healing. Various agents play a major role in making a decision of the two visit endodontics. Important factors such as preoperative diagnosis, the capability of obtaining infection control, an anatomy of the root canal, procedural complications, and subjective factors such as patients' signs and symptoms are among these. This study demonstrated which a rigorous instrumentation 1-visit root canal treatment can have the same success of a 2-visit treatment. The difference in radiographic evidence of periapical healing between the two root canal treatments was negligible.<sup>[8]</sup>

Despite the fact that increasing observation periods can be best possible, periapical changes in bone density along with healing should be possible after 12 months when applying the PAI, with no necessity for longer observation times.<sup>[9,16]</sup> Within the limitations of Gogala Dorasani et al.<sup>[9]</sup> study, no statistically notable difference in radiographic evidence of periapical healing between the two group was observed after 12 months follow-up. The two groups showed a statistically notable decrease in PAI scores from the start to 12 months evaluation. Both groups showed improved healing in almost similar percentage of teeth at the end of 12 months. Various studies have used 12 months as the period due to taking into account the clinical studies being resource-intensive and difficulty of controlling patient dropouts during the treatment time.<sup>[17-20]</sup> Despite the fact that longer observation periods can have the ideal capability, periapical changes in bone density proved to be clearly associated with healing after 12 months when applying the PAI. Also, there is no requirement for longer observation times.<sup>[21]</sup> Nevertheless, the more long-term clinical effectiveness still requires further observation.<sup>[22]</sup> The assertion that no statistically notable differences occurred between single- and multi-visits endodontic procedures when treating teeth with periapical rarefactions regardless of the technique used. The capability of healing has expected and satisfactory degrees when a comparison is made in a single visit and multi-visits cases. Based on clinical and radiographic outcomes, it can be summarized that no further advantages are gained by applying an inter-appointment antibacterial dressing including calcium hydroxide. Perhaps, there is no strict obligation to eliminate bacteria. Also, the maximum bacteria reduction and efficient canal filling might be adequate in terms of healing, instead of complete eradication.<sup>[10]</sup>

### Conclusion

Root canal treatment of two and single-visit represented approximately similar success in the periapical pathology endodontic treatment of teeth.

**Table 3: Meta-analysis data summary. Heterogeneity chi-squared=0.12 (d.f.=4) p=0.998.**

Study	ES	[95% Conf. Interval]		Weight (%)
		lower	upper	
J Vera et al. <sup>[8]</sup>	0.96	-0.765	2.685	7.21
Gogala Dorasani et al. <sup>[9]</sup>	0.61	-0.880	2.100	9.67
Ajay Chhabra et al. <sup>[10]</sup>	0.78	-0.172	1.388	58.10
Vince A et al. <sup>[11]</sup>	0.67	-0.702	2.042	11.39
T. Kvist et al. <sup>[12]</sup>	0.71	-0.544	1.964	13.63
I-V pooled ES	0.754	0.291	1.218	100.00

I-squared (variation in ES attributable to heterogeneity)=0.0%  
Test of ES=0 : z= 3.19 p=0.001

## Conflict of Interest

The authors disclose that they have no conflicts of interest.

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