International Endodontic Journal (1991) 24, 24–27

Flare-up rate of single-visit endodontics

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Summary. The purpose of the study was to compare the flare-up rate for single-visit endodontics among teeth without radiographic or clinical signs of apical periodontitis, those with radiographic or clinical signs of apical periodontitis not previously root-treated, and those with apical periodontitis where retreatment was performed.

All teeth were instrumented to a predetermined minimum size with a 0.5 per cent solution of sodium hypochlorite being used as the irrigant. The root canal was obturated without regard to the presence or absence of symptoms or diagnosis of the apical condition. The patients were given written post-operative instructions and a prescription for 600 mg ibuprofen to be taken if mild to moderate pain developed. If severe pain and/or swelling developed, the patient was instructed to telephone immediately and was considered to have had a flare-up.

Teeth without signs of apical periodontitis did not have any flare-ups. One flare-up occurred in 69 teeth with signs of apical periodontitis not previously root-treated. The majority of the flare-ups (3 of 22 teeth) occurred in teeth with signs of apical periodontitis requiring retreatment.

Introduction

Single-visit endodontics has many advantages for the dentist and patient. Perhaps the most important advantage is the prevention of root canal contamination and/or bacterial regrowth that can occur when the treatment is prolonged over an extended period (Tsatsas *et al.* 1974, Byström & Sundqvist 1983). Two factors are critical in single-visit endodontics: (i) the incidence and severity of flare-ups; and (ii) the effect on long-term prognosis of the procedure.

Teeth that do not exhibit apical radiolucencies, or sensitivity to percussion or palpation must be assumed to be free of apical inflammation and to have non-infected root canals (Sundqvist 1976, Möller *et al.* 1981). Single-visit endodontics appears to be the treatment of choice in these teeth, assuming that instrumentation and obturation are carried out aseptically. Most studies indicate that the incidence of postoperative pain after single-visit treatment in these teeth is equal to or lower than that in multi-visit treatment (Pekruhn 1981, Roane *et al.* 1983). Studies on long-term success also favour single-visit endodontics in non-infected teeth (Kerekes & Tronstad 1979).

Teeth which do exhibit apical radiolucencies with or without sensitivity to percussion and palpation must be assumed to be inflamed apically and to have infected root canals (Sundqvist 1976, Möller *et al.* 1981). The advisability of single-visit endodontics in these teeth is open to question. While studies do indicate that the flare-up rate in infected teeth treated in a single visit is the same as that for multi-visit treatment (Oliet 1983, Fava 1989), the pain that does occur in infected teeth can be severe and difficult to manage. The evidence for the prognosis of obturating a contaminated canal is contradictory (Bender *et al.* 1964, Engström *et al.* 1974).

A review of the literature has failed to discover any studies comparing the flare-up rate in teeth with apical periodontitis which were not previously treated endodontically with retreatment cases in the same category.

The purpose of this study was to compare the flare-up rate for single-visit endodontics among teeth without apical periodontitis, those with apical periodontitis not previously endodontically treated, and teeth with apical periodontitis where retreatment was performed.

Materials and methods

All teeth were treated by the author working in full-time private practice.

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Table I. Minimum instrumentation sizes before obturation

	Size
Single rooted tooth	50
Multirooted anterior and premolar	35
Buccal canals (maxillary molars)	35
Mesial canals (mandibular molars)	35
Palatal (maxillary molars)	50
Distal (mandibular molars)	50

Teeth requiring endodontic therapy were included in the study when two criteria were fulfilled: (i) no antibiotics or anti-inflammatory drugs had been taken by the patient for at least 1 week prior to treatment; and (ii) the root canals could be enlarged to minimum pre-set instrumentation sizes before obturation (Table I). A modified stepback instrumentation technique was used, in which the coronal two-thirds of a straight canal or the straight aspect of a curved canal was flared with size 2 and 3 gates glidden burs after minimal preliminary instrumentation. However, the apical 3–5 mm was instrumented to a larger size than the classical stepback technique (Table I); these large sizes were based on the natural diameters of the canals (Kuttler 1955, Green 1956). In retreatment cases the gutta-percha was softened with chloroform before removal and reinstrumentation. A solution of 0.5 per cent sodium hypochlorite introduced into the canal by a loosely fitting 27-gauge needle was used as the irrigant. In teeth without signs of apical periodontitis, the canals were instrumented 1–2 mm from the radiographic apex; in teeth with signs of apical periodontitis, the canals were instrumented 0.5–1 mm from the radiographic apex. The initial use of an apex locator, followed by periodic radiographic checks, ensured that the lengths were maintained as accurately as possible.

This study was performed in conjunction with another evaluating the effect of three commonly used intracanal medicaments on the flare-up rate (Trope 1990). All teeth were treated in strict sequence without regard to the presence or absence of symptoms or diagnosis of the periapical condition. Therefore in every fourth tooth the root canals were obturated in a single visit. Only if technical difficulties were encountered that did not permit full instrumentation and obturation within a reasonable time period was the tooth excluded from the study. Subsequent teeth were then treated according to the sequencing protocol of the study until another single-visit treatment was attempted. Postoperative instructions were given both verbally and on a printed sheet which was handed to the patient (Fig. 1). A prescription for 600 mg ibuprofen, to be taken if mild to moderate pain developed, was also given.

Fig. 1. Post-operative instructions.

After root canal treatment, it is possible for the patient to experience mild to moderate pain. This is normal and should not last for more than 24 to 48 hours. If you experience severe pain and the medication provided is insufficient to make the pain tolerable or if swelling develops in the area of the tooth, please call the office immediately.

If the patient felt that the pain was intolerable, or existing pain was not improving or a swelling had developed, the patient was instructed to telephone immediately. The patient was then considered to have had a flare-up.

A χ^2 test was used to compare statistically the flare-ups that occurred for the different case types.

Results

The number of flare-ups and the types of cases in which they occurred are summarized in Table II. Four flare-ups occurred in 226 treated teeth (1.8 per cent). In 135 of the teeth, apical periodontitis was not present and no flare-ups occurred. Apical periodontitis was present in 91 teeth, all four flare-ups occurred in this group (4.4 per cent). The teeth with apical periodontitis were further divided into teeth not previously root-treated, where one flare-up occurred in 69 cases (1.4 per cent), and retreatment cases in which three flare-ups occurred in 22 teeth (13.6 per cent). The incidence of flare-ups in the apical periodontitis retreatment cases (13.6 per cent) was statistically significantly different from the incidence of flare-ups in the teeth without

Table II. The number and case types of post-instrumentation flare-ups

Case type	No. of teeth	Flare-ups	Percentage
No apical periodontitis	135	0	0
Apical periodontitis	91	4	4.4
No previous Endo	69	1	1.4
Retreatment	22	3	13.6
Total	226	4	1.8

signs of apical periodontitis, but was not significantly different from the cases with apical periodontitis not previously endodontically treated (1.4 per cent).

Discussion

In this study, a flare-up was considered only when the patient experienced intolerable pain and/or swelling. The purpose was to make the definition of a flare-up meaningful to the practising dentist.

None of the flare-ups which occurred was serious. At no time did a life-threatening situation occur, and admission to hospital was never contemplated. Antibiotic coverage and, occasionally, drainage was sufficient to resolve the problem in all cases.

Although the teeth were filled irrespective of symptoms or diagnosis of the periapical condition, some selection did occur because of the difficulty in instrumenting and obturating teeth with previous root fillings within a reasonable period of time. Thus fewer retreatment cases were completed in one visit. The percentage of flare-ups was high in the few cases that were completed; more cases might have made the statistical difference more obvious.

For all of the teeth in this study, no medicaments were placed in the canals after instrumentation. Nonetheless, the incidence of flare-ups was extremely low and compared favourably with that of teeth with root canals in which various medicaments were placed after instrumentation (Trope 1990). This finding strengthens the hypothesis that thorough instrumentation is the most important factor in reduction of the incidence of pain. Special care was taken to instrument the apical 3–5 mm to sizes consistent with the natural sizes of root canals (Kuttler 1955, Green 1956). These minimum sizes (Table I) were considerably larger than those recommended in the classical stepback technique (O'Keefe 1976, Balaban *et al.* 1984). The presence of a thoroughly instrumented and thus cleaner apical canal could account for less postoperative pain. This is supported by the findings of Barnett & Tronstad (1989), where the same instrumentation technique was used and a similar low frequency of flare-ups was recorded. In addition, care was taken to instrument short of the radiographic apex, another possible factor in the low flare-up rate.

Teeth with vital pulps or necrotic pulps without signs of apical periodontitis did not flare-up; the canals of these teeth were considered to be free of infective bacteria (Sundqvist 1976, Möller *et al.* 1981). This lack of postoperative pain and the favourable long-term success of the treatment method make it the treatment of choice for these teeth.

Teeth not previously root-treated with signs of apical periodontitis had an extremely low flare-up rate (1.4 per cent), and could safely be treated in a single visit. However, the effect on long-term prognosis of this form of treatment must be considered. Instrumentation and irrigation will not eliminate all the bacteria from the root canal space (Byström & Sundqvist 1983). Theoretically, at least, it seems inappropriate to obturate a contaminated canal. The placement of a post-instrumentation intracanal medicament which

will consistently sterilize the canal should increase the long-term prognosis of these teeth (Byström *et al.* 1985). However, this still needs to be confirmed by a good prospective study.

The flare-up rate for retreatment cases with apical periodontitis, on the other hand, was unacceptably high (13.6 per cent). In instrumenting retreatment cases, the old gutta-percha tended to be pushed ahead of the files, forcing bacterial and other debris into the periapex, where they could cause severe inflammation and sometimes intolerable pain. The chloroform used to soften the old gutta-percha is also toxic and may have contributed to the increased incidence of pain (Wolfson & Seltzer 1975). The high flare-up rate and the difficulty in treating a flare-up in an obturated canal makes single-visit root treatment undesirable in these retreatment cases.

Conclusions

According to the findings of this study:

(i) teeth without apical periodontitis did not flare-up and may be treated in a single visit;

(ii) teeth with apical periodontitis but no previous root treatment can be treated in a single visit, with a low probability of a flare-up occurring;

(iii) in teeth with apical periodontitis which need retreatment, the flare-up rate was highest and single-visit root treatment would be inadvisable.

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