Retreatment versus initial root canal treatment: Factors affecting posttreatment pain

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Objective. The purpose of this study was to determine the factors associated with posttreatment pain in patients receiving root canal retreatment (RCR) and in those receiving initial root canal treatment (IRCT).

Study design. Eighty four patients scheduled for RCR or IRCT completed questionnaires on pretreatment pain levels (Visual Analogue Scale, 0-100) and demographic data. Diagnosis and original obturating material, if applicable, were also recorded, and treatment was initiated. At 4, 8, 12, 24, 48, 72, 96, and 120 hours, patients recorded posttreatment pain levels. Seventy one patients returned completed questionnaires.

Results. There was no significant difference in posttreatment pain with respect to patients undergoing RCR and patients undergoing IRCT, type of original obturating material, or pretreatment diagnosis. Posttreatment pain levels were significantly increased at 4, 8, and 12 hours after treatment. Patients reporting higher levels of pretreatment pain (Visual Analogue Scale > 20) had significantly increased posttreatment pain (P < .05) up to 24 hours after the procedure.

Conclusions. Pretreatment pain level influenced posttreatment pain more than RCR or IRCT, the type of original obturating material, or the pretreatment diagnosis.


The occurrence and control of pain are of critical interest in endodontics. Of particular importance is pain after root canal treatment. Throughout the endodontic literature, two distinctly different types of posttreatment endodontic pain have been described. One is the flare-up, defined as pain or swelling, or both, within hours or days after a root canal treatment procedure that requires an unscheduled office visit.1 The other is general posttreatment pain, which is less severe and does not involve swelling or necessitate an emergency visit. Although not as severe, this pain is just as significant because it occurs more commonly.

Seltzer et al2 have proposed several mechanisms as etiologic factors of pain after endodontic therapy. These include an alteration in the local adaptation and changes in the immune response and periapical tissue pressure, as well as psychological factors. Clinical and demographic factors that may influence the incidence of posttreatment symptoms have been the topic of many research efforts; however, attempts to identify positive correlations between these factors and the occurrence of posttreatment symptoms have yielded mixed, inconclusive results.

Retreatment has been suggested as a contributing factor in posttreatment complications. In a retrospective study, Torabinejad et al3 found an increased incidence of interappointment emergencies after retreatment (RCR) in comparison with the incidence after initial root canal treatment (IRCT). Trope4 and Imura and Zuolo5 reported a significantly higher rate of flare-ups in RCR than in IRCT. However, these studies addressed only the incidence of interappointment emergencies and did not assess the levels of posttreatment pain. In addition, RCR was considered to be only one possible variable influencing the occurrence of a flare-up. The type of root filling material removed from the canal system was not addressed. Thus, level
of posttreatment pain after retreatment of the root canal system, with respect to type of previous root canal filling material, has not been examined.

The purpose of this prospective clinical study was to determine whether endodontic RCR differs from IRCT with respect to the severity of posttreatment pain. Secondly, this study addressed which factors may be associated with posttreatment pain.

**MATERIAL AND METHODS**

The University of Iowa Institutional Review Board approved this study. A total of 84 patients requiring endodontic treatment were identified from the University of Iowa College of Dentistry clinical pool. All were members of the Department of Endodontics. The following exclusion criteria were applied: (1) no prophylactic antibiotic coverage required; (2) no debilitating systemic diseases; (3) no current use of antibiotics; and (4) no current use of analgesics.

Informed consent was obtained. Patient demographics, tooth number, pulpal diagnosis (ie, reversible pulpitis, irreversible pulpitis, necrosis, or previously treated), and periapical diagnosis (ie, normal, chronic apical periodontitis, acute apical periodontitis, or acute apical abscess) were recorded. In RCR cases, the type of previous obturating material (gutta-percha, silver point, or paste) was also recorded. Patients were asked to indicate their “peak pain level in the 6 hours before the appointment” on a Visual Analog Scale (VAS).6 The VAS consisted of a 100-mm line (0 mm, “no pain”; 100 mm, “worst pain imaginable”).

The treatment procedures for cases were routine. The extent of treatment was determined according to the diagnosis, the time available, and the complexity; some patients were seen in single visits, and others were seen in multiple visits. All patients were anesthetized with local anesthetic. In RCR cases, retreatment specific to removal of the previous obturating material was performed. Canals were irrigated with 2.6% NaOCl. If additional appointments were necessary, the access was closed with a dry cotton pellet and a temporary filling. The extent of treatment rendered, and any occurrence of overinstrumentation or overfill, were also recorded on the treatment form.

At the conclusion of the appointment, all patients were instructed to record their level of pain on a VAS and were given routine posttreatment information and were advised to not take analgesics. They were instructed to record their posttreatment pain on a VAS at 4, 8, 12, 24, 28, 72, 96, and 120 hours. If, within 72 hours of the appointment, a patient had to report to the clinic because of severe pain or swelling (flare-up), she was instructed to mark the time of occurrence on the form. After 5 days, the patients were instructed to return the questionnaire to the Endodontics Department in a postage-paid envelope. A total of 71 patients completed and returned the questionnaire. Pain scores of patients who took analgesics postoperatively (a total of 15) were deleted after the time of self-administration of the medication.

Posttreatment pain scores were analyzed by using analysis of variance. Differences were considered significant when probabilities were less than .05.

**RESULTS**

Patient demographics and treatment information for IRCT and RCR groups are shown in Table I. The groups were similar with respect to sex, age, tooth type, and treatment stage at completion of the appointment. Within the RCR group, the ratio of patients with silver points (6/13) that were completed in one appointment was similar to that of the gutta-percha group (12/25). No flare-ups were experienced by patients in the study.

Of the patients with IRCT, 8 had pulpal diagnosis of reversible pulpitis (ie, elective treatment for prosthetic reasons), 9 had irreversible pulpitis, and 13 had necrosis. The patients with IRCT were more likely to have a periapical diagnosis of “normal” than the RCR patients. In addition, the patients with IRCT tended to report slightly higher levels of pretreatment pain. However, there was no significant difference (P > .08) in preoperative pain levels between patients with IRCT and patients with RCR.

The severity of posttreatment pain was compared both in the IRCT and the RCR groups by using repeated-measures analysis of variance (Fig 1). Combining both groups, there was a significant difference in pain levels over time after the endodontic treatment (P < .05). A

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**Table I. Patient sex, tooth type, pretreatment pain, periapical diagnosis, and stage of treatment, by treatment type**

<table>
<thead>
<tr>
<th>Type of treatment</th>
<th>Sex (M/F)</th>
<th>Age (y)</th>
<th>Tooth type (anterior/posterior)</th>
<th>Pretreatment pain (VAS, mean ± SEM)</th>
<th>Periapical diagnosis (%)</th>
<th>Treatment (% obturated)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IRCT</td>
<td>9/21</td>
<td>46.6</td>
<td>5/25</td>
<td>8.6 ± 2.4</td>
<td>53.3</td>
<td>43.3</td>
</tr>
<tr>
<td>RCR</td>
<td>15/26</td>
<td>45.7</td>
<td>13/28</td>
<td>4.2 ± 1.3</td>
<td>26.8</td>
<td>48.8</td>
</tr>
</tbody>
</table>

CAP, Chronic apical periodontitis; AAP, acute apical periodontitis; AAA, acute apical abscess.
The post hoc Dunnett test revealed that pain levels were significantly increased at 4, 8, and 12 hours after treatment, in comparison with other posttreatment times (P < .05). At and after 24 hours, there was no significant difference in the levels of posttreatment pain.

There was no significant difference (P > .2) in posttreatment pain between IRCT and RCR cases at any time after treatment. To assess differences in posttreatment pain as related to original obturating material, patients receiving RCR were divided into 2 groups on the basis of the original obturating material (ie, silver point or gutta-percha). There were too few past fills for comparison. No significant difference (P > .3) in posttreatment pain was seen between the gutta-percha and the silver-point RCR groups.

The level of posttreatment pain was significantly related to the level of pain that patients reported in the 6 hours before RCR (Fig 2). Those who presented with increased pain levels (VAS > 20) reported significantly increased posttreatment pain in comparison with patients who presented with lower pain levels (P < .05). There was, however, no significant difference in posttreatment pain with respect to pretreatment periapical diagnosis (P > .2).

DISCUSSION

The purpose of this study was to evaluate factors influencing posttreatment pain after RCR and after IRCT. We showed that posttreatment pain was most severe in the first 24 hours after treatment and was not significantly
related to RCR or IRCT, type of filling material, or pretreatment periapical diagnosis. However, posttreatment pain was related to the level of pretreatment pain.

Our findings that most posttreatment pain occurs within the first 24 hours after treatment are consistent with previous research.\(^7\)\(^9\) The fact that posttreatment pain did not significantly differ between patients with RCR and patients with IRCT suggests that the pain is not related to the canal contents but more likely to the root canal treatment procedure in general. This is further supported by the fact that posttreatment pain levels in this study did not significantly differ between gutta-percha and silver-point RCR cases.

An increased incidence of flare-ups has been reported after retreatment.\(^3\)\(^-\)\(^5\) Because no flare-ups occurred in our patients, it is difficult to correlate our findings with those reported previously.

Another factor implicated in the incidence of posttreatment complications is pretreatment diagnosis. Specifically, some studies have found an increased incidence of postoperative pain\(^10\)\(^,\)\(^11\) or flare-ups\(^12\) in cases with necrotic than in cases with vital pulp. Others have reported an increased incidence of flare-ups in patients with painful periapical pathosis\(^5\) or periapical radiolucency.\(^13\) We did not find a relationship between pretreatment diagnosis and posttreatment pain. Thus, our data suggest that posttreatment pain is related more to pretreatment pain than to pretreatment diagnosis.

Postoperative analgesics were used by 10/30 (33%) of patients with IRCT and 5/41 (12%) patients with RCR. The use of analgesics could be interpreted as an indicator of postoperative pain. Further evaluation and follow-up with the patients who took analgesics revealed that some had taken analgesics for pain unrelated to their endodontic treatment and others had taken analgesics with the anticipation that they would have pain (despite instructions to avoid analgesics). It is, therefore, difficult to surmise differences in postoperative pain on the basis of usage of analgesics, given the varied explanations and the limited number of patients who took analgesics.

A fairly consistent finding in studies\(^1\)\(^,\)\(^7\)\(^,\)\(^14\)\(^,\)\(^15\) that assess posttreatment pain is a correlation between the presence of pretreatment pain and the occurrence of posttreatment pain. Specifically, these previous studies have shown that patients who present with more pain are much more likely to experience posttreatment pain. Indeed, patients with pretreatment pain levels above 20 on the VAS had significantly more posttreatment pain. Therefore, it is appropriate to consider pretreatment pain when planning posttreatment pain management strategies.

REFERENCES


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