



Single-visit versus Two-visit Root Canal Treatment of Permanent First Molars in 9-14 Years Old Children

9-14 Yaş Çocuklarda Daimi Birinci Büyük Azı Dişlerinin Tek ve İki Seanslı Kök Kanal Tedavileri

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Abstract

Objective: We aimed to examine the postoperative pain (PP) and 2-year follow-up results of single-visit and two-visit root canal treatment (RCT) applied to the permanent first molars (PFM) of children.

Materials and Methods: Children aged 9-14 years who had a single- or two-visit RCT on their PFM were retrospectively analyzed. Teeth were classified into group 1 (single-visit RCT) and group 2 (two visits RCT). The visual analog scale data, which were routinely recorded the first 48 h after RCT on the anamnesis forms, were used to evaluate PP. The success rate of the RCT in both groups was determined by clinical examination and radiographic evaluation at the end of 2 years, and the Periapical Index (PAI) was used to determine the healing of periapical tissues. Chi-square and Kruskal-Wallis tests were used for statistical analysis.

Results: A total of 51 RCTs, 27 in group 1 and 24 in group 2, were examined. The presence and severity of PP did not significantly differ between the groups ($p=0.798$). The mean PAI score of group 1 was 1.96 ± 1.13 at the beginning and decreased to 1.81 ± 1 at the end of 2 years. For group 2 it was 2.08 ± 1.59 at the beginning and 2.08 ± 1.35 at the end of 2 years. There was no significant difference between the groups regarding mean preoperative ($p=0.683$) and postoperative PAI scores ($p=0.670$).

Conclusions: Single-visit and two-visit RCTs of children showed similar clinical and radiographic results.

Keywords: Single-visit root canal treatment, postoperative pain, flare-up, periapical healing

Öz

Amaç: Çocukların daimi birinci büyük azı (DBBA) dişlerine tek seansta ve iki seansta yapılmış kök kanal tedavilerinin (KKT) postoperatif ağrı ve 2 yıllık takip bulgularının incelenmesi amaçlanmıştır.

Gereç ve Yöntemler: Dokuz-14 yaş arası çocuk hastaların kök ucu kapanmış DBBA dişlerine tek veya iki seansta uygulanmış KKT geriye dönük incelenmiştir. Tek seansta KKT yapılmış dişler grup 1, iki seansta KKT yapılmış olan dişler grup 2 olarak ayrılmıştır. Postoperatif ağrının değerlendirilmesinde tedavi sonrası ilk 48 saatte rutin olarak anamnez formlarına kaydedilmiş olan vizüel analog skala verileri kullanılmıştır. Her iki gruptaki KKT'nin 2 yıl sonundaki başarı durumu klinik ve radyografik olarak incelenmiş ve periapikal dokuların iyileşme durumunun belirlenmesinde periapikal indeksinden (PAI) yararlanılmıştır. Verilerin istatistiksel analizinde ki-kare ve Kruskal-Wallis analizleri $p<0,05$ anlamlılık düzeyinde kullanılmıştır.

Bulgular: İki yılın sonunda 1. grupta 27, 2. grupta 24 olmak üzere toplam 51 KKT incelenmiştir. Gruplar arasında postoperatif ağrının mevcudiyeti ve şiddeti açısından anlamlı farklılık tespit edilmemiştir ($p=0,798$). Birinci grubun başlangıç PAI skoru ortalaması $1,96\pm 1,13$ iken 2 yıl sonunda $1,81\pm 1$ 'e düşmüştür. İkinci grupta ise bu değer başlangıçta $2,08\pm 1,59$ ve 2 yıl sonunda $2,08\pm 1,35$ olarak tespit edilmiştir. Ortalama PAI skorları açısından başlangıçta ($p=0,683$) ve 2 yıl sonunda ($p=0,670$) gruplar arasında anlamlı farklılık olmadığı gözlenmiştir.

Sonuç: Dokuz-14 yaş grubu çocukların DBBA dişlerine tek seansta ve iki seansta yapılmış olan KKT'nin postoperatif ağrı ve 2 yıllık periapikal iyileşme durumu açısından anlamlı farklılık göstermediği tespit edilmiştir.

Anahtar Kelimeler: Tek seansta kök kanal tedavisi, postoperatif ağrı, flare-up, periapikal iyileşme

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Received/Geliş Tarihi: 18.01.2022

Accepted/Kabul Tarihi: 16.05.2022



Introduction

Root canal treatment (RCT) is based on the principle of maximizing the elimination of intracanal bacteria by mechanical instrumentation, irrigation and calcium hydroxide medicaments placed into the canals. The clinical procedures of RCT which are challenging even by adults, are also difficult to accept by children. Therefore it can often be time-consuming and challenging for both the physician and the child patient. For these reasons, researchers have been working on new techniques, tools and materials in order to make RCT as practical as possible, shorten the chair time and reduce the number of sessions. As a result, single visit RCT have become popular and there are many studies investigating the clinical success of this treatment (1-4).

It was reported that little controversy exists that teeth diagnosed with irreversible pulpitis should be treated in 1 session (5), but about the cases of pulp necrosis with/without periradicular inflammation the literature is controversial (6,7). It was reported that mechanical debridement combined with antibacterial irrigation using 0.5% sodium hypochlorite can render only 40-60% of the treated teeth bacteria-negative (8,9). In addition to mechanical debridement and antibacterial irrigation, it has been reported that coating the inside of the canal with calcium hydroxide interappointments can increase the rate of bacteria-negative teeth to around 70% (10). On the other hand, it is stated that RCT completed in single visit not only reduces chair time and cost, but also has a lower flare-up rate (11,12).

It has been observed that studies investigating the clinical success of RCT in single visit were conducted without including patients under the age of 15 (5,13,14). Only one study included patients aged 11-18 years (15). There is insufficient data regarding the rate of flare-up and postoperative pain (PP) or long-term results of single visit RCT of permanent first molars (PFM) in children. Therefore, in this retrospective study, it was aimed to examine the PP and flare-up rates and 2-year follow-up results of single visit RCT applied to the PFM of children, and to compare the findings with two-visit RCT.

Materials and Methods

Ethical approval of the research was received from the Medical Ethics Committee of Pamukkale University (decision number: 15, date: 17.08.2021). In the study, pediatric patients aged 9-14 years who had single or two visit RCT on their PFM by the same physician in Pamukkale University Department of Pediatric Dentistry were analyzed. The anamnesis forms and radiographic records of these patients were investigated retrospectively. The inclusion criteria of PFM with RCT were;

- Presence of a completed root development,
- First time root canal treatment (not the cases of retreatment),

- The cases of irreversible pulpitis or necrotic pulp with or without periapical infection,
- Absence of inflammation drain from the canal (no purulent exudate),
- Absence of widespread periradicular infection beyond the apical 1/3 of the root.

The patients who were consisted of positive patients according to the Frankl behavior scale (16), who had not used antibiotics in the last 1 month before RCT and who could come to the follow-up appointment at the end of 2 years were included in the study. Of the teeth that met the inclusion criteria were named as group 1 those who had single visit RCT and group 2 those who had two visits. Initial periapical status of the treated teeth were evaluated by using the periapical index (PAI) (17) with 5 different scores: 1. Normal periapical structures, 2. Small changes in bone structure, 3. Changes in bone structure with some mineral loss, 4. Periodontitis with well-defined radiolucent area, 5. Severe periodontitis with exacerbating features. When in doubt the higher score is assigned and for multirrooted teeth the highest of the scores given to the individual roots is used (17).

In both of the groups, mechanical instrumentation of the root canals with Reciproc single-file system (size 25 and a taper of 0.06), irrigation with 5% NaOCl, filling with gutta-percha and composite resin restoration of the tooth were performed by the same clinician. In the group 2, additionally root canals dressed with calcium hydroxide and temporary restoration of the tooth were performed in the first visit. Then in the second visit, following the irrigation of calcium hydroxide residues with 5% NaOCl, root filling and restoration procedures completed. Visual analog scale (VAS) (18) scores of the patients which were recorded as none (no pain), slight pain (mild discomfort, need no treatment), moderate pain (pain relieved by analgesics), and severe pain or flare-up (pain and/or swelling not relieved by simple analgesics and required unscheduled visit) on patient anamnesis forms at the end of 6, 12, 24 and 48 hours after treatment were used to evaluate PP. The success rate of the RCT in both groups was determined by the clinical examination and radiographic evaluation and PAI (17) was used again to determine the healing status of periapical tissues after 2 years.

Statistical Analysis

Data were analyzed with the SPSS package program (SPSS v23.0, SPSS Inc., Chicago, IL, USA). Categorical variables were given as numbers and percentages, and the differences between categorical variables were analyzed with chi-square analysis, and data that did not meet the prerequisites of parametric tests were examined with the Kruskal-Wallis test at a significance level of $p < 0.05$.

Results

Totally 51 RCT (27 molar teeth in the group 1 and 24 in the group 2) of 32 patients were examined at the end of

2 years. The mean age of the patients participating in the study was 11.47 years. The ratio of male/female was 1 (16 girls/16 boys), and there was no significant difference between the groups ($p>0.05$). The distribution of the preoperative symptoms of the patients according to the groups is shown in Table 1.

There was PP at a rate of 11.1% and 8.3% in the group 1 and group 2, respectively. Patients who felt PP in both groups stated that the pain started at the end of the first 6 hours and ended within the first 48 hours. 13.0% of the cases who had had preoperative pain in group 1 and 9.0% of the group 2 had PP, too. The presence and severity of PP did not differ significantly between the groups ($p=0.798$), and VAS 4 or 5 scores were not detected in any of the patients in either group. Findings related to VAS scores are given in Table 2.

While the mean preoperative PAI score of the teeth in group 1 was 1.96 ± 1.13 , it decreased to 1.81 ± 1 at the end of 2 years. The mean preoperative PAI score of the teeth in group 2 was 2.08 ± 1.59 , and it was calculated as 2.08 ± 1.35 at the end of 2 years. There was no significant difference between the groups about mean preoperative PAI score ($p=0.683$) and mean postoperative PAI score ($p=0.670$). The PAI score data of the teeth at the end of 2 years is given in Table 3 and periapical radiographs of a tooth from each group at baseline and after 2 years are shown in Figure 1. The relationship between the presence of preoperative symptoms and PAI findings at the end of 2 years is given in Table 4. Only in group 2, it was observed that the patients with preoperative periapical lesions had significantly higher PAI scores at the end of 2 years ($p=0.003$).

Table 1. Distribution of the preoperative symptoms according to groups

Preoperative symptoms	Group 1 %	Group 2 %	p-value*
Spontaneous pain	85.18%	91.66%	0.671
Percussion precision	70.37%	75%	0.712
Periapical radiolucency	62.96%	50%	0.351
Periapical lesion	18.51%	25%	0.574

* $p\leq 0.05$ value indicates statistical significance

Table 2. Postoperative VAS scores of the patients

Groups	None n (%)	Slight pain n (%)	Moderate pain n (%)	Severe pain or flare-up n (%)	p-value*
Group 1 n=27	24 (88.9%)	2 (7.4%)	1 (3.7%)	0	0.798
Group 2 n=24	22 (91.7%)	0	2 (8.3%)	0	

VAS: Visual analogue scale. * $p\leq 0.05$ value indicates statistical significance

Discussion

According to the results of the study, single-visit and two-visit RCT of PFM of the children did not show significant differences. This result is consistent with most research results in the literature (4,14).

In a study conducted by Risso et al. (15) in adolescents aged 11-18, it was reported that PP was higher in patients who had two-visit RCT than the patients who had single-visit RCT, but the two groups were similar in terms of the severity of the pain. In the study of Paredes-Vieyra and Enriquez (5), including the patients over the age of 16, it was found that a higher rate of PP occurred after two-visit RCT. In another study including patients over the age of 15, it was reported that more PP had occurred in the first 24 hours after two-visit RCT, but the pain status of the patients who had one-visit and two-visit RCT became similar at the end of 48 hours (13).

Although studies examining the success of single-visit and two-visit RCT generally focus on PP and flare-up rate (13,15,19), authorities have stated that PP does not have any effect on the long-term healing success of RCT and therefore, they report that success should be evaluated with long-term clinical and radiographic examinations (20,21). Similarly, in this study, it was observed that PP had no

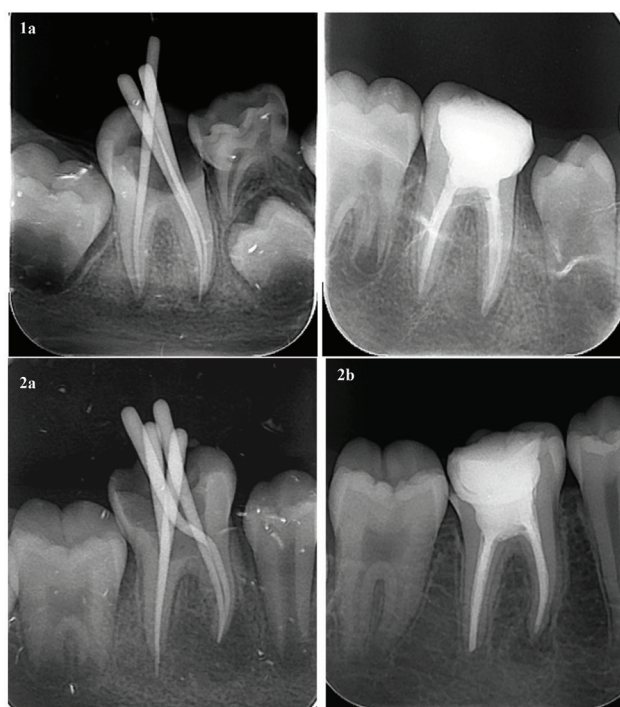


Figure 1. Before and after the root canal treatment (RCT) periapical radiographs of the teeth

1a: Initial periapical radiography of a tooth treated with single-visit RCT. **1b:** Periapical radiography of the same tooth treated with single-visit RCT after 2 years. **2a:** Initial periapical radiography of a tooth treated with two-visit RCT. **2b:** Periapical radiography of the same tooth treated with two-visit RCT after 2 years

effect on the clinical and radiographic findings at the end of 2 years.

It was determined that preoperative symptoms did not have a significant effect on PP or healing status after 2 years. These findings contradict the findings of Risso et al. (15), who stated that there is a significant positive relationship between preoperative pain and PP.

In the study only the patients with preoperative lesions had significantly higher PAI scores at the end of 2 years in group 2. It has been reported that the healing of the periapical lesion can take up to 5 years (22,23) and the healing success of teeth with apical periodontitis is 10-15% lower than those without (21,24). Therefore, in the present study it was not surprising that patients with preoperative periapical lesions had a higher PAI score at the end of 2 years than those without.

The opinion that the success of two- or multiple- visit RCT will be higher than one-visit RCTs because the root canals are disinfected by dressing with calcium hydroxide between the appointments (19,10) is not supported by the results of this research. Results of the present study are supporting the report of Manfredi et al. (4) that there is no evidence to suggest that one treatment regimen is better than the other and on the basis of the available evidence that it seems likely that the benefit of a single visit RCT, in terms of time

and convenience for both patient and dentist, has the cost of a higher frequency of PP.

In this clinical study including an age group that may have problems of compliance with long-term dental treatments, the attitude of the patients towards RCT completed in one-visit and two-visit was also observed and it seems that one-visit RCT was more challenging for the pediatric patients since the time spent in the chair in one-visit RCT was longer than the time spent in each session of the two-visit RCT. However, one-visit RCT is advantageous in that it can be completed with a single anesthesia application and eliminates the need for re-anesthesia, which is often experienced in the second session of two-visit RCTs. For this reason, one-visit RCT may be a better choice, especially for children who are difficult to persuade to go to the dentist and have fear of injections, however, the time of the treatment should not exceed the tolerance limit of the child, in order to complete the treatment absolutely in one-visit.

Conclusion

As a consequence, no statistical significant difference was observed in terms of periapical healing status at the end of 2 years between the single-visit or two-visit RCTs of the PFM of patients aged 9-14 years. A higher rate of PP was observed after single-visit RCT but this finding is

Table 3. Periapical healing status of the teeth according to the PAI data at the end of 2 years

Groups	Healed (PAI ≤2) n (%)	Not healed (PAI ≥3) n (%)	Improved (decreased PAI) n (%)	Unchanged (same PAI) n (%)	Worse (increased PAI) n (%)
Group 1 n=27	22 (81.48%)	5 (18.52%)	8 (29.62%)	15 (55.55%)	4 (14.81)
Group 2 n=24	16 (66.66%)	8 (33.33%)	6 (25%)	12 (50%)	6 (25)

PAI: Periapical index

Table 4. Relation between the presence of preoperative symptoms and the mean PAI scores at the end of 2 years

Preoperative symptoms		Group 1 PAI at the end of 2 years		Group 2 PAI at the end of 2 years	
		Mean ± SD	Median (min-max)	Mean ± SD	Median (min-max)
Percussion	Yes	2.00 ± 1.11	2 (1-4)	2.11 ± 1.49	1 (1-5)
	No	1.38 ± 0.52	1 (1-2)	2 ± 0.89	2 (1-3)
	p-value*	0.238		0.820	
Periapical radiolucency	Yes	1.76 ± 1.03	1 (1-4)	1.83 ± 1.53	1 (1-5)
	No	1.9 ± 0.99	2 (1-4)	2.33 ± 1.15	2,5 (1-4)
	p-value*	0.639		0.219	
Periapical lesion	Yes	2.4 ± 1.14	2 (1-4)	3.33 ± 0.52	3 (3-4)
	No	1.68 ± 0.95	1 (1-4)	1.67 ± 1.28	1 (1-5)
	p-value*	0.165		0.003	

*p≤0.05 value indicates statistical significance. SD: Standard deviation, min: Miminum, max: Maximum, PAI: Periapical index

not statistically significant. Furthermore, the presence of preoperative symptoms did not have a significant effect on PP or signs of periapical healing after 2 years.

Ethics

Ethics Committee Approval: Ethical approval of the research was received from the Medical Ethics Committee of Pamukkale University (decision number: 15, date: 17.08.2021).

Informed Consent: Retrospective study.

Peer-review: Externally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: A.İ.G., Concept: C.Ç.E., Design: C.Ç.E., Data Collection or Processing: C.Ç.E., A.İ.G., Analysis or Interpretation: C.Ç.E., Literature Search: C.Ç.E., A.İ.G., Writing: C.Ç.E.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study received no financial support.

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