



## COMPARATIVE EVALUATION OF POSTOPERATIVE PAIN AFTER SINGLE VISIT ENDODONTIC TREATMENT IN PERMANENT SINGLE ROOTED TEETH USING PROTAPER NEXT AND HYFLEX EDM ROTARY FILE SYSTEMS – AN IN-VIVO STUDY

### Dentistry

|                            |                                                                                                    |
|----------------------------|----------------------------------------------------------------------------------------------------|
| <b>Dr Arun Rahar*</b>      | Reader in M. M. College of Dental Sciences and Research, Mullana (Ambala)<br>*Corresponding Author |
| <b>Dr Amita</b>            | Professor in Bhojia Dental College and Hospital, Baddi, Himachal Pradesh                           |
| <b>Dr Shweta Goyal</b>     | Senior Resident in Swami Devidayal Dental College and Hospital, Golpura, Barwala                   |
| <b>Dr. Nivedita</b>        | Senior Resident in S.G.T University, Gurgaon                                                       |
| <b>Dr. Vandana Multani</b> | Senior Lecturer Sudha Rustagi College of Dental Sciences and Research Faridabad Haryana            |
| <b>Dr Komalpreet Kaur</b>  | PG Student in M. M. College of Dental Sciences and Research, Mullana (Ambala)                      |

### ABSTRACT

**Background-** The main aim of this study was to evaluate and compare the postoperative pain after single visit endodontic treatment in permanent single rooted teeth using Protaper Next and Hyflex EDM rotary file systems. A total of 60 systematically healthy patients whose permanent maxillary and mandibular single rooted teeth diagnosed as symptomatic irreversible pulpitis with symptomatic apical periodontitis, seeking single visit root canal treatment. The patients were randomly selected and divided into two groups without any discrimination of age, gender and teeth consisting of 30 patients in each group. **GROUP 1: Protaper Next File System** **GROUP 2: Hyflex EDM File System.** For rating the intensity of pain, a modified VAS was selected as it has been recommended in a report of Cochrane database of systematic reviews for post endodontic pain. The data recorded was statistically analysed using the intergroup comparison of pain scores between the Protaper Next and Hyflex EDM. using chi square test at 95% confidence interval at different time intervals, Pain scores in the Protaper Next group was higher as compared to the Hyflex EDM at 6 hrs 24 hrs time intervals, but the difference between the groups was statistically non-significant. At 48 hrs and 72 hrs the pain scores were higher in the Hyflex EDM group but the difference between the groups was statistically non-significant ( $p > 0.05$ ).

### KEYWORDS

Postoperative Pain, Protaper, Hyflex, VAS

### INTRODUCTION

The basic principles of root canal treatment are the eradication of root canal irritant, obturation of the root canal system and preservation of the natural dentition. The root canal procedure can be done in single visit or multiple visits. The recent invention of rotary nickel-titanium systems and improvements in the understanding of irrigation dynamics and delivery systems have facilitated the mechanical instrumentation and disinfection of the root canal, which makes the single-appointment treatment more convenient.<sup>1</sup> As time factor is probably one of the more important factor it is possible to use single visit endodontics as the most accepted technique among the patients and operators.<sup>2</sup>

### MATERIAL AND METHODOLOGY

The study was conducted with the approval of the institutional ethical committee, at the Post graduate clinic in the department of conservative dentistry and endodontics, BRS Dental College and hospital, Sultanpur, Panchkula, Haryana. A total of 60 systematically healthy patients whose permanent maxillary and mandibular single rooted teeth diagnosed as symptomatic irreversible pulpitis with symptomatic apical periodontitis, seeking single visit root canal treatment as per inclusion and exclusion criteria were selected for the study. The patients were randomly selected and divided into two groups without any discrimination of age, gender and teeth consisting of 30 patients in each group.

**GROUP 1:** Protaper Next File system

**GROUP 2:** Hyflex EDM File system

### Inclusion Criteria–

- I. Permanent maxillary and mandibular single rooted teeth with diagnosis of symptomatic irreversible pulpitis with symptomatic apical periodontitis.
- II. Teeth with well-formed root apex.
- III. Between 18 to 60 years of age.
- IV. Adequate clinical crown for application of rubber dam.
- V. Teeth with mild to moderate root curvature ( $5^\circ$  to  $20^\circ$ )

### Exclusion Criteria–

- I. Internal or External resorption
- II. Calcified canals
- III. Extreme root curvature (degree of curvature  $> 20^\circ$ )

- IV. Root fracture
- V. Wide open apex
- VI. Root canal retreatment
- VII. Patient on medication (antibiotic and analgesic)
- VIII. Medically compromised (systemic disease)
- IX. Traumatic tooth
- X. Periapical abscess
- XI. Presence of sinus tract
- XII. Non vital tooth
- XIII. Patients allergic to Ibuprofen
- XIV. Pregnant females

### Procedure

Before initiation of treatment, the whole procedure and the study design was explained to the patients. The informed consent form was given, and then the patient signed an informed consent form. Complete medical and dental history was taken. The intensity of preoperative pain was measured using the visual analog scale. Prior to start of the procedure, each patient was anesthetized with (2% lidocaine 1:100,000 epinephrine), 1.8 ml of local anaesthesia, the patient who experienced pain during instrumentation, intra pulpal anaesthesia was administered. When the area was anesthetized, tooth was isolated with a rubber dam (GDC). All carious lesion was eliminated Access cavity was prepared with Endo access bur and refined with Endo Z bur using an air-rotor handpiece (NSK) with air water spray. Patency of the canal was checked with a no. 10 K-file. The working length obtained with the apex locator (Coltene / Whaledent, Altstätten, Switzerland) was confirmed by taking a digital radiograph. The teeth in group 1 ( $n = 30$ ) instrumented with a crown down technique using ProTaper Next file system (Dentsply, Maillefer, Switzerland). ProTaper Next files were used with the sequence XA (19/.035), proglider glide path file (16/0.02) PTN X1 (17/0.04), and X2 (25/0.06) at a rotational speed of 300 rpm along with torque values of 200 gcm. Each file was used with a brushing motion, whilst those in group 2 ( $n = 30$ ) were instrumented using a Hyflex EDM file system (Coltene). Hyflex EDM were used with sequence orifice shaper (25/0.12), glide path file (10/0.05) and hyflex (25 ~ ) one file (variable taper) at a rotational speed of 500 rpm along with torque values of 300 gcm.

During the preparation, irrigation was carried out with 3% NaOCl and

17% EDTA using 27 gauge side vented needle, the needle was placed 1.5 mm short from the working length. Intermittent agitation using a # 15 k file was done to prevent apical debris accumulation and coronapical movements of the needle were done to agitate the irrigant manually. Apical gauging was done using # 25 k 2% taper file after biomechanical preparation and if the file was loosen at the apex maintaining the same working length then the tooth was excluded from the study. After completion of biomechanical preparation, canals were flushed with 5 ml saline. Final irrigant used was 5 ml of 17% EDTA. After final irrigation of canals master apical gutta percha cone was evaluated by taking RVG. After that canal was dried with the help of absorbent paper point of adequate size. Zinc oxide eugenol sealer was mixed and applied to walls of prepared canal and Obturation of the canals were carried out with Gutta Percha cones by lateral condensation technique. Post obturation radiograph was taken Cavity was sealed by Filtek TM Z250 XT nanohybrid composite (3M ESPE) Proper occlusal contact confirmed by articulating paper. Root canal treatment in both the groups was carried out in a single appointment, and the severity of postoperative pain was assessed using Visual analog scale score (described later) after 6, 24, 48, and 72 hrs. The patient who experienced pain after treatment then mild analgesic Ibuprofen (400 mg, 8-12 hrs) was given. After that patients were contacted through telephonic medium and reminder was given to them to note their pain readings and return the form duly filled and submit after three days.

### Criteria for the Assessment of Pain-

For rating the intensity of pain, a modified VAS was selected as it has been recommended in a report of Cochrane database of systematic reviews for post endodontic pain. They suggest that the level of discomfort/pain must be rated in categories arranged in advanced order and exactly described with the use of analgesics. Thus, making it accurate criteria for quantifying pain.<sup>3</sup>

### Visual Analog Scale (VAS)

- No pain (0): The treated tooth felt normal. Patients did not have any pain.
- Mild pain (1): Recognizable, but not discomforting, pain, which required no analgesics.
- Moderate pain (2): Discomforting, but bearable, pain (analgesics, if used, were effective in relieving the pain).
- Severe pain (3): Difficult to bear (analgesics had little or no effect in relieving the pain).

### Statistical Analysis

Statistical analysis was performed using SPSS software (IBM SPSS Statistics for Windows, Version 21.0. Armonk, NY: IBM Corp)

- Intergroup comparison of pain using VAS score at different time interval was done using Chi-square test at 95% confidence interval (not significant).
- Intergroup comparison of Ibuprofen intake was done using Chi-square test at 95% confidence interval (not significant).
- Intragroup (Group -I) comparison of pain using VAS score at different time interval was done using Repeated measure Anova and Post HOC LSD analysis at 95% confidence interval (significant).
- Intragroup (Group-II) comparison of pain using VAS score at different time interval was done using Repeated measure Anova and Post HOC LSD analysis at 95% confidence interval (significant).
- Intragroup (Group -I) comparison of Ibuprofen intake was done using Chi-Square test at 95% confidence interval (significant).



Preoperative Radiographic View w.r.t. 35



Working Length Determination w.r.t. 35



Master Cone X-ray w.r.t. 35



Obturation x-ray w.r.t. 35

### RESULTS

The patients were randomly selected and divided into two groups without any discrimination of age, gender and teeth consisting of 30 patients in each group.

### Group 1: Protaper Next File System

#### Distribution of Various Characteristics of Study Population

Table 1: Gender Distribution of Study Subjects

| Groups        | Female | Male  |
|---------------|--------|-------|
| Protaper Next | 9      | 21    |
|               | 30.0%  | 70.0% |
| Hyflex EDM    | 13     | 17    |
|               | 43.3%  | 56.7% |

The above table shows 60 patients were selected for the study 30 in each group. In group I (Protaper Next group), 9 (30.0%) were females and 21 (70.0%) were males. In group II (hyflex EDM), 13 (43.3%) were females and 17 (56.7%) were males.

Table 2: Age Distribution of Study Subjects

| Groups        | Mean  | Std. Deviation | Std. Error Mean |
|---------------|-------|----------------|-----------------|
| Protaper Next | 41.56 | 10.033         | 1.831           |
| Hyflex EDM    | 41.46 | 8.270          | 1.509           |

Above table shows mean age in Group I (Protaper Next group) was 41.56 and in Group II (hyflex EDM) was 41.46.

Table 3: Comparison of Pain Scores Between Two Groups at Different Time Intervals

|                          | Groups        | No Pain    | Mild       | Mode-rate  | Severe    | Chi Square value | P value         |
|--------------------------|---------------|------------|------------|------------|-----------|------------------|-----------------|
| Pre-operative Pain Score | Protaper Next | 0 (0%)     | 0 (0%)     | 0 (0%)     | 30 (100%) | 0.000            | 1.000 (Non-Sig) |
|                          | Hyflex EDM    | 0 (0%)     | 0 (0%)     | 0 (0%)     | 30 (100%) |                  |                 |
| Pain at 6 hrs            | Protaper Next | 17 (56.7%) | 04 (13.3%) | 09 (30.0%) | 0 (0%)    | 0.087            | 0.957 (Non-Sig) |
|                          | Hyflex EDM    | 18 (60%)   | 04 (13.3%) | 08 (26.7%) | 0 (0%)    |                  |                 |
| Pain at 24 hrs           | Protaper Next | 19 (63.3%) | 6 (20%)    | 05 (16.7%) | 0 (0%)    | 0.302            | 0.860 (Non-Sig) |
|                          | Hyflex EDM    | 21 (70%)   | 05 (16.7%) | 04 (13.3%) | 0 (0%)    |                  |                 |

|                |               |            |            |           |        |       |                 |
|----------------|---------------|------------|------------|-----------|--------|-------|-----------------|
| Pain at 48 hrs | Protaper Next | 24 (80%)   | 05 (16.7%) | 01 (3.3%) | 0 (0%) | 0.444 | 0.801 (Non-Sig) |
|                | Hyflex EDM    | 24 (80%)   | 04 (13.3%) | 02 (6.7%) | 0 (0%) |       |                 |
| Pain at 72 hrs | Protaper Next | 29 (96.7%) | 01 (3.3%)  | 0 (0%)    | 0 (0%) | 0.351 | 0.554 (Non-Sig) |
|                | Hyflex EDM    | 28 (93.3%) | 02 (6.7%)  | 0 (0%)    | 0 (0%) |       |                 |

Above table shows the intergroup comparison of pain scores between the Protaper Next and Hyflex EDM. using chi square test at 95% confidence interval at different time intervals, Pain scores in the Protaper Next group was higher as compared to the Hyflex EDM at 6 hrs 24 hrs time intervals, but the difference between the groups was statistically non-significant. At 48 hrs and 72 hrs the pain scores were higher in the Hyflex EDM group but the difference between the groups was statistically non-significant ( $p>0.05$ )

**Table 5: Comparison of Pain Scores Between Males and Females in Group I at Different Time Intervals**

| Time Intervals | Female    | Male      | P value                |
|----------------|-----------|-----------|------------------------|
| Pain at 6 hrs  | 1.44±0.88 | 0.42±0.74 | 0.001(Significant)     |
| Pain at 24 hrs | 1.22±0.83 | 0.23±0.53 | 0.001(Significant)     |
| Pain at 48 hrs | 0.66±0.70 | 0.04±0.21 | 0.001(Significant)     |
| Pain at 72 hrs | 0.11±0.33 | 0.00±0.00 | 0.129(Non-Significant) |

Independent t test at  $p\leq 0.05$  is significant

**Table 8: Intragroup Comparison of Ibuprofen Intake In Group I**

| Time Interval | No     | Yes   | P value             |
|---------------|--------|-------|---------------------|
| At 6 hrs      | 21     | 9     | 0.001 (Significant) |
|               | 70.0%  | 30.0% |                     |
| At 24 Hrs     | 25     | 5     |                     |
|               | 83.3%  | 16.7% |                     |
| At 48 Hrs     | 29     | 1     |                     |
|               | 96.7%  | 3.3%  |                     |
| At 72 Hrs     | 30     | 0     |                     |
|               | 100.0% | 0.0%  |                     |

**Table 9: Intragroup Comparison of Pain Scores in Group II**

| TIME              | Mean Difference | Std. Error | Sig.  | Significance    |
|-------------------|-----------------|------------|-------|-----------------|
| Pre op v/s 6 hrs  | 2.333           | 0.151      | 0.001 | Significant     |
| Pre op v/s 24 hrs | 2.566*          | 0.151      | 0.001 | Significant     |
| Pre op v/s 48 hrs | 2.733*          | 0.151      | 0.001 | Significant     |
| Pre op v/s 72 hrs | 2.933*          | 0.151      | 0.001 | Significant     |
| 6 hrs v/s 24 hrs  | 0.233           | 0.151      | 0.125 | Non-Significant |
| 6 hrs v/s 48 hrs  | 0.400*          | 0.151      | 0.001 | Significant     |
| 6 hrs v/s 72 hrs  | 0.600*          | 0.151      | 0.001 | Significant     |
| 24 hrs v/s 48 hrs | 0.166           | 0.151      | 0.272 | Non-Significant |
| 24 hrs v/s 72 hrs | 0.366*          | 0.151      | 0.001 | Significant     |
| 48 hrs v/s 72 hrs | 0.200           | 0.151      | 0.188 | Non-Significant |

**Table 10: Intragroup Comparison of Ibuprofen Intake in Group II**

| Time Intake | No     | Yes   | P value             |
|-------------|--------|-------|---------------------|
| At 6 hrs    | 22     | 8     | 0.001 (Significant) |
|             | 73.3%  | 26.7% |                     |
| At 24 Hrs   | 26     | 4     |                     |
|             | 86.7%  | 13.3% |                     |
| At 48 Hrs   | 28     | 2     |                     |
|             | 93.3%  | 6.7%  |                     |
| At 72 Hrs   | 30     | 0     |                     |
|             | 100.0% | .0%   |                     |

## DISCUSSION

In this present study single visit endodontic treatment procedure was selected instead of multiple visit endodontic treatment because there is no significant difference in treatment outcome of single and multiple visits. There are also studies reporting no increase in post-operative pain complications after single visit endodontic treatment. (El Mubarak et al. 2010)<sup>4</sup> (Wang C et al. 2010)<sup>5</sup> Rather few studies indicating lesser pain after single visit RCT (Oginni A et al. 2004)<sup>6</sup>, (Yoldas O et al. 2004)<sup>7</sup>, (NgYL et al. 2004).<sup>8</sup>

According to "International Association for study of pain" pain is defined as an unpleasant sensory and emotional experience associated with actual or potential tissue damage. Pain is an unwanted yet unfortunately common sensation after root canal treatment (RCT) which commences a few hours or days after treatment and is always an

unpleasant experience for both patient and clinicians (Wang C, et al. 2010)<sup>5</sup>, (Harrison JW et al. 1993)<sup>9</sup>. Root canal procedures are commonly believed to be the most painful dental treatment (Pack JG et al. 2011).<sup>10</sup> The incidence of postoperative pain after RCT, mainly mild discomfort, was reported to range from 3% to 58% (Sathorn C et al 2008)<sup>11</sup>, but less than 12% of patients experienced severe pain.<sup>8</sup>

Results Obtained in Our Study Were as Follows:

On intergroup comparison of pain scores between the Protaper Next and Hyflex EDM, pain scores in the Protaper Next group was higher as compared to the Hyflex EDM at 6 hrs 24 hrs time intervals, but the difference between the groups was statistically non-significant. Hence, after comparing the ibuprofen intake between the Protaper Next and Hyflex EDM, in Protaper Next group it was found to be higher as compared to the Hyflex EDM at 6 hrs 24 hrs time intervals but the difference between the groups was statistically non-significant.

In the present study patient in both groups had pain up to some extent. This could be attributed because of following reasons:

Arias A et al. (2013)<sup>12</sup> while establishing predictive models to evaluate post-operative pain found that all the teeth had postoperative pain and the incidence of more post-operative pain was associated with maxillary molars which can be a complication due to apical extrusion. Previous studies demonstrated that all canal preparation techniques are associated with wide-ranging variability in debris extrusion depending on the mechanical systems used. This could be attributed to differences in the cross-section, cutting-edge design, taper, tip type, configuration, concept of use, flexibility, alloy type, number of files used, kinematics, or cutting efficacy.<sup>74</sup> The pain associated with periradicular inflammation due to extrusion of debris may also be attributed to substance P and calcitonin gene-related peptide which activates G protein-coupled receptors on nociceptors, leading to the sensitization or activation of neurons, and these neuropeptides can cause peripheral sensitization characterized as hyperalgesia, allodynia, and spontaneous pain. Furthermore, central sensitization is initiated by a barrage in C-fiber inputs with sufficient intensity and duration.<sup>13</sup>

## CONSLUSION

Patients in Both the Groups Experienced Pain and the Following Results Were Obtained:

The intergroup comparison of pain scores were done between the Protaper Next group and Hyflex EDM group using the chi square test at 95% confidence interval at different time intervals, Pain scores in the Protaper Next group was higher as compared to the Hyflex EDM at 6 hrs 24 hrs time intervals, but the difference between the groups was statistically nonsignificant. At 48 hrs and 72 hrs the pain scores were higher in the Hyflex EDM group but the difference between the groups was statistically non-significant ( $p>0.05$ ) it has been explained on the basis of gender distribution i.e. more female patients were in group II. The intergroup comparison of ibuprofen intake was done between the Protaper Next group and Hyflex EDM group using the Chi Square test at 95% confidence interval at different time intervals, Ibuprofen untake in the Protaper Next group was higher as compared to the Hyflex EDM at 6 hrs 24 hrs time intervals but the difference between the groups was statistically non-significant. At 48 hrs the ibuprofen intake was higher in the Hyflex EDM group but the difference between the groups was statistically non-significant ( $p>0.05$ )

The intragroup comparison of pain scores were done in the Protaper Next Group using Repeated Measures Anova and Post Hoc LSD analysis at 95% confidence intervals. There was a statistically significant reduction in the pain scores from the preoperative time interval to 72 hrs post-operative time intervals.

The intragroup comparison of pain scores were done in the Hyflex EDM Group using Repeated Measures Anova and Post Hoc LSD analysis at 95% confidence intervals. There was a statistically significant reduction in the pain scores from the preoperative time interval to 72 hrs post-operative time intervals. The intragroup comparison of ibuprofen intake in the Protaper Next Group was done using Chi Square test at 95% confidence intervals. There was a statistically significant reduction in the pain scores from the 6 hrs post-operative time interval to 72 hrs post-operative time intervals.

## REFERENCES

1. Yingying Su, Chenglin Wang, Ling Ye Healing Rate and Post-obturation Pain of Single-visit Multiple-visit Endodontic Treatment for Infected Root Canals: A Systematic Review J Endod 2010
2. Ahmed F, Thosar N, Baliga MS and Rath N. Single Visit Endodontic Therapy: A Review. Austin J Dent. 2016; 3(2): 1035.

3. Wang C, Xu P, Ren L, Dong G, Ye L. Comparison of post-obturation pain experience following one-visit and two-visit root canal treatment on teeth with vital pulps: a randomized controlled trial. *Int Endod J*. 2010;43(8):692–697.
4. ElMubarak AH, Abu-bakr NH, Ibrahim YE. Postoperative pain in multiple-visit and single-visit root canal treatment. *Journal of endodontics*. 2010;36(1):36-9.
5. Wang C, Xu P, Ren L, Dong G, Ye L. Comparison of post-obturation pain experience following one-visit and two-visit root canal treatment on teeth with vital pulps: a randomized controlled trial. *Int Endod J*. 2010;43(8):692–697.
6. Oginni A, Udoye CI. Endodontic flare-ups: comparison of incidence between single and multiple visits procedures in patients attending a Nigerian teaching hospital. *Odontostomatol Trop*. 2004;27(108):23–27.
7. Yoldas O, Topuz A, Isçi AS, Öztunc H. Postoperative pain after endodontic retreatment: single- versus two-visit treatment. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*. 2004;98(4):483–487.
8. Ng YL, Glennon JP, Setchell DJ, Gulabivala K. Prevalence of and factors affecting post-obturation pain in patients undergoing root canal treatment. *Int Endod J*. 2004;37(6):381–391.
9. Harrison JW, Baumgartner JC, Svec TA. Incidence of pain associated with clinical factors during and after root canal therapy. Part 2. Postobturation pain. *J Endod*. 1983;9:434-8.
10. Pack JG, White SN. Pain prevalence and severity before, during, and after root canal treatment: a systematic review. *J Endod*. 2011;37:429-38.
11. Athorn C, Parashos P, Messer H. Australian endodontists' perceptions of single and multiple visit root canal treatment. *Int Endod J* 2009;42:811–8.
12. Arias A, De La Macorra JC, Hidalgo JJ, Azabal M. Predictive models of pain following root canal treatment: a prospective clinical study. *International endodontic journal*. 2013;46(8):784-93.
13. Cheema J, Gupta AK, Minocha A. Comparison of Dentinal Cracks after Root Canal Preparation with Hand Files and Protaper NEXT, HYFLEX EDM, K3 XF and Twisted Rotary Files. *Journal of Advanced Medical and Dental Sciences Research*. 2018;6(5):30-5.