

Incidence of post-operative pain following single visit endodontics in vital and non-vital teeth: An *in vivo* study

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Abstract

This clinical study was conducted to compare the post-operative pain following single visit endodontics in vital and non-vital teeth, with and without periapical radiolucency. A total of 60 adult patients requiring root canal therapy in anterior and premolar teeth were selected for this study. Single sitting root canal treatment was carried out and the subjects were recalled after 2 weeks and instructed to fill out a series of self-report questionnaires for responses about pain in the interim after 1 day, 2 day, 3 day, 1 week and 2 weeks. In vital teeth (Group I) 60% of the treated cases had pain, of which 36% had mild pain (non-significant) and 24% had moderate pain (significant). In non-vital teeth without periapical radiolucency (Group II) 64% of cases had pain, of which 48% had mild pain (non-significant) and 16% had moderate pain (significant). In non-vital teeth with periapical radiolucency (Group III) 32% of the cases had pain of which 24% had mild pain (non-significant) and 8% had moderate pain (significant). None of the teeth in any of the groups had severe pain. There was no statistical difference between incidence of pain in vital and non-vital teeth without periapical radiolucency. Non-vital teeth with periapical radiolucency exhibited relatively less pain as compared with non-vital teeth without periapical radiolucency, but the pain continued in a significant percent of teeth even after 2 weeks. Pain incidence dropped significantly within a period of 1 day to 2 weeks in vital teeth and non-vital teeth without periapical radiolucency. There was a tendency for less incidence of significant pain after a single visit root canal treatment in these groups. Results obtained were comparable with those obtained by several investigators.

Keywords: Pain after root canal treatment, post-operative pain, single sitting root canal treatment

Introduction

It is a paradox that though pain is the principle motivating factor for an individual to seek dental treatment, it is also an appreciable entity that dissuades the sufferer from cheerfully opting for a root canal treatment. Though clinical success of a root canal treatment is achieved by careful and thorough debridement, preparation and obturation of the root canals, the major concern for the patient is always about post-operative pain.

The purpose of this study is to compare the incidence of pain following single-visit endodontics in vital teeth and non-vital teeth with and without periapical radiolucency.

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Materials and Methods

Sixty adult patients aged between 16 and 60 years, requiring root canal therapy in anterior and premolar teeth were selected from Department of Conservative Dentistry and Endodontics, Padm. Dr. Y. Patil Dental College and Hospital, Nerul, Navi Mumbai for this study.

Selection criteria

- Asymptomatic vital/non-vital teeth requiring root canal treatment
- Teeth with sound periodontal apparatus
- Teeth without pus or inflammatory exudate draining through the canal
- Teeth without anatomic variations
- Patients not on analgesics or sedative medication prior to root canal therapy
- Teeth without sinus tract
- Teeth without history of trauma
- Teeth selected as abutments or to be retained under an overdenture
- Teeth with periapical radiolucency not exceeding 3 mm × 3 mm in size.

Patients with any systemic diseases, pregnant patients, immunocompromised patients, retreatment cases and teeth with calcified canals were not included in the study.

At an initial appointment, subjects were informed about the nature of the study. A thorough clinical examination including case history was taken.^[1] All cases were subjected

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to vitality testing using electric pulp tester [Figure 2]. A pre-operative radiograph was taken to check the canal, periodontal tissues and presence of periapical radiolucency.

The subjects were divided into three groups based on vitality test and radiographic evaluation:

- Group I - 20 vital teeth requiring root canal treatment
- Group II - 20 non-vital teeth without periapical radiolucency requiring root canal treatment
- Group III - 20 non-vital teeth with periapical radiolucency requiring root Canal treatment.

Local anesthesia administered and root canal treatment was initiated (Figures 1-4 show the armamentarium used). The tooth was isolated using rubber dam. Caries/defective restoration was removed. Root canal treatment was completed (Figures 5-16 show representative Xrays of each group). Subjects were recalled after 2 weeks and instructed to fill out a series of self-report questionnaires in the interim after 1 day, 2 day, 3 day, 1 week and 2 weeks. The

questionnaires asked for responses about pain, experienced during 2 weeks.

Rating for pain

- 0 - No pain
- 1 - Mild pain: Any discomfort that did not require medication or emergency treatment, no matter how long it lasted
- 2 - Moderate pain: Pain requiring medication
- 3 - Severe pain: Pain that was not relived by medication and required palliative treatment.

Results

A total of 60 patients were available for follow-up, out of whom 24 were males and 36 were females. Post-obturation evaluation was carried out after 1st day, 2nd day, 3rd day, 1 week and 2 weeks and the readings obtained were tabulated [Tables 1-5] and also plotted as a bar graph [Graph 1]. Incidence of pain was calculated for each group at the end of 1 day, 2 day, 3 day, 1 week and 2 weeks using Chi-square test. Intragroup comparison was carried out and it was found to be statistically not significant [Table 6].

1st day after obturation 48% of teeth did not have post-operative pain. 36% teeth had mild pain and 16% moderate pain. Severe pain was not reported in any case [Table 1].



Figure 1: Materials and armamentarium



Figure 2: Electric pulp tester



Figure 3: Electronic apex locator

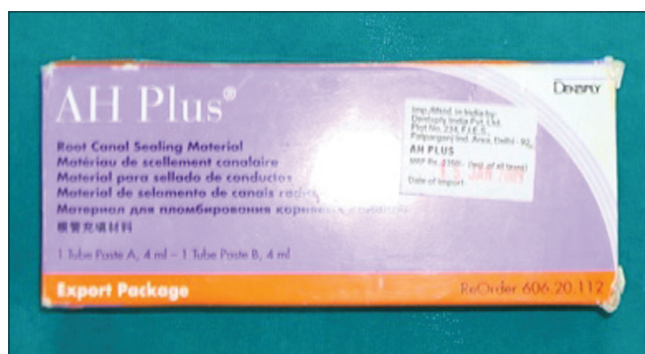


Figure 4: Root canal sealer: AH plus

In Group I - 40% did not have pain, 36% teeth had mild pain and 24% moderate pain Group II - 36% did not have pain, 48% teeth had mild pain and 16% moderate pain Group III - 68% did not have pain, 24% teeth had mild pain and 8% moderate pain.

2nd day after obturation 60% teeth did not have pain. 33.3% teeth had mild pain and 6.7% had moderate pain. Severe pain has not been reported in any of the cases [Table 2].

In Group I - 60% did not have pain, 28% teeth had mild pain and 12% moderate pain. 28% teeth showed a reduction in pain whereas in 32% teeth the pain was not reduced when compared with post-operative pain after 1 day.

In Group II - 48% did not have pain, 44% teeth had mild pain and 8% moderate pain.

In 20% teeth pain was reduced whereas in 44% teeth there was no reduction in pain compared with 1st day.

In Group III - 72% did not have pain, 28% teeth had mild pain, 4% teeth showed a reduction in pain whereas 28% teeth showed no reduction in pain compared to 1st day.

3rd day after obturation 76% teeth were reported free of pain. 18.7% teeth had mild pain and 5.3% teeth had moderate pain [Table 3].

In Group I - 76% did not have pain, 12% teeth had mild pain and 12% moderate pain. 16% teeth did not have a reduction in pain whereas pain was reduced in 28% teeth compared with 1st day.

In Group II - 76% did not have pain, 20% teeth had mild pain and 4% moderate pain. 48% teeth showed a reduction in pain and 16% teeth showed no reduction in pain compared with the 1st day.

In Group III - 76% did not have pain, 24% had mild pain. 12% teeth showed no reduction in pain, whereas 20% teeth did not show any decrease in pain compared to 1st day.

One week post-obturation, 93.3% teeth were free of



Figure 5: Group I (vital teeth requiring root canal treatment): Pre-operative Intra oral periapical x-ray

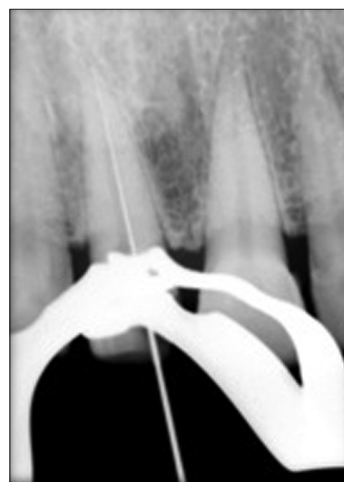


Figure 6: Group I: Working length IOPA



Figure 7: Group I: Master cone IOPA



Figure 8: Group I: Post-obturation IOPA

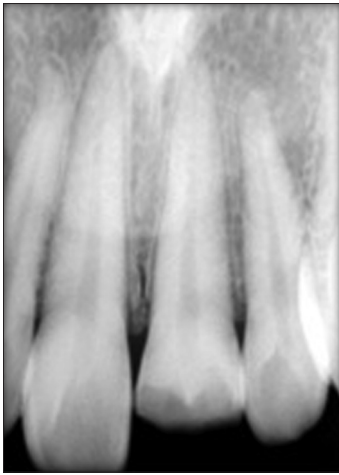


Figure 9: Group II (non-vital teeth without periapical radiolucency requiring root canal treatment): Pre-operative IOPA



Figure 10: Group II: Working length IOPA

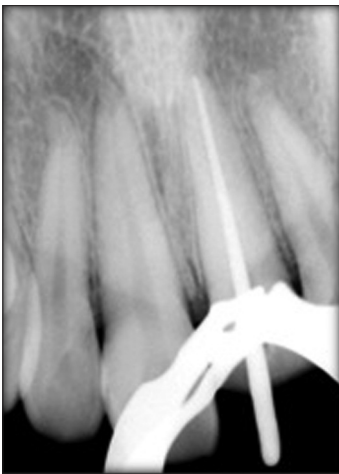


Figure 11: Group II: Master cone IOPA



Figure 12: Group II: Post-obturation IOPA

pain and 6.7% had mild pain (2 in Group I and 3 in Group III) [Table 4].

In Group I - 92% did not have pain 8% had mild pain. 8% teeth showed a reduction in pain compared to 1st day.

In Group II - None of the teeth had pain.

In Group III - 88% did not have pain, 12% had mild pain. 12% did not show any reduction in pain 20%teeth the pain was reduced to score 0.

Two weeks post-obturation, 94.7% teeth had no pain and 5.3% teeth had mild pain [Table 5].

In Group I - None of the teeth had pain.

Group II - None of the teeth had pain.

Group III - 84% teeth did not have pain, 16% had mild

pain 12% teeth did not show any reduction in pain when compared to 1st day mild pain developed in asymptomatic teeth.

There was no difference with regard to pain among both the sexes.

Discussion

This clinical study presents an overview and analysis of incidence of post-operative pain after a single visit endodontics in vital and non-vital teeth with and without periapical radiolucency.

The single visit endodontic treatment regimen, which does not deviate from multiple visit endodontic therapy in achieving the basic objectives of endodontic therapy, has become the choice of treatment for today's fast paced society. The clinician has the benefit of tactile sensation of canal preparation, canal anatomy, length etc., for which



Figure 13: Group III (non-vital teeth with periapical radiolucency requiring root canal treatment): Pre-operative IOPA

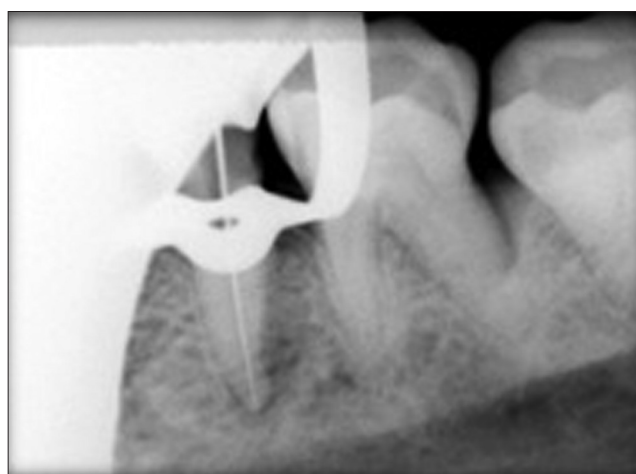


Figure 14: Group III: Working length IOPA



Figure 15: Group III: Master cone IOPA



Figure 16: Group III: Post-obturation IOPA

Table 1: Incidence of pain after 1 day

Day 1 (%)	Group			Total
	1.00	2.00	3.00	
Count				
0.00	7 (40.0)	6 (36.0)	15 (68.0)	28 (48.0)
1.00	7 (36.0)	10 (48.0)	4 (24.0)	21 (36.0)
2.00	6 (24.0)	4 (16.0)	1 (8.0)	11 (16.0)
Total	20 (100.0)	20 (100.0)	20 (100.0)	60 (100.0)
Incidence	60	64	32	

$\chi^2=7.167$; $P=127$ NS. NS: Non-significant

in multiple visit he has to refresh his memory and tactile sensation on every visit.

Pain and its relation to various factors in a single visit endodontics has been investigated and reported by many previous studies. Most of the studies recommend the use of a single visit endodontics in vital teeth and asymptomatic non-vital teeth. The use of this procedure in non-vital teeth with periapical radiolucency still remains a dilemma. This

Table 2: Incidence of pain after 2 days

Day 2 (%)	Group			Total
	1.00	2.00	3.00	
Count				
0.00	12 (60.0)	10 (48.0)	14 (72.0)	36 (60.0)
1.00	6 (28.0)	8 (44.0)	6 (28.0)	20 (33.3)
2.00	2 (12.0)	2 (8.0)		4 (6.7)
Total	20 (100.0)	20 (100.0)	20 (100.0)	60 (100.0)
Incidence	40	52	28	

$\chi^2=5.26$; $P=0.26$ NS. NS: Non-significant

study was designed to investigate the post-operative pain following single visit endodontics in vital and non-vital teeth with and without periapical radiolucency.

In this study, post-operative pain has been arbitrarily classified. Teeth without any discomfort were classified as no pain. Teeth with minimal discomfort that did not require medication, was grouped under mild pain. Noticeable pain requiring medication was grouped as moderate pain. Intolerable pain that was not relieved by medication and

Table 3: Incidence of pain after 3 days

Day 3 (%)	Group			Total
	1.00	2.00	3.00	
Count				
0.00	15 (76.0)	16 (76.0)	15 (76.0)	46 (76.0)
1.00	3 (12.0)	3 (20.0)	5 (24.0)	11 (18.7)
2.00	2 (12.0) ^a	1 (4.0)		3 (5.3)
Total	20 (100.0)	20 (100.0)	20 (100.0)	60 (100.0)
Incidence	24	24	24	

^a $\chi^2=4.5$; $P=343$ NS. NS: Non-significant

Table 4: Incidence of pain after 1 week

Week 1 (%)	Group			Total
	1.00	2.00	3.00	
Count				
0.00	19 (92.0)	20 (100.0)	18 (88.0)	57 (93.3)
1.00	1 (8.0)		2 (12.0)	3 (6.7)
2.00	0 (0)	0 (0)	0 (0)	0 (0)
Total	20 (100.0)	20 (100.0)	20 (100.0)	60 (100.0)
Incidence	8	0	12	

^a $\chi^2=3$; $P=0.223$ NS. NS: Non-significant

Table 5: Incidence of pain after 2 weeks

Week 2	Group			Total
	1.00	2.00	3.00	
Count (%)				
0.00	20 (100.0)	20 (100.0)	18 (84.0)	58 (94.7)
1.00	0 (0)	0 (0)	2 (16.0)	2 (5.3)
2.00	0 (0)	0 (0)	0 (0)	0 (0)
Total	20 (100.0)	20 (100.0)	20 (100.0)	60 (100.0)
Incidence	0	0	16	

^a $\chi^2=8.451$; $P=0.015$ significant

required emergency treatment was grouped as severe pain. The teeth in our study were further grouped as having significant pain and not significant pain.

Pain incidence according to this grouping was as follows:

- Not significant pain - No to mild pain - Table 7
- Significant pain - Moderate to severe pain - Table 8.

The incidence of pain and its severity on the first post-operative day, in the present study showed:

- In vital teeth (Group I) 60% of the treated cases had pain, of which 36% had mild pain (non-significant) and 24% had moderate pain (significant)
- In non-vital teeth without periapical radiolucency (Group II) 64% of cases had pain, of which 48% had mild pain (non-significant) and 16% had moderate pain (significant)

Table 6: Intra-group comparison day 1

Group	F	P
1.00 between groups	8.447	0.000
2.00 between groups	13.273	0.000
3.00 between groups	1.406	0.236

Table 7: Non-significant pain

Time period	Group		
	I (%)	II (%)	III (%)
Day 1	76	84	92
Day 2	88	92	100
Day 3	88	96	100
1 week	100	100	100
2 week	100	100	100

Table 8: Significant pain

Time period	Group		
	I (%)	II (%)	III (%)
Day 1	24	16	8
Day 2	12	8	0
Day 3	12	4	0
1 week	0	0	0
2 week	0	0	0

- In non-vital teeth with periapical radiolucency (Group III) 32% of the cases had pain of which 24% had mild pain (non-significant) and 8% had moderate pain (significant)
- None of the teeth in any of the groups had severe pain.

The present study can be compared with various studies reported in the literature, which used a similar method of evaluation.

Vital teeth

The incidence of pain in our study for vital teeth (Group I) is plotted in Graph 2.

Fox *et al.*,^[2] reported that 90% of teeth treated in a single visit had little or no spontaneous pain at the end of 1 day and 99% had no spontaneous pain at the end of 1 week. Olie^[3] treated 264 teeth and found 10.6% incidence of pain following obturation after 24 h and no pain at all after 1 week. These findings are similar to the present study where 36% patients reported mild pain and 12% moderate pain after 1 day; 6% reported mild pain after 1 week.

Non-vital teeth

The incidence of pain in our study for non-vital teeth (Group II) is plotted in Graph 3.

Mulhern *et al.*,^[4] reported 26.7% of teeth with pain after

1 day and 6.67% pain after 1 week following the treatment of 30 teeth with asymptomatic necrotic pulp. Pekruhn^[5] studied 51 cases and reported 15.6% of cases as relatively painful. He grouped pain as a symptom in two groups such as relatively painful and relatively not painful. This is comparable to the present study 36% patients reported mild pain and 12% moderate pain after 1 day; 6% reported mild pain after 1 week.

Non-vital teeth with periapical radiolucency

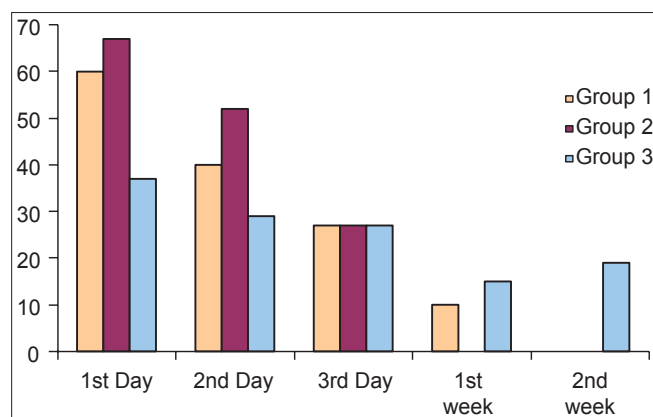
The incidence of pain in our study for non-vital teeth with periapical radiolucency (Group III) is plotted in Graph 4.

Kane *et al.*,^[6] Treated 80 teeth in a single visit out of which prolonged discomfort was seen in two cases. This is comparable with our study where two cases had discomfort even after 15 days. Not many studies in the literature advocate the use of a single visit endodontics in non-vital teeth with periapical radiolucency and those documented have shown conflicting results. In the present study 16% of the non-vital teeth without periapical lesion and 8% of the teeth with periapical lesion had significant pain after 1 day. No significant pain was reported after 2 weeks, but in teeth

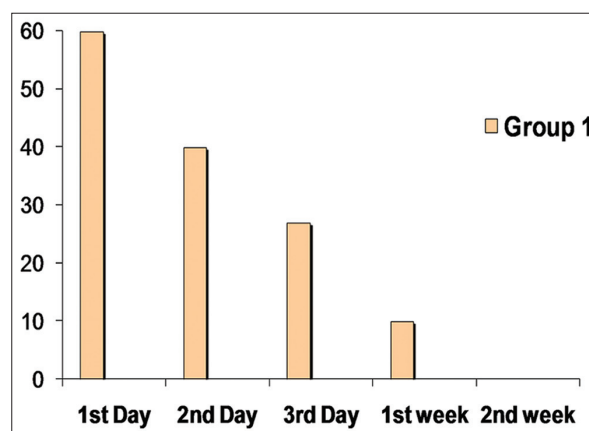
with periapical lesion 16% had mild pain. This is similar to findings of Fox *et al.*^[2] and Sathorn *et al.*^[7] who reported a higher percentage of pain in non-vital teeth without lesion. On the contrary Mulhern *et al.*,^[4] reported 26.7% of non-vital teeth with lesion had pain and none in non-vital teeth without lesion.

There are several reasons why an obturated tooth with a history of vitality will show post-operative pain. Inadvertently missed strands of pulp tissue, possible leakage of irrigant beyond the apex, failure to disocclude the tooth and even non-cooperation of the patient with respect to post-operative instructions could well be the cause for sustained post-obturation pain.^[7-11] Non-vital teeth, after obturation, may show sustained presence of pain due to a coexistent periodontal/periradicular lesion, persistent anaerobic infection or external root resorption.^[12-16]

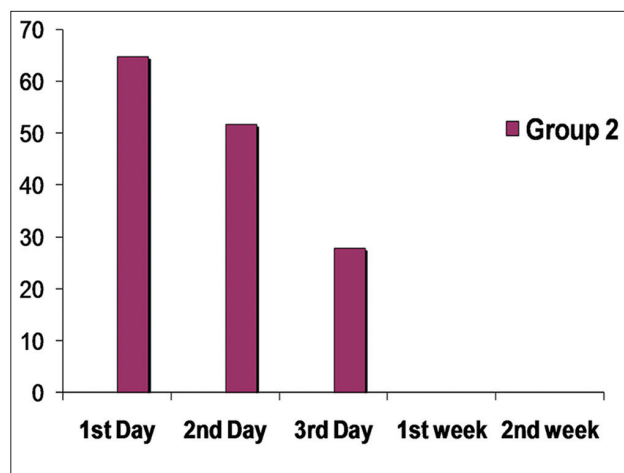
Usually, the root canal treatment would make the host response destroy the organisms in the root canal space.^[17,18] However, some microorganisms are able to resist the immune defenses and persist in the periradicular tissues, sometimes by producing an extracellular matrix or protective plaque.^[19-21] The two species of microorganisms are *Actinomyces israeli*



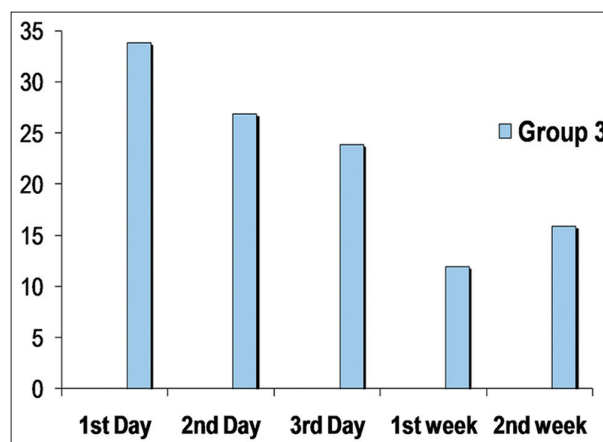
Graph 1: Total incidence of pain



Graph 2: Incidence of pain in Group 1



Graph 3: Incidence of pain in Group 2



Graph 4: Incidence of pain in Group 3

and propionibacterium propionicum, which prevent healing after root canal treatment.^[22]

In every case at every stage of the treatment, sustained effort was made to eliminate all probable and anticipated causes of pain so that unbiased and comparable outcomes were achieved.

Conclusion

There is no statistical difference between incidence of pain in vital and non-vital teeth without periapical radiolucency [Table 6 and Graph 1]. Non-vital teeth with periapical radiolucency exhibited relatively less pain as compared with non-vital teeth without periapical radiolucency, but the pain continued in a significant percent of teeth even after 2 weeks. Pain incidence dropped significantly within a period of 1 day to 2 weeks in vital teeth and non-vital teeth without periapical radiolucency. There was a tendency for less incidence of significant pain after a single visit root canal treatment in these groups. The results of this study are comparable with various previous studies.^[23-25,2,4,5,6] We conclude that within the limits of our study, single visit procedure for root canal preparation showed encouraging results in vital and non-vital teeth with and without periapical radiolucency and is definitely a promising treatment option in routine endodontics as the incidence of pain appears to be distributed fairly evenly in all the groups.

References

- Grossman L. Endodontic Practice, 10th ed. Philadelphia: Lea and Febiger; 1989.
- Fox J, Atkinson JS, Dinin AP, Greenfield E, Hechtman E, Reeman CA, *et al.* Incidence of pain following one-visit endodontic treatment. *Oral Surg Oral Med Oral Pathol* 1970;30:123-30.
- Oliet S. Single-visit endodontics: A clinical study. *J Endod* 1983;9:147-52.
- Mulhern JM, Patterson SS, Newton CW, Ringel AM. Incidence of postoperative pain after one-appointment endodontic treatment of asymptomatic pulpal necross in single-rooted teeth. *J Endod* 1982;8:370-5.
- Pekruhn RB. The incidence of failure following single-visit endodontic therapy. *J Endod* 1986;12:68-72.
- Kane AW, Sarr M, Faye B, Toure B, Ba A. Incidence of postoperative pain in single session root canal therapy study in black senegalese apropos of 96 cases. *Dakar Med* 1999;44:114-8.
- Sathorn C, Parashos P, Messer H. The prevalence of postoperative pain and flare-up in single- and multiple-visit endodontic treatment: A systematic review. *Int Endod J* 2008;41:91-9.
- Ingle J, Bakland L. Endodontics, 5th ed. India: B.C. Decker, Elsevier; 2003.
- Roane JB, Dryden JA, Grimes EW. Incidence of postoperative pain after single- and multiple-visit endodontic procedures. *Oral Surg Oral Med Oral Pathol* 1983;55:68-72.
- Marshall JG, Leisinger RW. Factors associated with endodontic post-treatment pain. *J Endod* 1993;19:573-5.
- Albashaireh ZS, Alnegrish AS. Postobturation pain after single- and multiple-visit endodontic therapy. A prospective study. *J Dent* 1998;26:227-32.
- Fava LR. A comparison of one versus two appointment endodontic therapy in teeth with non-vital pulps. *Int Endod J* 1989;22:179-83.
- Rudner WL, Oliet S. Single-visit endodontics: A concept and a clinical study. *Compend Contin Educ Dent* 1981;2:63-8.
- Dodge JS. Single visit endodontics a clinical study. *J Endod* 1983;9:35-40.
- Clem WH. Post-treatment endodontic pain. *J Am Dent Assoc* 1981;116:533-6.
- Sjögren U, Figdor D, Persson S, Sundqvist G. Influence of infection at the time of root filling on the outcome of endodontic treatment of teeth with apical periodontitis. *Int Endod J* 1997;30:297-306.
- Ashkenaz PJ. One-visit endodontics. *Dent Clin North Am* 1984;28:853-63.
- Trope M, Grossman LI. Root canal culturing survey: Single-visit endodontics. *J Endod* 1985;11:511-3.
- Sundqvist G. Ecology of the root canal flora. *J Endod* 1992;18:427-30.
- Eleazer PD, Eleazer KR. Flare-up rate in pulpally necrotic molars in one-visit versus two-visit endodontic treatment. *J Endod* 1998;24:614-6.
- Trope M, Delano EO, Orstavik D. Endodontic treatment of teeth with apical periodontitis: Single vs. multivisit treatment. *J Endod* 1999;25:345-50.
- Cohen S, Burns RC. Pathways of Pulp, 8th ed. St. Louis, Missouri 2002: The C.V. Mosby Company; 2002.
- Trope M. Flare-up rate of single-visit endodontics. *Int Endod J* 1991;24:24-6.
- Calhoun RL, Landers RR. One-appointment endodontic therapy: A nationwide survey of endodontists. *J Endod* 1982;8:35-40.
- Pekruhn RB. Single-visit endodontic therapy: A preliminary clinical study. *J Am Dent Assoc* 1981;103:875-7.

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