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Clinical evaluation of postoperative pain after single-visit root canal treatment using different rotary file systems in human teeth

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Abstract

Various instrument kinematics used in single-visit endodontics influence the occurrence of pain after endodontic therapy. This study aimed to evaluate the occurrence of pain after mechanical instrumentation with Hyflex EDM (HEDM) and ProTaper Gold file systems during single-visit endodontic therapy. Patients diagnosed with asymptomatic irreversible pulpitis and normal apical tissues in mandibular premolar teeth were included in the study for single-visit root canal therapy. The patients were divided into two groups (n = 30) according to the rotary instrument used during root canal preparation (group A [HEDM] and group B [ProTaper Gold]). Pain was evaluated after endodontic therapy at 8, 24, and 48 h intervals using the visual analog scale (VAS). Postoperative pain was lower in the HEDM file system than in the ProTaper Gold file system after single-visit root canal therapy at 8, 24, and 48 h.

Keywords: Hyflex EDM, postoperative pain, root canal therapy, rotary instrumentation, Protaper gold

Introduction

Pain after endodontic therapy is a routine complication, reported to be 1.4-16%. Post-endodontic pain is multifactorial. One underlying cause is debris extrusion during chemo mechanical preparation. Proper irrigation protocols and aspiration techniques are used to limit instrumentation to the canal's confines, and the extrusion of debris can be minimized using different endodontic files with appropriate kinematics.

Current mechanical preparation of root canals uses rotary nickel-titanium (NiTi) instruments that employ either of the two kinematics (rotation or reciprocation). Rotary single-file systems, such as Hyflex EDM (HEDM), are produced by a distinctive process called “electric discharging machining.” This technique uses spark erosion, which amplifies the fracture resistance and cutting efficiency. The cross-section of the file varies along the length of the file, with triangular, trapezoidal, and quadratic shapes in the coronal third, middle third, and apical third, respectively.

ProTaper Gold features the simplicity and smoothly tapered shapes. It provides great resistance to cyclic fatigue and great ability in cleaning and shaping.

Material and methods

Patients diagnosed with asymptomatic irreversible pulpitis with normal periapical tissue were selected. Sixty patients who met the inclusion criteria were categorized into two groups of 30 each; group A (HEDM) and group B (ProTaper Gold). The inclusion criteria were as follows: Patients aged 18-40 years, with single-rooted mandibular premolars diagnosed with asymptomatic irreversible pulpitis with normal periapical tissue and patients who could understand the use of the pain scale.

The exclusion criteria were as follows: Patients with acute and chronic apical abscess or cellulitis; known allergies to opioids, non-opioids, NSAIDS, analgesics, lidocaine; pregnant or lactating mothers; teeth with complex root canal morphology; teeth with poor prognosis; patients with systemic diseases; unwilling to participate in the study and those receiving premedication with analgesics; and patients with active pain in other than the tooth to be tested.

A thorough treatment protocol was briefed to the participants and informed consent was obtained from all participants.

Treatment protocol

The entire clinical procedure was performed by a single surgeon. Local anesthesia was administered with 2% lignocaine (1:80,000 epinephrine). After the rubber dam application and access opening, a #10 stainless steel hand K-file was used to establish the glide path. The working length was obtained using the CL2I apex locator (Coltene) and was confirmed using an intraoral periapical radiograph. Mechanical preparation was performed up to size 25 using a stainless-steel hand K-file.

Group A (n=30): the canals were instrumented with hyflex edm niti file with a gentle apical stroke and pecking movement with endomotor canal pro cl2i at 500 rpm and 2.5 ncm torque.

Group B (n=30): the canals were instrumented with ProTaper Gold file with a gentle apical stroke and pecking movement with endomotor canal pro cl2i at 500 rpm and 2.5 ncm torque.

In both groups, irrigation was performed intermittently in the following sequence: 5 ml of 5.25% NaOCl followed by saline. Absorbent paper points were used to dry the canals,

and the canals were obturated using the corresponding master gutta-percha cone with bioceramic sealer. Post endo restoration was done using composite resin.

A visual analog scale (VAS) was used to measure pain after endodontic therapy. Based on this scale, the pain level was numerically documented in the range of 0-100. The following VAS classifications were used: no pain, 0-24; mild pain, 25-49; moderate pain, 50-74; severe pain, 75-100. Pain scoring based on the VAS questionnaire was recorded at 8, 24, and 48 h by telephone inquiry. Ibuprofen 400 mg was prescribed for all patients, with instructions to use it only for excruciating pain. They were cautioned against taking drugs without the investigator's knowledge. After two weeks, the patients were called back for final restoration.

Results

Hyflex EDM is better clinically than ProTaper Gold for biomechanical preparation of the root canal.

Discussion

The effectiveness of endodontic therapy will be influenced by effective chemo mechanical preparation, three-dimensional root canal filling, and the level of postoperative discomfort. It is challenging to assess the subjective nature of pain. As a result, postoperative pain and VAS scores were adequately described to study participants. This scale is regarded as a conclusive and reliable way to evaluate pain. The VAS scale was generally easily understood by participants, who accurately rated their level of pain. To control the technique and operator-related variables in this study, endodontic therapy was administered to every participant in a single visit by a single operator. The only distinction between the two groups' mechanical preparation procedures was the employment of rotary files.

To preserve standardisation and rule out the impact of different tapers on postoperative pain, the file systems used were identical in size. Kinematics are different in both systems. According to earlier research, preoperative discomfort and periapical state have a considerable impact on postoperative pain. Because of this, this study included teeth with asymptomatic irreversible pulpitis and normal periapical condition in order to assess pain following endodontic therapy

Single-visit endodontic procedures are preferred to minimize the effects of related variables. Su *et al*. reported that the occurrence of pain after endodontic therapy in a single visit was minimal compared with multiple-visit endodontic treatment. The results of this study revealed significantly less pain in the HEDM group than in the ProTaper Gold group at 8 h, which was subsequently reduced at 24 h and 48 h. When comparing the VAS between HEDM and ProTaper Gold in three different time slots, it was found that HEDM had higher success than ProTaper Gold among participants in terms of the least post-endodontic pain. Therefore, this study showed that HEDM was better at minimizing postoperative pain than ProTaper Gold.

A systematic review by Pak *et al*. stated that, during the initial phase, pain after single-visit endodontic treatment was found to be preponderant. According to this review, the mean posttreatment pain severity was greater at 24 h. After 7 days, the severity of the pain gradually reduced. In the present study, the incidence of pain tracked a similar curve, which was greater at 8 h in both groups, followed by a significant reduction in pain at 24 and 48 h. None of the patients in this trial needed analgesics because they weren't having any acute pain.

Postoperative discomfort has been attributed to variations in cleaning and shaping techniques, immunological reactions to extruded root canal debris, irrigants, instrumentation beyond the apex, or foreign body reactions to obturating materials. As a result, significant care was taken in this study to limit the impact of these factors.

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