



Post-Obturation Pain Following One-Visit Versus Two-Visit Root Canal Treatment of Necrotic Anterior and Premolar Teeth using Protaper Next

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Abstract

It is widely known that the prepared canals can never be sterile before obturation, no matter how potent the antibacterial irrigants or intracanal medications are. There are currently two means to reduce bacterial persistence and reinfection in the canals. We can either fill the canals with antibacterial agents in many visits or immediately obturate the canals, to decrease the space for bacterial colonization, in a single-visit approach.

The goal of the present study was to compare the intensity of postoperative pain following one-visit versus two-visit root canal for instrumentation of root canals.

Methods: Fifty patients who fulfilled specific inclusion criteria were assigned to two groups according to the root canal instrumentation technique used, one-visit versus two-visit root canal treatment was carried out and the severity of postoperative pain was assessed by visual analogue scale (VAS) scores after the session until complete pain relief was achieved.

Results: mean of VAS scores between the two groups and within the same group at different follow up periods (6, 12, 24 and 48 hours) showed no statistically significant difference.

Keywords: Necrotic Teeth; One-Visit; Two-Visit; ProTaper Next; Post-Obturation Pain

Introduction

Root canal treatment relieves patients' dental pain although, sometimes, immediate post-obturation pain may slightly exceed the pretreatment pain levels [1,2]. Flare-up is the initiation or continuation of pain and/or swelling after a root canal treatment. The main challenge in management of necrotic teeth is the presence of necrotic tissues and bacteria that can be pushed into periapical tissues [3]. During root canal preparation, pulp tissue and/or microorganisms may be extruded [4-6].

Several studies have shown that it is very difficult to achieve a bacteria-free root canal system [7]. Two approaches have been proposed to solve this problem, one of them is "multiple visit" and The second is "single visit" where eliminating the remaining bacteria or rendering them harmless by entombing them by obturation, finishing the treatment in one visit [7-10].

The use of contemporary endodontic techniques, such as magnifying devices, electronic apex locators, rotary NiTi files increases the success rate of endodontic treatment and also lessens the time needed to be completed in a single visit [3,11].

ProTaperNext is a 5th generation system designed to bring the best features from the past with the most recent technological advancements to simplify rotary shaping procedures eliminating the number of files used to shape canals [12].

Thus, the purpose of the present study is to compare the postoperative pain after the use of rotary ProTaperNext system following one-visit versus two-visit root canal Treatment of necrotic anterior and premolar Teeth Preoperatively, and after 6 hours, 24 hours, 48 hours and 7 days postoperatively, using Visual Analogue Scale (VAS).

Participants and Methods

The trial design is a parallel, randomized, 1:1, participant-blinded clinical trial. This trial design methodology adjusts to the consolidated standard of reporting trials (CONSORT) statement. This randomized clinical trial was confirmed by the institutional review board of the faculty of oral and dental medicine, Cairo University. The sample size calculations considered that minimal clinical difference of 1 in pain score between test and control groups was clinically relevant and using a power of 80% indicated that ideal sample size of 25 in each group would be required.

Fifty consented patients between the ages of 18 and 60 years who were referred to the Endodontic Department of the faculty of oral and dental medicine, Cairo University. Patients diagnosed with necrotic anterior and premolar teeth and had no symptoms before treatment initiation was selected for the study.

The exclusion Criteria were pregnancy or lactation, medically compromised patients, multiple teeth that required treatment in the same quadrant, periapical radiolucency, very severe and abrupt apical curvatures. A pain diary is given to each participant to rate his/her pain level before endodontic treatment as preoperative reading on the visual analogue scale (VAS). Each tooth is anaesthetized by local anesthesia by a dental syringe using 1.8 ml Mepivacaine HCl 2% - Levonordefrin 1:20000.

Access cavity preparation is performed by round bur and Endo-Z bur then the tooth is separated by a rubber dam. The patency of the canals is done with hand K-files size #15.

Working length is determined using an electronic apex locator (Root ZX, J.Morita USA) and affirmed with intraoral periapical

radiograph to be 0.5-1 mm shorter than radiographic apex. Root canals are mechanically prepared in a crown-down approach using the rotary ProTaper Next instruments in an endodontic motor (X-Smart, Dentsply Maillefer, USA) according to the manufacturers' instructions.

The rotary files are introduced inside the canal using EDTA gel. The canals are thoroughly irrigated using 2ml of 2.6% sodium hypochlorite between every two successive instruments with the aid of a 27gauge needle at a depth of 2-3mm from the working length. Root canals were prepared to suitable size apical file. After dryness with paper points, root canals are obturated using the lateral condensation technique. Selection of master gutta-percha cone corresponds to the same size of the master apical file (MAF). Cone fitness radiograph is taken to ensure proper length and preparation of the root canals. A suitable size spreader is used to allow space for auxiliary guttapercha in canals that are coronally wider than the master cone.

Teeth in single visit group were obturated during the initial appointment using epoxy resin sealer which is homogeneously mixed. Excess gutta-percha is cut off with the aid of heated plugger. After obturation, a cotton is placed in the pulp chamber and the access cavity is closed with a temporary filling (Cavit temporary filling 3M ESPE, Germany). At the end of the session, patients were given the Visual Analogue Scale (VAS) and with detailed instructions, they were asked to fill the form.

All patients in the two-visit group received root canal treatment in two visits where the root canal preparation was completed in the first visit and obturation was determined within 7 days next to the first visit.

After 1 week from the first visit, the patients in the two-visit group returned for the second visit. Isolation was performed by rubber dam, temporary filling was removed and irrigation of the canal was done by 3 ml of 2.5% NaOCl, followed by drying the canals with paper points #30 and obturation was done in the same manner as single-visit group.

At the end of the second session, patients were given the Visual Analogue Scale (VAS) and with detailed instructions, they were asked to fill the form.

All patients received postoperative instructions. In case of moderate or severe pain, patients were instructed to call the operator. If there was pain indicating a flare up (emergency), the patients were informed to contact the dentist and were requested to visit the clinician for emergency treatment. All these data were recorded.

Results

Base line data:

Demographic data, clinical and radiographic findings

There was no statistically significant difference regarding mean age values ($p=0.867$), gender distribution ($p=0.615$), examined teeth (Anterior/Premolar) ($p=1$) and Arch (Upper/Lower) ($p=0.698$) respectively between Single-visit and Two-visit groups.

Post-operative pain related to results of demographic data showed no statistical significance between any factor of them (age values, gender, arch type and tooth type) between Single-visit and Two-visit groups.

There was no statistically significant difference between Single-visit and Two-visit groups regarding presence or absence of radiographic findings where ($p=0.500$).

Pain and Visual Analogue Scale (VAS) scores

Effect of time on pain and median Visual Analogue Scale (VAS) scores within the same group at different follow up periods:

Single visit group

Data clarifies that pain scores in single-visit group was the highest at 6 hours (1.13 ± 1.03) with median (1) followed by 24 hours (0.58 ± 0.83) with median (0) unlike scores at diagnosis (0.25 ± 0.44) with median (0), at 48 hours (0.13 ± 0.34) with median (0) and 7 days (0.04 ± 0.20) with median (0) which were significantly lower with the least at 7 days. Results stated that post-operative pain after single-visit root canal treatment was higher in the first 24 hours then subsided.

Two-visit group

Data clarifies that pain scores in two-visit group was the highest after 6 hours (0.83 ± 0.87) with median (1) followed by 24 hours (0.71 ± 0.91) with median (0) unlike scores at diagnosis (0.33 ± 0.48) with median (0), at 48 hours (0.42 ± 0.20) with median (0)

and 7 days (0.00 ± 0.00) with median (0) which were significantly lower with the least at 7 days. Results stated that post-operative pain after two-visit root canal treatment was higher in the first 24 hours then subsided.



Figure 1: Area chart representing changes in (VAS) scores of pain regarding changes in time comparing between (Group 1: Single-visit; Group 2: Two-visit).

Effect of number of visits on pain in each time period:

There was no statistically significant difference between (Single-visit) and (Two-visit) groups in scores of pain regarding number of visits.

- **Pain incidence:** There was no statistically significant difference between (Single-visit) and (Two-visit) groups in incidence of pain.

Discussion

Clinical success of endodontic treatment can be tested based on different viewpoints; according to estimations that involve the dentist, the patient or the tooth itself. Linking to the dentist is the value of symptom (clinical silence/absence of pain), the value of image (root canal space completely filled with no evidence of periapical inflammation), and the value of clinical condition (a well-restored and functioning tooth) [13].

The goal of this parallel design randomized clinical trial was to assess the postoperative pain intensity after root canal preparation comparing to rotary ProTaper Next system under controlled clinical conditions in single-visit and two-visit root canal treatment.

In this study, the root canal treatment was done for necrotic teeth since the vital teeth have a pulp stump that may serve as a barrier to the extrusion of debris, but such opposition is not found in necrotized teeth [14,15].

In the current study, the baseline data regarding age range, different gender, tooth type, different arches, and presence or absence of periapical involvement did not affect postoperative pain outcome because the two groups were equally randomized as shown by the non-significant difference found in statistical analysis between these different variables.

Furthermore, the root canal treatment was done for necrotic teeth with no or slight widening, and there was no statistically significant difference between (Single-visit) and (Two-visit) groups regarding presence or absence of radiographic findings where ($p=0.500$).

This came in agreement with Raju, *et al.* [16] who concluded in their study that presence or absence of periapical evidence had no significant influence postoperative pain. However, post-operative pain was found to be positively correlated with the presence of periapical involvement as mentioned by Pamboo, *et al.* [17].

Recently, single visit RCT has gained increased approval too as a treatment procedure of RCT. Multiple studies showed no significant differences regarding postoperative pain between the single and multiple-visit treatments [18-25].

In the existing study, the root canal treatment was completed in two visits in one group and in a single visit in the other group. And results stated that there was no statistically significant difference between (Single-visit) and (Two-visit) groups in scores of pain regarding number of visits. This came in coincidence with DiRenzo, *et al.* [20], Ince, *et al.* [21], El Mubarak, *et al.* [22], Raju, *et al.* [16].

Yet, our results came in contrast with Rao, *et al.* [23] and Jorge, *et al.* [19] whose studies proved higher success rates in single-visit treatment groups in comparison with other groups. Furthermore, results gave evidence that a meticulously instrumented one-visit root canal treatment could be as successful as a two-visit treatment.

Furthermore, the recent use of rotary nickel-titanium files, understanding of irrigation dynamics and delivery systems have supported the mechanical instrumentation and disinfection of the root canal, which makes the single-visit treatment more suitable than before. Along with other advantages including time saving, cost effectiveness, better patient acceptance, and reduction of the

inter-appointment infection risks, single-visit root canal treatment has become an approved treatment protocol [14,26-29].

In the present study, ProTaper Next was used as proven simplicity, efficiency and less debris extrusion. This was approved by Ozsu, *et al.* [30], Capar, *et al.* [31], Kirchoff, *et al.* [32], Kocak, *et al.* [33] and Silva, *et al.* [34] as all these studies showed higher performance and promising results of ProTaper Next, showing less time consumption and less debris extrusion in comparison with other types of rotary instrument and other techniques.

The outcome in the present study was the post-operative pain. This is a subjective experience influenced by many variables. Therefore, patients' self-assessment reports were provided by a frequently used scale for the evaluation of dental pain which is the Visual Analogue Scale (VAS).

VAS is a quantitative, yet, is a subjective method for scoring pain. The Visual analogue scale (VAS) ranks pain from zero to ten. These values were transferred to four intensity levels: none, mild, moderate and severe pain. Assessment of the pain intensity was carried out after 6, 24 and 48 hours and 7 days. Former studies agreed that both vital and non-vital teeth introduced high pain levels within the first 24 hours [18,35].

Regarding pain scores in single-visit group, they were the highest at 6 hours followed by 24 hours unlike scores at diagnosis, at 48 hours and 7 days and were significantly lower with the least at 7 days. Similarly, data also clarified the same pain scores in two-visit group with the highest scores after 6 hours followed by 24 hours unlike scores at diagnosis, at 48 hours and 7 days which were significantly lower with the least at 7 days.

Through the first 24 hours (6 and 24 hours), the incidence of pain between single-visit group and two-visit group, was not significantly different, yet, the results were in favor of the two-visit group which showed lower prevalence of pain than the single visit group overall.

This was in agreement with the clinical trials done by DiRenzo, *et al.* [20] and Ince, *et al.* [21] who found no significant difference between the two groups. Although, Ince, *et al.* [21] introduced that postoperative pain is fundamentally related to preoperative pain rather than the clinical/radiographic diagnosis.

Also, the results that El Mubarak, *et al.* [22] concluded in their study that regarding the number of visit 90.6% of patients who were treated in a single visit had no pain and 9.4% developed severe pain. 88% of patients who were treated in two-visits had no pain and 11.4% had severe pain. They concluded that the difference in postoperative pain between single-visit and multiple-visit root canal treatment was not statistically significant.

As well, Jorge, *et al.* [19] stated the results of their study with evidence that a well instrumented one-visit root canal treatment can be as successful as a two-visit treatment.

Rao, *et al.* [23] in their clinical study concluded significant lower postoperative pain in patients undergoing root canal treatment in single-visit group than multiple-visit group, yet, this difference was not statistically significant. The lower incidence of post-operative pain in single-visit root canal treatment might be assigned to immediate obturation, thereby preventing passage of medications, repeated instrumentation, and irrigation. Furthermore, a single-visit approach might also prevent pain resulting from reinfection of the canals as an effect of bacterial ingress from a leaky temporary restoration or lateral canal. On the contrary, the two-visit technique includes the placement of a temporary seal and the repeated physical and chemical stimulation to periapical tissues.

Results of the current study proved that there was no statistical significance in the pain incidence at different pain categories in (diagnosis, 6, 24, and 48 hours) between single-visit and two-visit group. On the other hand, there was significant difference in the first 24 hours that two-visit group showed less pain than single-visit group. This might result from debris extrusion following the use of rotary system that increased the neuropeptides released from C-type nerve fibers present in the periodontal ligament which determine the amount of pain as reported by Caviedes-Bucheli, *et al.* [36].

Conclusions

Within the limitations of this study, it can be concluded that:

1. Single-visit and two-visit root canal treatment for treating asymptomatic necrotic teeth in patients showed equality in results.

2. Within 24 hours postoperative, single visit treatment or two-visit treatment of asymptomatic necrotic teeth using ProTaper Next rotary system is considered an acceptable procedure.
3. Results of the study encourage the single-visit treatment for treatment of asymptomatic necrotic teeth for the comfort and time saving of both patients and dentist.
4. The results of this study confirmed that a meticulously instrumented one-visit root canal treatment could be as effective as a two-visit root canal treatment.

Recommendations

1. Follow up single-visit root canal treated cases of necrotic teeth using ProTaper Next rotary systems is mandatory for judging correct long term prognosis.
2. Further studies are needed to give an answer for the increase in pain intensity after 24 hours of treatment following its regression following single-visit and two-visit root canal preparation of necrotic teeth using ProTaper Next system.

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