

Comparison of Success Rate of Single and Multiple Visit Root Canal Treatments: An In Vivo Study

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ABSTRACT

Aim: Clinicians have been providing single-visit and multiple-visit endodontic treatments for their patients. This study aims to compare the success rate of single-visit and multiple-visit endodontic treatments.

Material and Method: Patients who required primary endodontic treatment in Dental College & Hospital were randomly allocated for single-visit (Group I) or multiple-visit (Group II) treatments using the same materials and procedures. Ni-Ti rotary files were used to prepare the root canals, which were subsequently obturated with a core-carrier technique. The chairside time was recorded. The treated teeth were followed up every 6 months until 24 months on clinical signs and symptoms including pain, tenderness to percussion, sinus tract, mobility and abscess.

Results: A total of 100 teeth from patients aged 14 to 45 years were followed up for at least 24 months. The success rates of single-visit and multiple-visit treatments were 88.9 and 87.4 %, respectively ($p = 0.729$, effect size odds ratio = 1.156). The average chairside times of single-visit and multiple-visit treatments were 62.0 and 92.9 min, respectively (mean difference = -30.9, 95 % CI: -39.4 to -22.4, $p < 0.001$, effect size odds ratio = -0.996). Single-visit and multiple-visit treatment had no significant difference in the prevalence of postoperative pain within 6 months and after at least 24 months, but it was significant immediately after the obturation in single visit ($p < 0.05$).

Conclusion: The success rate and prevalence of postoperative pain of single-visit or multiple-visit treatment had no significant difference. The chairside time for single-visit treatment was shorter than multiple-visit treatment.

Keywords: Root Canal Treatment, Single Visit, Multiple Visit, Core carrier technique.

INTRODUCTION

Endodontic treatment used to take multiple visits to complete, with one of the main reasons for this being that it required a considerable amount of time to complete the treatment.¹ The use of contemporary endodontics techniques and equipment, such as use of rubber dam,² magnifying

devices,^{3,4} electronic apex locators,⁵ engine-driven rotary nickel titanium files,⁶ and so forth, not only increases the success rate of endodontic treatment but also, shortens the time needed for the treatment. Endodontic treatment may therefore be completed in a single visit. The concept of a single-visit root canal treatment (RCT) was described as early as the 1880s.⁷⁻⁹ Thereafter, there were reports

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on immediate root filling describing the criteria for success based on the manner of mechanical cleaning and the method of removing the bacterial origins from the canal system.¹⁰ The treatment techniques used at that time were very primitive, and the success rate of single-visit root canal treatment was low. The single-visit treatment was brought back in the 1950s by Ferranti,¹¹ who advocated the use of diathermy for pulpal disinfection and hydrogen peroxide for irrigation. This treatment differed significantly from today's techniques. However, Ferranti was able to describe how the most important criteria for achieving successful results were, in fact, the proper shaping and cleaning of the canals. Currently, these principles are still applied, as important criteria, prior to consideration of single-visit treatment. In 1970, Tosti reported a satisfactory result in his clinical study using a single-visit approach, although the sample size of his study was small.¹²

Nowadays, root canal therapy has become increasingly automated and can be performed more quickly, so some clinicians are incorporating single-visit endodontics into their own clinic routine as a main component of contemporary practice. On the other hand, some dentists believe that the traditional multiple-visit protocol has a long history and a high clinical success rate, preferring to provide multiple-visit endodontic treatment to their patients. This paper aimed to perform a systematic review of clinical studies on the success rate and complications of single-visit endodontic treatment.

MATERIALS AND METHOD

The participating patients were randomly assigned into two groups, in the Govt. dental college and hospital for endodontic treatment. The treated teeth were randomly assigned to either single-visit (Group I) or multiple visit (Group II) treatments using the random-number generating function of a calculator. If the patient needed more than one endodontic treatment, the randomised allocation was performed on every tooth which required treatment. A number unknown to the operators and the independent assessor was given to each treated tooth for clinical assessment, data entry and analysis. The estimated sample size was 50 for each treatment group based on the power of the study set at 80 % ($\beta = 0.20$) and with $\alpha = 0.05$ as the

significance level. Local anaesthetic was given and rubber dam was used for isolation. The root canals were cleaned and shaped using Ni-Ti rotary files (ProTaper NiTi, Dentsply Maillefer, Ballaigues, Switzerland). A 5.25 % sodium hypochlorite was used for irrigation. The prepared tooth was obturated after shaping and cleaning of the canals if it was in the single-visit group. For those teeth assigned to multiple-visit group, non-setting 5 % calcium hydroxide paste (UltraCal XS, Ultradent, South Jordan, UT, USA) was used as inter-appointment medication. The tooth was temporarily restored with resin-modified zinc oxide and eugenol cement (IRM, LD Caulk Dentsply, Milford, CT, USA) until obturation. The next appointment was scheduled in following week. It could be two to three visits depending on the complexity of the treatment. All teeth were obturated using a core-carrier technique (Thermafil, Dentsply Maillefer, Ballaigues, Switzerland). The total chairside time was recorded by the dental assistant. The treated teeth were restored with silver amalgam or composite resin. Patients were recommended to take a dose of paracetamol 500 to 1000 mg every 4 to 6 hrly if needed. All patients were reviewed 1 week after obturation, and were advised to have indirect extracoronary restoration (partial or full veneer) to avoid failure due to extra-coronary leakage or tooth fracture. If the patient experienced pain or discomfort of treated tooth after obturation, they were asked to rate their pain or discomfort using a pain scale score table. The patients were asked to attend regular follow-ups every 6 months until 24 months after the endodontic treatment. The collected data was analysed with the SPSS version 21.0 program (IBM, SPSS Statistics for Windows, Version 21.0. Armonk, NY: IBM Corp.) by a statistician.

RESULTS

A total of 100 patients with 100 teeth selected from aged 14 to 45yrs were followed up for at least 24 months, and the mean ($\pm$ SD) review period was 29.4 ± 9.3 months. To estimate the reliability, clinical assessment in around 16 % of the sample ($n = 100$) was duplicated. Kappa values of the intra-observer agreement for the two observers were both 1.000. Kappa value of the interobserver agreement was 0.911 (standard error = 0.039). The

Table 1: Clinical assessment of single and multiple visit patients.

Clinical symptoms	Single Visit (n=50) (Group I)	Multiple Visit (n=50) (Group II)	One way Annova Test (P Value)
Pain immediately after RCT	44	8	P<0.05*
Teeth pain after 6 Months	2	1	p>0.05 ^{NS}
Teeth pain after 12 Months	2	2	
Teeth pain after 18 Months	1	1	
Teeth pain after 24 Months	1	No Pain	

*:Significant NS: Not Significant

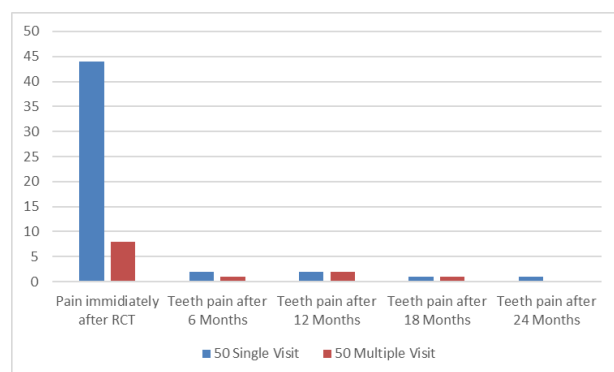


Fig 1: Showing number of visits and related pain.

success rate of endodontic treatment was 88.2 % (n = 100) in this study. The success rates for the single visit treatment (n = 50) and multiple-visit treatment (n = 50) were 88.9 and 87.4 %, respectively (One Way Annova Test: p = 0.729, effect size odds ratio = 1.156). The relationship between the primary treatment outcome (success or failure) was not significantly related to the treatment visit, i.e., single visit or multiple visits (p = 0.764) in the full model of the multiple logistic regression adjusted for the aforementioned independent variables (Table 1) (Fig 1). The prevalence of postoperative pain after 6 months of the single-visit and multiple-visit were 21 and 12 % (One way Annova Test: p = 0.055, effect size odds ratio = 2.061), whereas the prevalence of postoperative pain after at least 24 months were 0.9 and 1.0 %, respectively (p > 0.999, effect size odds ratio = 0.879), but the post operative pain immediately after the completion of single visit RCT is significant (p<0.05).

DISCUSSION

This study achieved the minimal required number of participants, but the sample was not very large. Therefore, the power of the statistical test used in this study was not high. The treatment outcome was categorised as a success in this study when the treated tooth had no signs or symptoms in clinical assessment.¹³ A review period of at least 24 months was adopted. According to the results, the first null hypothesis of no differences in the success rate between single-visit and multiple-visit primary non-surgical endodontic treatment was accepted in this study. Moreover, the success rates of both treatment groups were high (88.9 and 87.4 %, respectively). The difference was small and had limited clinical implications. Some dentists believe performing multiple-visit treatment has a higher success rate than single visit.¹⁴ This belief, however, was not substantiated according to the results of this study. The success rate of single-visit endodontic treatment in this study was very similar to another study reported by Field and his co-workers,¹⁵ though there was a slight different in the endodontic treatment protocol. The obturation method used in this study was the corecarrier technique, which is different from previous studies that used conventional cold lateral condensation. However, a literature review found no difference in success rate between the cold lateral condensation and core-carrier obturation technique.¹⁶ In this study, the success rate of endodontic treatment was similar to other studies using a core-carrier obturation system.^{17,18} Failures still occur even though contemporary endodontic techniques with the highest standards and the most careful procedures are used. There might be unknown factors that influence disinfection of inflamed periapical tissue and, hence, the post-treatment healing of a lesion.¹⁹ This provided explanation to a lower success rate for teeth with apical periodontitis than teeth without apical periodontitis in this study. This study found no significant difference in postoperative pain between the single-visit and multiple-visit treatment groups. Therefore, the second null hypothesis was accepted. The common perception of dentists that multiple-visit endodontic treatment can reduce postoperative pain was therefore not validated.¹⁴ Practically, quite a number of dentists who subjectively preferred multiple-visit treatment on account of the better success rate and reduced postoperative pain were not justified by this study.²⁰ The third null

hypothesis—that there would be no difference in the chairside time used for single-visit and multiple-visit endodontic treatment—was rejected. Better recall of root morphology, established coronal access and reduction of repeated procedures such as application of rubber dam isolation and local anaesthetic allow dentists to shorten the total chairside time. The chairside time was significantly shorter with the use of a magnifying loupe and treatment on single-canal teeth; these findings concurred with another recent study.²⁰ From the time management point of view, patients could benefit from single-visit treatment. This may be desirable for anxious patients in need of sedation, those who are medically compromised or those who have special needs, hoping for reduced stresses built up prior to a dental visit and reduced treatment-associated risks.²¹ Moreover, a single visit treatment shortens the time for oral rehabilitation because the tooth can be restored to function sooner. This study reflected that single-visit non-surgical primary endodontic treatment could be performed with a reasonable success rate. The paramount consideration for general dentists is case selection. Those complicated and challenging cases including calcified canal, bifurcated canal and additional canal that could not be located without high-power magnification should be referred to an endodontic specialist for a better success rate. A preoperative discussion between dentist and patient should be done first and foremost, for the patient's benefit, on the outcome of non-surgical endodontic treatment.²¹

CONCLUSION

In this study, the success rate of single visit and multiple visit endodontic treatments had no significant difference. There was also no statistical difference in the prevalence of postoperative pain between two treatment groups. The chairside time for single-visit treatment was shorter than multiple-visit treatment.

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