

Single visit endodontics: Incidence of post-operative pain after instrumentation with three different techniques: An objective evaluation study

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المعالجة اللبية خلال زيارة مفردة : احتمال حدوث الألم التالي للمعالجة بعد استعمال الأدوات بتطبيق ثلاث تقنيات . دراسة تقييم ذاتياً حركي التقييم الذاتي على حالة فواطع علوية متموته لتقييم حدوث الألم التالي للمعالجة التي أُخترت خلال زيارة واحدة وذلك باستعمال ثلاث تقنيات مختلفة. شملت الدراسة مائة وخمسة أسنان من إحدى وتسعين مريضاً بعمر يتراوح من ١٨ إلى ٥٥ سنة، جرى تقسيم الأسنان إلى ثلاثة مجموعات، تضمنت كل مجموعة ٣٥ سناً جرى تحضيرها باستعمال إحدى الطرق التالية: مبادر فولاذية وتطبيق طريقة الدرجة الراجعة، مجموع مبادر بروفايل ٠.٠٤ ٢٩% وتطبيق الدرجة النازلة ومبادر بروفايل GT. لوحظ اختلاف احصائي واضح في احتمال حدوث الألم التالي للمعالجة خلال التماسي والأربعين ساعة التالية لإتمام معالجة قناة الجذر. يمكن الاستنتاج على أن استعمال مبادر بروفايل ٠.٠٤ ٢٩% الممدبة ومبادر بروفايل GT من شأنها أن تساهم في التقليل من احتمال حدوث الألم التالي للمعالجة عند المرضى الذي تلقوا معالجة لقناة الجذر خلال زيارة واحدة.

An objective evaluation study was carried out on necrotic pulp of the maxillary central incisors in order to describe the incidence of post-operative pain following single-visit root canal treatment using three different instrumentation techniques. One hundred and five teeth from 91 patients whose ages ranged from 18 to 55 years were selected and divided into three groups. Each group (35 teeth) was prepared by one of the following instruments: stainless steel k-files utilizing a step-back technique, Profile 0.04-29% series files using crown-down pressureless technique and Profile GT files using crown-down pressureless technique. A significance difference in the incidence of postoperative pain within the first 48 hours after the completion of root canal therapy was observed among the groups. It was concluded that the use of Profile 0.04-29% taper and Profile GT files contributed to the lower incidence of postoperative pain in patients who received root canal therapy in single endodontic visit.

Introduction

In recent years, one appointment endodontics has gained increased acceptance as the best treatment for most cases. Some endodontists even feel that there are few cases that cannot be treated successfully in one appointment. Feranti¹ reported that there was little difference in postoperative sequela between single-visit and two-visit root canal therapy. Dodge in 1978² described various techniques used to complete endodontic treatment in a single visit. Traditionally, k-files were used to prepare root canals using different techniques such as circumferential filing mode utilizing the step-back technique. Recently, new automated systems for root canal instrumentation; the Profile 0.04 taper series 29 and the greater taper GT rotary instruments were introduced.^{4,5} Both systems are used in a crown down pressure-less technique.

Flare-ups have been most commonly used to describe post-treatment symptoms, although there is little agreement as to which point pain and swelling become bona fide flare-up. Walton and Fouad³ defined flare-up as patient report of pain or swelling, or combination of both within a few hours to a few days after root canal treatment procedure. This usually disrupts patient lifestyle and requires unscheduled visit and an active treatment such as incision and drainage, or canal

debridement.

It has been reported that there was little or no difference in the quality of treatment, incidence of post-obturation complications, or success rate between single-visit and multiple-visits root canal treatment using different canal preparation techniques.⁶⁻⁹ No previous studies reported incidence of post-operative pain after using Profile 0.04-29 series or Profile GT in a single visit root canal treatment.

The purpose of this study was to analyze the incidence of post-operative pain following single-visit root canal treatment in necrotic pulps of maxillary central incisors using three different instrumentation techniques.

Material and Methods

One hundred and five maxillary central incisors with necrotic pulps from 91 patients whose ages ranged from 18 to 55 years were used in this study. Maxillary central incisors were selected for this study due to the fact that they maintain simple root morphology. The pathological status of the pulps was determined by the previous dental history and routine endodontic diagnostic procedures. All procedures were undertaken by the author provided that:

- The patient accepted the proposed single appointment procedure together with the criteria for postoperative pain evaluation and

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- an informed consent was obtained.
- The tooth had a necrotic pulp, which was not causing spontaneous symptoms.
 - Periradicular lesions (if any) did not exceed 2-3mm in diameter.
 - The patient was in good general health.

Prior to access cavity preparation adequate anesthesia was administered and rubber dam applied. Upon cavity access preparation the canal was irrigated with 2.6% NaOCl. The teeth were divided randomly into 3 groups of 35 teeth each according to the technique to be used for instrumentation as follows:

Group 1

The canals of the first 35 teeth were prepared by the step-back technique as described by Clem.¹⁰ After access cavity preparation, the working lengths (WL) were estimated with a #20 k-file* (Kerr Company, USA), then Sizes #25, 30, 35, 40 files were used respectively to instrument each canal to the WL. Instrumentation was considered complete when size #40 k-file fit to working length. Step-back was started with size #45 1 mm short of the WL followed by size #50, 55, and 60 in 1mm short of each other. Recapitulation was accomplished with #15 k-file, provided the fact that the recapitulation file did not exceed the estimated WL.

Group 2:

In this group, the Profile 0.04 taper 29 series files** (Tulsa Dental Products, Tulsa, OK, USA) shown in Fig.1 were used in a TCM Endo microprocessor low reduction gear hand-piece (Nouvag AG, Goldach Switzerland) seen in Fig. 2 at approximately 150 RPM. According to the manufacturer's instructions, the files were used in a crown-down preparation manner: a size #2 profile 0.04 taper (white color) (equivalent to size #15 ISO instrument) was selected as the best predetermined size that could reach the WL. Then size #4 Profile 0.04 taper (red color) was used in the low-speed handpiece halfway down the canal with light pressure. When resistance was felt the instrument was withdrawn and cleaned of debris, Sizes #5,6, and 7 Profile 0.04 (blue, green and black color) were used in the same manner to approximately the same depth. Using a pre-selected size #4,5 and 6 Profile 0.04 taper, the instrumentation proceeded apically to the working length. The middle part of the canal was then enlarged sequentially from size #5 to size #8 Profile 0.04 taper. Size #15 k-file was then

introduced to recapitulate the canal. Canal preparation was considered complete when #40 k-file fitted to working length.

Fig. 1. The Profile 0.04 taper 29 series files.



Group 3

In this group, Profile GT files (Tulsa Dental Products, Tulsa, OK, USA) seen in Fig. 3 were mounted on the same handpiece used in group 2. According to the manufacturer's instructions, the files were used in a crown-down preparation manner based on the following procedure: A size #4 Profile GT file (blue color) with 0.12 taper was used to approximately half-way down the canal with light pressure. When resistance was felt, the instrument was withdrawn. Then, size #3 Profile GT file (red) with 0.10 taper was inserted with light pressure until resistance was felt, then the instrument was withdrawn. The instrumentation continued to the apical 1/3 of the canal using size #2 Profile GT file (gold) with 0.08 taper, and size #1 Profile GT file (silver) with 0.06 taper. The middle and apical part of the canal were then enlarged sequentially from size #4 to the size #5 Profile 0.04 taper. The patency of the canal was checked with size #15 k-file.

Fig. 2. Profile GT files. (Tulsa Dental Products, Tulsa, OK, USA)



After the cleaning, shaping procedures and final irrigation were completed, all root canals were dried and obturated with laterally condensed gutta-percha cones and an Epoxy Resin root canal sealer (AH-26) (Dentsply, USA).

All the patients were contacted 48 hours and one week respectively after the treatment and were asked to report all postoperative reactions. If the patient did not require an analgesic and reported minimal or no discomfort that disappeared within 48 h, postoperative pain was classified as none to slight. If the patient reported tolerable pain and/or mild tenderness on biting that did not require an analgesic; it was classified as mild postoperative pain. If the patient reported intermittent pain with moderate sensitivity on biting that required an analgesic, the postoperative pain was classified as moderate. If the patient reported continuous pain with extreme sensitivity on biting that required a strong analgesic, the postoperative pain was classified as severe. A final postoperative clinical evaluation by routine clinical tests was performed 1 week after completion of the treatment. At the same time, all patients were asked to report any other reactions they might have felt during the second to the seventh day after treatment. Data were collected and recorded for statistical analysis.

Results

Incidence of pain within 48 hours

Statistical analysis of the results of the objective clinical evaluation using Kruskal-Wallis test showed that there was a significant difference ($P=0.014$) in pain incidence among the three groups (Table 1). The post hoc Tukey type tests showed that patients who received RCT using step-back technique reported a significantly higher incidence of postoperative pain compared to patients received RCT using Profile 0.04-29 series and GT systems. However, there was no significant differences between Profile 0.04-29 series group and GT group ($P<0.05$).

Incidence of pain 1 week after the first visitThe statistical analysis using Kruskal-Wallis test showed that, there was a significant difference between the three groups ($P=0.016$) Table 2. Post hoc tests showed that step-back technique patients reported a higher incidence of pain compared to patients treated using Profile 0.04-29 series and GT systems. However, there was no significant difference between the Profile 0.04-29 series and GT files groups ($P<0.05$)

Table 1. Incidence of postoperative pain within 48 hours.

Technique	Pain				Total
	No pain	Mild	Moderate	Severe	
Group 1	27	4	3	1	35
Group 2	34	0	1	0	35
Group 3	33	1	1	0	35

Table 2. Incidence of postoperative pain 1 week after the first visit.

Technique	Pain	No Pain	Total
Group 1	4	31	35
Group 2	0	35	35
Group 3	0	35	35
Total	4	101	105

Discussion

The results of this clinical study indicated a statistical difference in the expression of postoperative pain in necrotic pulp maxillary central incisors treated in one appointment. Cases instrumented with step back technique had a higher incidence of postoperative pain than cases instrumented with the Profile 0.04 system and Profile Greater Taper system (GT).

The findings of the current investigation agree with previous results obtained by numerous investigators. They reported a low incidence of postoperative pain in teeth with necrotic pulps in one visit root canal therapy in spite of the use of different instrumentation techniques.⁷⁻⁹ Al-Bashaireh and AlNegrish¹¹ using only step back technique to instrument canals reported a significantly higher incidence of postobturation pain in the multiple-visits group than in the single-visit group. They also reported that pain was significantly associated with the treatment of necrotic pulps.

Extrusion of root canal contents beyond root canals system into the peri-radicular tissues is a problem that may occur with all instrumentation techniques.¹²⁻¹⁵ Seltzer and Nadirof¹⁶ suggested that inflammatory and immunological reactions occur when such debris is pushed into the peri-radicular area. Al-Omari and Dummer¹³ and McKendry¹⁷ reported that step-back technique

produced more apically extruded debris than engine driven nickel-titanium instrumentation techniques. The hypotheses that engine driven rotary nickel-titanium instruments produce less debris, was supported by Sarina and Hicks.¹⁴ They suggested that instrumentation techniques involving rotational movement such as Profile and the light speed decreases the amount of debris forced apically thus leading to a decreased potential for peri-radicular tissue irritation and postoperative pain. This result is confirmed by the current findings, where nickel-titanium Profile and GT files with u-shaped cross section were efficient in preparing and cleaning all sections of the root canal with coronal evacuation of the dentin debris as penetration proceeded. On the other hand, with stainless steel k-files, debris was jammed in the canal or pushed toward apex. These considerations may explain the moderate pain felt by few patients when canals were instrumented with the Profile 0.04-29% taper system and Profile GT system.

Al-Jabreen¹⁸ reported a statistical difference in time consumed to complete preparation of simulated root canals, as well as a lower incidence of transportation after using the Profile GT files compared to the use of conventional stainless-steel hand files. Together with the findings of the current study, the Profile GT seems to have very promising results in root canal preparation.

It is obligatory to fully understand the fundamentals and principles of endodontics before engaging in single visit endodontics. All the indications and contraindications in each case on an individual basis should be considered in decision-making whether or not it can be completed in a single visit. However, it is also important for the practitioner to have a clinical sense of what can be accomplished once the rubber dam has been placed. Once a high level of competence is attained, one-visit endodontics can be successfully performed if well-skilled clinicians choose their cases carefully and adhere to basic endodontic principles.

Conclusion

The use of the Profile 0.04 and GT systems in preparing single rooted teeth contributed to lower the incidence of post-operative pain reported by patients.

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