Effect of the Simultaneous Working Length Control during Root Canal Preparation on Postoperative Pain

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Abstract

Aim: The aim of this study was to evaluate the effect of simultaneous length control during root canal preparation on postoperative pain compared with separate working length determination and root canal preparation. The design was a parallel-group, randomized, controlled trial with 2 arms. **Methods:** Forty-four molar teeth were randomly divided into 2 groups (n = 22), a control group (separate length determination and root canal preparation) and a simultaneous length control during root canal preparation group. The following variables were recorded: age; gender; tooth number; preoperative pain on the visual analog scale; pain level on days 1, 3, 5, and 7; and analgesic intake after the procedure and initial/final percussion pain. The data were analyzed with the χ^2 test, independent samples t test, and Mann-Whitney U test. **Results:** The simultaneous length control during root canal preparation group resulted in lower postoperative pain levels on day 1 than did the control group ($P < .05$). Despite 2 patients' intake of postoperative analgesics in the control group, no patient needed to use postoperative analgesics in the simultaneous length control during root canal preparation group ($P > .05$). **Conclusions:** Simultaneous length control during root canal preparation as a nonpharmacologic strategy for reducing postoperative pain is a beneficial technique for preventing postoperative pain. *(J Endod 2017;■:1–6)*

Key Words

Endodontic treatment, Gold Reciproc motor, postoperative pain, reciprocation, root canal treatment, separate working length control, simultaneous working length control, working length determination

Significance

Traditionally, the protection of the working length from deviations can be achieved manually by observing the stopper and coronal reference points. The Gold Reciproc motor allows for simultaneous length control during instrumentation with auto-stop function. According to the results of the present study, simultaneous length control during root canal preparation is a beneficial technique to prevent postoperative pain.

Working length determination is one of the most important steps in endodontics. Failure to determine the working length can result in insufficient instrumentation of the root canal or in overinstrumentation of the root canal. This leads to the extrusion of materials such as irrigants and filling materials. The use of radiography and apex locators during root canal treatment are the most preferred techniques among clinicians for determining working length (1). According to a recent study, working length determination with an electronic apex locator is similar to the radiographic technique in terms of enabling the accurate determination of working length (2). Moreover, in another study, the effect of the determination of working length with an electronic apex locator and digital radiography on postoperative pain was evaluated, and no difference was found between the 2 groups (3).

The Gold Reciproc motor (VDW GmbH, Munich, Germany) is an electronic apex integrated endodontic motor that allows simultaneous length control during instrumentation. This motor was evaluated in a study and was found to be as reliable and accurate as conventional electronic apex locators (4). An interesting property of this motor is that when an instrument reaches the working length, the motor automatically stops the instrumentation. Thus, it can be concluded that automatically stopping instrumentation when the instrument reaches the working length would decrease postoperative pain compared with manually controlling the working length by using stoppers during instrumentation (separate length determination and root canal preparation).

Postoperative pain is a frequent problem in endodontics (5). Pharmacologic strategies for reducing postoperative pain include medication with acetaminophen (6), antihistamines (7), nonsteroidal anti-inflammatory drugs (8), steroidal anti-inflammatory drugs (9), salicylic acid (10), narcotic analgesics (11), a combination of 2 medications (12, 13), or using long-acting anesthesia (14). With regard to nonpharmacologic strategies for preventing postoperative pain, preoperative relaxation approaches and explanations for patients (15), glide path application (16), occlusal reduction (17), or using different kinematics during root canal treatment (18) have been used.

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CONSORT 2010 checklist of information to include when reporting a randomised trial*

Section/Topic	Item No	Checklist item	Reported on page No
Title and abstract			
	1a	Identification as a randomised trial in the title	Title page
	1b	Structured summary of trial design, methods, results, and conclusions (for specific guidance see CONSORT for abstracts)	1
Introduction			
Background and objectives	2a	Scientific background and explanation of rationale	2-3
	2b	Specific objectives or hypotheses	3
Methods			
Trial design	3a	Description of trial design (such as parallel, factorial) including allocation ratio	3
	3b	Important changes to methods after trial commencement (such as eligibility criteria), with reasons	3
Participants	4a	Eligibility criteria for participants	3
	4b	Settings and locations where the data were collected	5
Interventions	5	The interventions for each group with sufficient details to allow replication, including how and when they were actually administered	4
Outcomes	6a	Completely defined pre-specified primary and secondary outcome measures, including how and when they were assessed	5
	6b	Any changes to trial outcomes after the trial commenced, with reasons	5
Sample size	7a	How sample size was determined	5
	7b	When applicable, explanation of any interim analyses and stopping guidelines	-
Randomisation:			
Sequence generation	8a	Method used to generate the random allocation sequence	3
	8b	Type of randomisation; details of any restriction (such as blocking and block size)	3
Allocation concealment mechanism	9	Mechanism used to implement the random allocation sequence (such as sequentially numbered containers), describing any steps taken to conceal the sequence until interventions were assigned	3
Implementation	10	Who generated the random allocation sequence, who enrolled participants, and who assigned participants to interventions	3
Blinding	11a	If done, who was blinded after assignment to interventions (for example, participants, care providers, those assessing outcomes) and how	4
	11b	If relevant, description of the similarity of interventions	-
Statistical methods	12a	Statistical methods used to compare groups for primary and secondary outcomes	5
	12b	Methods for additional analyses, such as subgroup analyses and adjusted analyses	5
Results			
Participant flow (a diagram is strongly recommended)	13a	For each group, the numbers of participants who were randomly assigned, received intended treatment, and were analysed for the primary outcome	5
	13b	For each group, losses and exclusions after randomisation, together with reasons	5
Recruitment	14a	Dates defining the periods of recruitment and follow-up	5
	14b	Why the trial ended or was stopped	-
Baseline data	15	A table showing baseline demographic and clinical characteristics for each group	11
Numbers analysed	16	For each group, number of participants (denominator) included in each analysis and whether the analysis was by original assigned groups	5
Outcomes and estimation	17a	For each primary and secondary outcome, results for each group, and the estimated effect size and its precision (such as 95% confidence interval)	5,6
	17b	For binary outcomes, presentation of both absolute and relative effect sizes is recommended	-
Ancillary analyses	18	Results of any other analyses performed, including subgroup analyses and adjusted analyses, distinguishing pre-specified from exploratory	-
Harms	19	All important harms or unintended effects in each group (for specific guidance see CONSORT for harms)	6
Discussion			
Limitations	20	Trial limitations, addressing sources of potential bias, imprecision, and, if relevant, multiplicity of analyses	7
Generalisability	21	Generalisability (external validity, applicability) of the trial findings	7
Interpretation	22	Interpretation consistent with results, balancing benefits and harms, and considering other relevant evidence	7
Other information			
Registration	23	Registration number and name of trial registry	TCTR20161221001
Protocol	24	Where the full trial protocol can be accessed, if available	-
Funding	25	Sources of funding and other support (such as supply of drugs), role of funders	-

*We strongly recommend reading this statement in conjunction with the CONSORT 2010 Explanation and Elaboration for important clarifications on all the items. If relevant, we also recommend reading CONSORT extensions for cluster randomised trials, non-inferiority and equivalence trials, non-pharmacological treatments, herbal interventions, and pragmatic trials. Additional extensions are forthcoming: for those and for up to date references relevant to this checklist, see www.consort-statement.org.

CONSORT 2010 checklist — Page 1

CONSORT 2010 checklist — Page 2

Figure 1. CONSORT checklist.

In this randomized, controlled clinical trial, Consolidated Standards of Reporting Trials (CONSORT) guidelines were followed (Fig. 1). The aim of the present study was to evaluate the effect of simultaneous length control during root canal preparation on postoperative pain compared with separate length determination and root canal preparation. The null hypothesis was that no differences in pain levels existed between the groups.

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