# 2. Pain after single-visit root canal treatment with two single-file systems: a prospective RCT

**Neelakantan P, Sharma S. Clinical Oral Investigations 2015; 19: 2211-2217**

Contemporary root canal preparation techniques employ the use of engine-driven nickel-titanium instruments that operate based on two kinematics—rotation or RECIPROCation. Most commonly used NiTi instruments operate with two types of movement: first is continuous rotating full sequence and second is RECIPROCating. Torsion and flexion occur with continuous rotating NiTi instruments while preparing root canals, which can lead to instrument fracture. To avoid this, RECIPROCating movement was proposed.[1] This movement minimizes the stresses on the instrument by counterclockwise (cutting action) and clockwise (release of instrument) movements. RECIPROCating movement claims to mimic manual movement and reduces various risks associated with continuous rotating file systems. However, RECIPROCating systems with small and equal clockwise (CW)/counterclockwise (CCM) rotation angles have decreased cutting efficiency, thus making progression into the canal more laborious.

Single file systems using RECIPROCating movements are being used more often by clinicians and examples include RECIPROC and WaveOne

An extensive literature search demonstrated that no study till date has evaluated the posttreatment pain after instrumentation of root canals with a single-file rotary or RECIPROCating system. Neelakantan & Sharma (2015) from India reported on a prospective multicentre clinical trial that sought to establish the influence of instrumentation technique (single-file RECIPROCation or single-file rotary) on posttreatment pain (incidence, degree, and duration).

## MATERIALS AND METHODS

640 patients were enrolled into this multicentre trial which involved two centres and two calibrated and experienced operators using a matched pair design.

For inclusion, patients were in the 25–40 year old age group, had two mandibular molars (in different arches) with a diagnosis of symptomatic irreversible pulpitis with symptomatic apical periodontitis, had a positive response on cold testing with ethyl chloride spray; and could tolerate rubber dam placement, had preoperative pain categorized as severe on the modified visual analogue scale (range of 8–10). Patients were excluded if they displayed radiographic evidence of a periapical lesion, were a retreatment case, were on medication for chronic pain, had teeth with difficult root canal anatomy (curvatures >30°, resorption, radiographic evidence of calcification, or open apices), had two or more adjacent teeth requiring root canal therapy, had more than two mandibular molars requiring root canal therapy, had the presence of sinus tracts or the absence of occlusal contacts or were medically compromised patients.

The clinical and radiographic data of the patients were assessed by a team of three endodontists who were blinded to the experimental protocols. A total of 16 patients were excluded because they did not meet the criteria for inclusion.

A standardised pre-operative technique was used for the initial preparation and the access cavity opening. The tooth was then allotted to one of the instrumentation techniques based on a sealed envelope method by a dental assistant who was blinded to the experimental protocols. The other tooth to be treated was automatically enrolled under the second instrumentation system. Both teeth requiring root canal treatment were treated the same day with a minimum time interval of four hours.

**Group 1 (n=624):** Root canal preparation was done with the RECIPROC system with strict adherence to the manufacturer's instructions using 3% sodium hypochlorite (Parcan, Septodont) as the irrigant.

**Group 2 (n=624):** Root canal preparation was done with the One Shape system (Micro-Mega) following the manufacturer's instructions. Coronal preflaring was done with Endoflare files, after which the glide path was created. Following this, the One Shape file was used to shape the root canals.

For both systems, the VDW Gold RECIPROC motor (VDW) was used with the appropriate settings as recommended by the manufacturer. While the RECIPROC was operated in the "RECIPROC ALL" mode, One Shape was used at a speed of 400 rpm and 2.5 N torque.

Apical patency was maintained throughout the shaping process using a size 10 K file along with copious amounts of irrigant solution –3% NaOCl (allowed to remained in canal for 5min after which it was flushed out with saline) and 2mL of 17% ethylenediaminetetraacetic acid (EDTA) solution, which was allowed to remain in the canal for 2min. The EDTA was flushed out with saline and canals were dried with paper points. The roots canals were obturated using gutta-percha points and a mineral trioxide aggregate sealer (MTA Plus) by the warm vertical condensation method. Following radiographic confirmation of the obturation, coronal seal was provided with a high-strength glass ionomer cement (Amalgomer). If any evidence of extrusion of root filling material was noticed radiographically, patients were excluded from the study (n=5). No occlusal reduction was performed.

All patients in the study were given a pain chart to be completed to record the incidence of pain (yes/no), level of posttreatment pain, and duration of pain (days). They were asked to submit the forms after one week. Patients were prescribed an optional medication of ibuprofen (400mg, 8–12h). Patients were asked to record the information if they took the medication. If the patient was

unable to locate the source of pain, they were excluded from the study. A modified visual analogue scale (VAS) was employed for assessment and statistical comparison of pain scores: score 0, absolutely nothing; scores 1–3 (*mild*), very weak discomfort or mild pain but requiring no intervention and not influencing ordinary activities of daily life; does not require analgesics; scores 4–6 (*moderate*), moderate pain which is distracting for the patient and occasionally negatively influences the patient from performing his normal daily activities; the pain is relieved with analgesics; scores 7–10 (*severe*), this score range covered very severe and extremely severe/unbearable pain that forced the patient to give up his/her daily activities and needed rest. This pain is not relieved by analgesics.

## RESULTS

The mean age of the patients included in this study was 31 ± 2 years. The number of patients excluded from the analysis because of sealer extrusion was five. Fourteen patients were lost to follow-up, and hence, the total number of patients included in the analyses was 605 (311 males and 294 females, i.e., 51.4 and 49.6%, respectively).

The mean baseline ***pretreatment pain*** in the RECIPROC group and One Shape group were 8.9 ± 1.82 and 8.3 ± 1.65, respectively, with no significant differences ($P > 0.05$).

There was significant difference in the incidence of ***postoperative pain*** between the two groups ($P = 0.001$). The number of patients who had no pain in the RECIPROC and One Shape group were 507 and 462, respectively. However, for patients who had pain (98 in the RECIPROC group and 143 in the One Shape group), the intensity showed significant difference, with patients in the One Shape group (40.5 % of the patients having pain) reporting more values of "severe" pain on the VAS scale compared to the RECIPROC group ($P = 0.001$). The same 40.5% patients (58 out of 143 patients) also reported having taken analgesics, and this was significantly higher than the percentage of patients in the RECIPROC group (19 out of 98 patients; 19.3%) ($P = 0.001$).

The percentage of patients having mild, moderate, and severe pain in the RECIPROC group was 71.4, 19.3, and 9.18%, respectively, whereas the intensity of pain in the One Shape group was 22.3% mild, 37.1% moderate, and 40.5 % severe. There was significant difference in the number of patients who had mild ($P < 0.001$), moderate ($P < 0.002$), and severe ($P < 0.001$) pain between the two groups. Disregarding the severity of pain, the mean duration of pain in the RECIPROC and One Shape group was 1.37 ± 0.85 and 1.61 ± 1.23 days, and hence, there was no significant difference between the two groups in duration of pain ($P = 0.074$). However, when duration was related to the severity of pain, there was no significant difference in the duration of postoperative pain between the two groups when the pain was mild ($P = 0.301$), but One Shape showed significantly longer duration of moderate ($P = 0.001$) and severe pain ($P = 0.002$). Of the 98 patients, only 6 patients reported severe pain longer than two days in the RECIPROC group.

## CONCLUSION

The authors concluded that the use of RECIPROC instrumentation system showed significantly less intensity and longer duration of moderate and severe posttreatment pain compared with the single-file rotary system (One Shape) in patients with symptomatic irreversible pulpitis with apical periodontitis.

## IMPLICATIONS FOR PRACTICE

This was a clinical trial with a huge sample size which implies that the result reported is not due to chance but to real differences in the interventions tested. The trial results suggest that RECIPROCation produces less postoperative pain than the single-file rotary system used in this trial.

**Reference**

1. Neelakantan P, Sharma S. Pain after single-visit root canal treatment with two single-file systems based on different kinematics—a prospective randomized multicenter clinical study. Clinical Oral Investigations 2015; 19: 2211-2217.