



Comparative Evaluation of Pain, Tenderness and Swelling followed by Radiographic Evaluation of Periapical Changes at Various Intervals of Time following Single and Multiple Visit Endodontic Therapy: An *in vivo* Study

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ABSTRACT

Aim: This clinical study was undertaken to evaluate the postoperative sequelae following single-visit versus multiple-visit endodontic therapy at various interval of time in vital as well as nonvital teeth.

Materials and methods: Thirty-two cases were randomly assigned to the following four groups, group I, group II, group III and group IV. After gaining the access to the pulp chamber, establishing the working length, thorough cleaning and shaping was done for all the cases. Obturation was done by protaper (variable taper) gutta-percha and AH-PLUS sealer using lateral and vertical condensation technique. All the cases were recalled after 48 hours, 1 week, 4 weeks and 6 weeks following obturation and were evaluated for postoperative pain, tenderness and swelling.

Results: There was no statistically significant difference amongst all the four groups in the incidence and severity of postoperative pain, tenderness and swelling at the end of one week. However, within 48 hours groups I, II and IV showed more pain when compared to group III. And groups I, II and III showed more tenderness compared with groups IV. Postoperative swelling was not reported.

Radiographic investigation at the end of 6 weeks showed significant change in the appearance of the periapical region in group II and group IV cases.

Conclusion: On strict adherence to biological principles and proper case selection, no significant difference in the success, postoperative pain and tenderness exist when treated with either single-visit or multiple-visit therapy.

Clinical significance: No significant difference in the success rate or postoperative pain, tenderness, and swelling exists when treated with either single-visit or multiple-visit endodontic therapy. Hence, one can readily integrate one-visit endodontic therapy into the routine clinical practice of dentistry.

Keywords: Root canal therapy, Single visit endodontics, Root canal, Single vs multiple visit root canal treatment.

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INTRODUCTION

Completing endodontic treatment in a single visit is an old concept that can be traced through the literature for at least 100 years. But, its implication in the routine practice was solely by the followers of 'Angelo Sargente'. Later single visit endodontics enjoyed a resurgence following World War II. The objective of endodontic treatment is removal of foci of infection and obliteration of the root canal space with an inert biocompatible material. As said 'Prevention is always better than cure', all the procedures during the treatment should be aimed at prevention of introducing infection into periapical tissues. 'Single visit endodontic therapy¹ is defined as the conservative, nonsurgical treatment of an endodontically involved tooth, consisting of complete biomechanical preparation and obturation of the root canal system in one visit'. Multiple visit endodontics is a routine mode of treatment and is usually less controversial than single-visit endodontics. Whereas single-visit endodontics has many advantages for the dentist and patient over multiple-visit endodontics, it reduces number of appointments, eliminates the chances of interappointment microbial contamination and flare-ups

caused by leakage/loss of temporary seal, economy of time. Major consideration regarding single visit has been concerned about postoperative pain and failure and fear of justification of multiappointment fees for one appointment therapy. Because of these reasons one appointment therapy was not routinely practiced. Recent studies have shown little or no difference in quality of treatment, incidence of posttreatment complications or success rate between single-visit and multiple-visit root canal therapy. But not all studies agree about the efficacy of this technique for every case.² Hence, this study was undertaken to compare the postoperative incidence of pain, swelling, tenderness and radiographic evaluation following single-visit versus multiple-visit endodontic therapy in vital as well as nonvital teeth.

AIM OF THE STUDY

The main aim of this study was to determine the incidence and severity of pain clinically, the occurrence of swelling, the incidence of tenderness and radiographic evaluation for periapical healing in various category of cases, at various time intervals.

MATERIALS AND METHODS

Armamentarium Used

K-files, barbed broaches, rotary NiTi Protaper System, gutta-percha points variable taper (Dentsply, Maillefer Company, USA), absorbent points, root canal sealer (AH-PLUS), root canal spreaders, root canal plugger (Fig. 1), irrigation syringe and needle, local anesthesia, irrigation solution (2.5% sodium hypochlorite), EDTA 17% (Glyde-Dentsply Maillefer, USA) (Fig. 2), rubber dam kit (Fig. 3). A total number of 32 single or two-rooted maxillary and mandibular teeth, i.e. anterior and premolars with straight canals were



Fig. 1: Materials and equipment used



Fig. 2: Irrigation solution, syringe, glyde, local anesthesia



Fig. 3: Rubber dam kit

selected. Patient’s medical history was taken as per the format. Medically compromised patients, i.e. diabetes, cardiac disease and other diseases were excluded from this study. Thirty-two cases were divided into the following four groups, group I—single-visit endodontic therapy (8 cases) with vital pulp involvement without periapical rarefaction, group II—single-visit endodontic therapy (8 cases) of asymptomatic pulpless teeth with periapical rarefaction as observed radiographically, group III—multiple-visit endodontic therapy (8 cases) of vital pulp involvement without periapical rarefaction, group IV—multiple-visit endodontic therapy (8 cases) of asymptomatic pulpless teeth with periapical rarefaction as observed radiographically.

PROCEDURE

Teeth undergoing treatment were anesthetized with 2 ml solution of lignocaine hydrochloride with 1:1,00,000

adrenaline either by infiltration in maxillary teeth and mandibular anteriors or mental nerve block in mandibular premolars. The tooth to be treated were relieved from the occlusion. The tooth to be treated was isolated using rubber dam. Access to the pulp chamber was gained with sterile burs following the principles of access cavity³ preparation for the respective teeth. In the presence of caries, complete excavation of the same was carried out before gaining access to the pulp chamber. Complete extirpation of the pulp was done using barbed broach in clockwise direction. Working length was determined by using electronic apex locator Tri Auto ZX (J Morita MFG Corporation, Kyoto, Japan) (Fig. 4) and file in radiograph with 15 no. K-files. Root canals were cleaned and shaped by Rotary NiTi Protaper System along with GLYDE (Dentsply Maillefer Company, USA) using crown down technique. The root canals were copiously irrigated with 2.5% sodium hypochlorite. Canals were dried with sterile absorbent paper points. The canals were obturated with selected master gutta-percha cone (variable taper) and AH-Plus sealer (Dentsply Maillefer Company, USA). The coronal gutta-percha cones were sheared off using heated instrument and vertical compaction was done using the heated pluggers at the individual canal orifices. In single-visit therapy, the canal was obturated in the same sitting, whereas in multiple-visit therapy, canal was obturated in the subsequent visit. Finally, coronal portion was sealed with intermediate restorative material and subjected to a radiographic examination to confirm the adequate obturation. Patients were recalled after 48 hours, 1, 4 and 6 weeks for clinical evaluation of pain, tenderness and swelling. The radiographic parameters were studied 6 weeks postendodontic therapy and then compared with preoperative radiographs for follow-up visits for any change in periapical area.



Fig. 4: Tri Auto ZX

RESULTS

Statistical Analysis

For Clinical Evaluation

Comparison of pain and tenderness incidence between groups: Fisher's exact probability test:

	Pain		Total
	Absent	Present	
Group I	a	b	a + b
Group II	c	d	c + d
Total	a + c	b+d	a+b+c+d = N

Exact probability:

$$P = \frac{(a+b)!(c+d)!(a+c)!(b+d)!}{N!a!b!c!d}$$

(If $P \rightarrow 0.05$ —significant difference)

For Radiographic Evaluation

Chi-square test:

$$\chi^2 = z \frac{(O - E)^2}{E}$$

O: Observed frequency

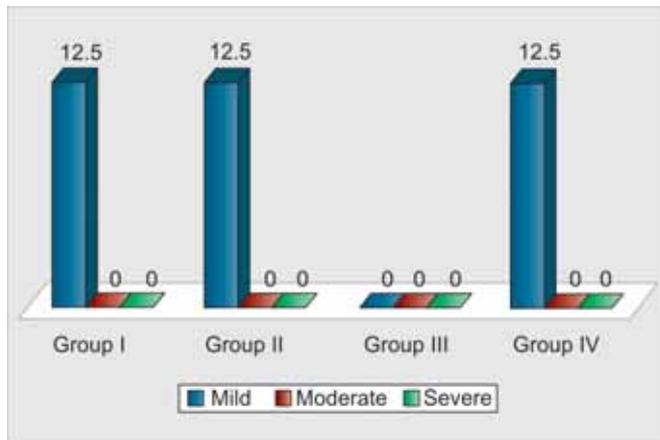
E: Expected frequency

DISCUSSION

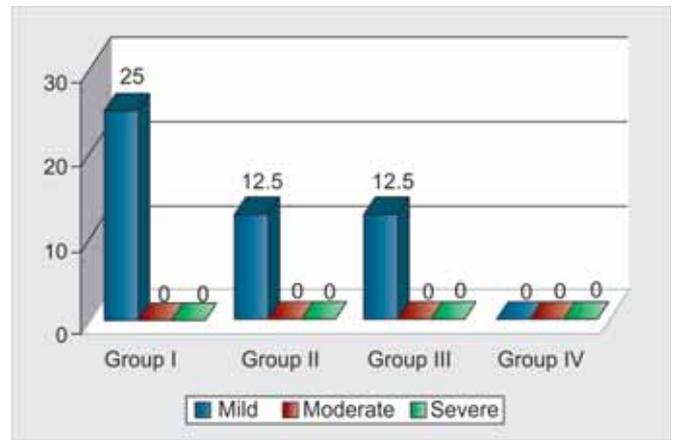
The first goal of endodontic therapy is to relieve acute pain and provide drainage of infection. According to Cohen following are the criteria for treatment evaluation,² i.e. to achieve success:

- Affected tooth is asymptomatic, functional and firm in its alveolus.
- Soft tissue appears normal and responds normally to manual examination.
- Radiographs reveal a normal lamina dura.

For failure, (1) affected tooth is symptomatic or has an abnormal appearance, (2) soft tissue responds abnormally to manual examination, (3) radiographs reveal that a lesion has not resolved, a lesion appears subsequent to endodontic treatment or preexisting lesion increases in size. Hence, this study was undertaken to compare the success rate between single-visit and multiple-visit endodontics in vital as well as nonvital teeth using clinical and radiographic parameters like: Incidence of pain, tenderness, swelling and radiographic changes. To consider endodontic treatment to be successful and be accepted by the patients, pain has to be relieved and there should not be any postoperative flare-ups. As observed, the percentage of patients who experienced pain after 48 hours in four groups are as follows:



Graph 1: Percentage of patients showing presence of pain at 48 hours follow-up visit



Graph 2: Percentage of patients showing presence of tenderness at 48 hours follow-up visit

group I, group II, group IV showed 12.5% patients reported with mild pain. None of the patients of group III reported pain (Graph 1). Hence, on comparing various groups no statistically significant difference was seen in the incidence or severity of postoperative pain during 48 hours follow-up. None of the teeth showed any painful experience after 1, 4 and 6 weeks period of time. William H Clem⁴ in his study ‘posttreatment endodontic pain’, out of 318 teeth, 75% of patients reported with no pain. He stated that sex, age, open or closed chamber and pulp vitality status did not create any significant difference between asymptomatic group and group with moderate pain. O’Kuna et al⁵ in his study on single sitting endodontic treatment, in 58 teeth with no subjective pain and no large rarefaction at the apex reported success of 100% clinically and 78% radiographically. The reasons which could be accounted for the occurrence of postobturation pain after 48 hours are as follows: Presence of any preoperative symptoms,⁴ incomplete removal of inflamed pulp tissue,⁵ overinstrumentation during canal preparation,⁴ escape of irrigants or caustic medicaments to the periapical area,⁵ overextension of the obturating materials,⁴ obturation quality (density).⁴ As observed percentage of patients experienced tenderness on percussion after 48 hours in four groups are, 25% of group I experienced mild tenderness, 12.5% patients of group II and III experienced mild tenderness, absence of tenderness in group IV (Graph 2). Hence, no statistically significant difference amongst all the four groups in the occurrence

and severity of postoperative tenderness at 48 hours was observed. Taintor and Ross, Johan Mantin Mulhern and Denny Rooney⁶⁻⁸ in their study quoted relief of postoperative sensitivity by relieving the tooth out of occlusion, usage of analgesic and antibiotics. None of the cases showed swelling from all the groups in the present study.

The radiographic evaluation done to evaluate the periapical changes were as follows (Table 1):

On comparing group I results with that of group III, no difference existed between the two. On comparing group II results with that of group IV, though the group II results were better than that of group IV, no statistical significant difference was found. It is necessary to acknowledge the fact that a period of 6 weeks is too short a period for radiographic evaluation, to draw any confirm conclusion regarding the outcome of treatment. Southard and Rooney⁹ reported 100% success by means of complete resolution of periapical radiolucency and an intact lamina dura after a period of 12 months. However, long-term studies must be carried out to evaluate the radiographic findings as it was not in the scope of this study to follow-up for a more period than 6 weeks.

Outcome and complications are the most important factors to be considered when making treatment plans.¹⁰ Numerous studies evaluating the effectiveness and posttreatment pain of single- versus multiple-appointment root canal treatment have been published, which reported no significant differences in effectiveness (healing rates)

Table 1: Radiographic evaluation of periapical changes at follow-up visit

Preoperative features	6 weeks postoperatively
Group I: Periodontal ligament space within normal limit (100%).	Group I: Periodontal ligament space within normal limit (100%).
Group II: Widening of periodontal ligament space with periapical rarefaction and discontinuity of lamina dura (100%).	Group II: Decrease in size of the lesion with 75%. No change in lesion with 12.5%. Repositioning of lamina dura with 12.5%.
Group III: Periodontal ligament space within normal limit (100%).	Group III: Periodontal ligament space within normal limit (100%).
Group IV: Widening of the periodontal ligament space with periapical rarefaction and discontinuity of lamina dura (100%).	Group IV: Decrease in size of lesion with 62.5%. No change in lesion size with 25%. Repositioning of lamina dura with 12.5%.

and postoperative pain between these two treatment regimens.^{11,12} However, most of the previous systematic reviews focused primarily on comparing procedures without considering the pretreatment pulpal status.¹¹ Studies have demonstrated that the incidence of postobturation pain decreased over time; it was greatest during the first 24 to 48 hours with a steady reduction in the following 7 days.^{13,14} Another study reported that the overall incidence of postoperative pain was 9.0% after 12 hours and 24 hours. Postoperative pain developed in 15.9% of the patients with history of preoperative pain, whereas 7.1% had postoperative pain among those without history of preoperative pain. However, there was no significant difference in postoperative pain between single-visit and multiple-visit root canal treatment.¹⁵

CONCLUSION

On strict adherence to biological principles and proper case selection, no significant difference in the success exists when treated with either single-visit or multiple-visit therapy. No significant difference in postoperative pain, tenderness, and swelling when single-visit or multiple-visit therapy is implemented in vital or nonvital teeth. In case of nonvital teeth with periapical rarefaction significant changes can be seen on radiograph 6 weeks following endodontic therapy irrespective of single-visit or multiple-visit endodontic therapy. Further long-term studies are required to evaluate the healing of periapical tissues radiographically. Hence, one can readily appreciate to accommodate one-visit endodontic therapy into the routine clinical practice of dentistry.

REFERENCES

1. Manoj KV, Ramachanran G. Single-visit endodontic therapy in asymptomatic pulpless maxillary anterior teeth. *J Indian Endo Soc* June 1992;4:17-23.
2. Chown RL, Landers RR. One appointment endodontic therapy. *Jour Endodontics* 1982;8:35-40.
3. Dodge JS. Immediate root filling. *Dental Cosmos* May 1887; 29:234.
4. Cohen S, Hargreaves. *Pathways of the pulp*, CV Mosby Company (9th ed) 2006.
5. Wiene FS. *Endodontic therapy* (5th ed). StLouis, CV Mosby 1996.
6. Southard Denny W, Rooney Thomas P. Effective one-visit therapy for the acute periapical abscess. *J Endodontics* 1984;10:12:580-83.
7. Paulo Fava Suo. One-appointment root canal treatment. Incidence of postoperative pain using a modified double flared technique. *Int Endo J* 1991;24:258-62.
8. Ferranti R. Treatment of the root canal of an infected tooth in one appointment. A report of 340 cases. *Dent Dig* 1959;65 (11):490-94.
9. Southard, Rooney. Effective one-visit therapy for the acute periapical abscess. *J Endodontics* 1984;10:580-83.
10. Sackett D. *Evidence-based medicine: How to practice and teach EBM* (2nd ed). Edinburgh: Churchill Livingstone 2000.
11. Figini L, Lodi G, Gorni F, Gagliani M. Single versus multiple visits for endodontic treatment of permanent teeth: A Cochrane systematic review. *J Endod* 2008;34:1041-47.
12. Sathorn C, Parashos P, Messer HH. Effectiveness of single-versus multiple-visit endodontic treatment of teeth with apical periodontitis: A systematic review and meta-analysis. *Int Endod J* 2005;38:347-55.
13. Al-Negrish AR, Hababbeh R. Flare-up rate related to root canal treatment of asymptomatic pulpally necrotic central incisor teeth in patients attending a military hospital. *J Dent* 2006;34: 635-40.
14. Yoldas O, Topuz A, Isç i AS, Oztunc H. Postoperative pain after endodontic retreatment: Single- versus two-visit treatment. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2004;98: 483-87.
15. El Mubarak AH, Abu-bakr NH, Ibrahim YE. Postoperative pain in multiple-visit and single-visit root canal treatment. *J Endod* Jan 2010;36(1):36-39.

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