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CLINICAL ARTICLE

A Comparison of Pulpectomy Alone Versus Pulpectomy with Trephination for the Relief of Pain

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Patients who when initially seen have pain of endodontic origin have a higher incidence of posttreatment pain than those who are pain-free pretreatment. The purpose of this study was to compare two methods of treatment—pulpectomy alone or pulpectomy with trephination—for the reduction of posttreatment pain in patients presenting with acute periradicular pain of pulpal origin. Seventeen patients with pretreatment pain were studied. Eleven received a pulpectomy to the radiographically determined working length. Six patients received a pulpectomy and trephination using a #4 round bur through a vertical incision. Visual analog scales were used preoperatively to measure pain intensity and unpleasantness, and postoperatively to measure intensity, unpleasantness, and pain relief at 4, 8, 16, 24, 48, 72, and 96 h. Analysis of preoperative data showed no difference between control and experimental groups. Posttreatment, at 4 h, the trephination group reported significantly more pain intensity and unpleasantness and less pain relief than the control group. Pulpectomy alone provided significantly better postoperative pain relief at 4 h compared with pulpectomy with trephination. At no time interval did the trephination group have less pain than the group without trephination.

One goal of endodontic therapy is to relieve pain caused by periradicular inflammation. Evaluating the success of treatment with respect to pain relief demands a reliable, sensitive method of pain measurement. One widely accepted method is a visual analogue scale (VAS). It has been proved to be a valid tool for the clinical measurement of pain (1–3), including dental pain (4, 5).

Inflammation has been associated with periapical pathosis of pulpal origin (6). One cardinal sign of inflammation is pain. It is a result of tissue pressure from hyperemia and edema, and the release of algogenic agents (7). Patients presenting with pain have been shown to have a significantly higher incidence (two to five times) of postoperative pain after nonsurgical endodontic therapy than patients who present without pain (8–13).

Trephination is defined as the surgical perforation of mucoperiosteum and alveolar bone over the root end of a tooth to relieve pain caused by the accumulation of tissue exudate (14). This procedure may provide pain relief in patients with severe and recalcitrant periradicular pain (15). In addition, in the asymptomatic patient, trephination has been shown to significantly decrease (16 to 25%) postoperative pain incidence when performed prophylactically along with root canal therapy (16, 17).

If trephination can reduce the incidences of postoperative pain in asymptomatic patients and resolve pain in recalcitrant cases, it might decrease the incidence and severity of postoperative pain in symptomatic patients. The purpose of this study was to determine if there is a difference in postoperative pain relief in patients presenting with acute periradicular pain of pulpal origin when treated by either pulpectomy alone or pulpectomy with trephination.

MATERIALS AND METHODS

Patients presenting for emergency endodontic care at Naval Dental School, Bethesda, MD, were screened for inclusion in this study. Patients were accepted as subjects if they presented with an uncomplicated medical history (American Society of Anesthesiology category I or II), did not require antibiotic prophylaxis, and the tooth in question had a clinical diagnosis of acute periradicular periodontitis (APP) or chronic periradicular periodontitis with symptoms (CPPS). The diagnoses of APP or CPPS were confirmed by a thorough clinical and radiographic examination that included vitality testing (thermal and electrical), palpation, percussion, and periodontal probing. In addition, for the purpose of this study, patients must have presented with significant spontaneous pain and acute periradicular pain to digital percussion upon examination.

After confirmation of the aforementioned criteria, the primary investigator requested the patient to enroll in the study. A thorough explanation of the proposed procedures concerning risks and benefits and of patient obligations for data collection was completed. The type of treatment was determined in a random manner.

PLEASE MAKE A MARK ON THE LINE TO SHOW THE INTENSITY OF THE PAIN YOU HAVE RIGHT NOW:

NO PAIN | ——— | PAIN AS MUCH AS IT COULD BE

PLEASE MAKE A MARK ON THE LINE TO SHOW THE UNPLEASANTNESS OF THE PAIN:

DOESN'T BOTHER ME AT ALL | ——— | CAN'T STAND IT

EVALUATION OF PAIN RELIEF

We want to know how much pain relief you have had (how much less is the pain) since you were treated at the clinic.

PLEASE MAKE A MARK ON THE LINE TO SHOW HOW MUCH PAIN RELIEF YOU HAVE HAD BY THIS TIME:

NO RELIEF OF PAIN | ——— | COMPLETE PAIN RELIEF

Please place this form back in the envelope and seal it. You may mail it at the earliest convenience. Be sure to take note of the next time you are to fill out another pain evaluation form. Thank you.

FIG 1. VASs from the patient Data Collection Form.

FIG 2. Radiographic verification of the location of the trephination.

Before commencing treatment, the patient completed the first two VASs as per the Data Collection Form 1 (Fig. 1) to evaluate the preoperative intensity and unpleasantness of pain. All patients received the same written instructions on the use of the VAS.

The control group received the pulpectomy procedure. Patients received a local anesthetic of 2% lidocaine with 1:100,000 epinephrine and rubber dam isolation. The access into the tooth was made with a high-speed handpiece and a #557 bur. Canals were opened coronally using 5.25% sodium hypochlorite as the irrigant and Gates Glidden burs (#2 through #4). Using Flex-R files, the working length was determined by radiograph at 1 mm short of the apex. The canals were then instrumented to a minimum file size of #25. Paper points were used to dry the canals, and a calcium hydroxide preparation was placed into all canals via lentulo spiral. The access was sealed with Intermediate Restorative Material (Caulk Dentsply, Milford, DE).

The experimental group received a pulpectomy with trephination. The pulpectomy treatment was performed first in the exact same manner as described herein. The trephination procedure was done via a small vertical incision (1/4 to 3/8 inch) near the apex or apices of the offending tooth. The cortical plate was penetrated to cancellous bone with a #4 round bur in a low-speed handpiece under copious saline irrigation. A D-16 explorer was used to probe the fenestration to guarantee complete penetration into cancellous bone. A radiograph was exposed to verify the proximity of the fenestration to the root apex (Fig. 2).

The patient was dismissed with written and oral postoperative instructions, a prescription for ibuprofen 800 (1 tablet to be taken every 6 to 8 h as needed for pain), and eight preaddressed, stamped envelopes each containing a Data Collection Form 1 (Fig. 1). Patients were asked to refrain from taking the analgesic unless

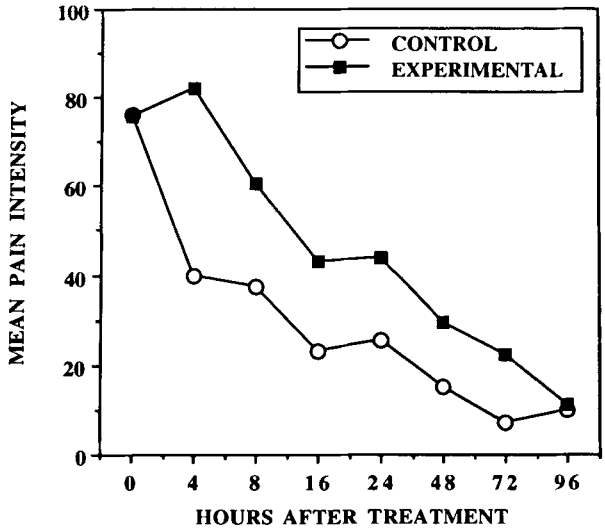

FIG 3. Mean pain intensity for control and experimental groups.

absolutely necessary. VASs were then completed by the patient at postoperative time intervals of 4, 8, 16, 24, 48, 72, and 96 h. For patient convenience, each envelope was marked with the date and time of day corresponding to the appropriate postoperative interval. Patients were instructed to seal each envelope after completion to prevent influencing subsequent marks. Patients were asked to mail the envelopes as soon as reasonably possible.

If it became necessary to use the prescribed analgesic, patients were instructed to complete an additional VAS, beginning with the initial dose of analgesic to record the current level of pain intensity and unpleasantness. They then completed the remaining VAS forms at the previously determined time intervals and marked any additional analgesic dosages on the Data Collection Form. The principal investigator phoned the patients during the first 24 h to verify efficacy of treatment and absence of any postoperative complications, and to encourage compliance in data collection.

When all VASs were received, data were tabulated. Levels of pain intensity, unpleasantness, and pain relief were converted to a numerical score by use of a 100-mm rule aligned with the left margin of the scales. Scores were assigned from 0 to 100, corresponding to the nearest mm mark on the rule. The mean scores for pain intensity, pain unpleasantness, and pain relief for control and experimental groups were compared at each time interval by independent t tests and Mann-Whitney U tests.

RESULTS

Preoperatively, there was no significant difference between the two treatment groups for pain intensity ($p = 0.965$) or unpleasantness ($p = 0.190$).

At 4 h postoperatively, the experimental group receiving trephination reported significantly greater pain intensity ($p = 0.025$) and unpleasantness ($p = 0.013$) than the control group. Likewise, the trephination group reported significantly less pain relief at 4 h postoperatively than the pulpectomy alone group ($p = 0.007$).

Figures 3, 4, and 5, respectively, show that the experimental group consistently reported greater pain intensity, unpleasantness, and less pain relief throughout the 96-h period. Because of the small sample size, however, this difference was only statistically significant at the 4-h period.

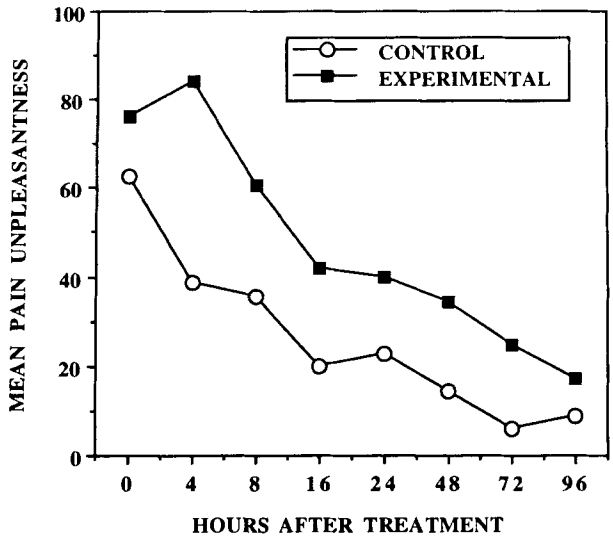

FIG 4. Mean pain unpleasantness for control and experimental groups.

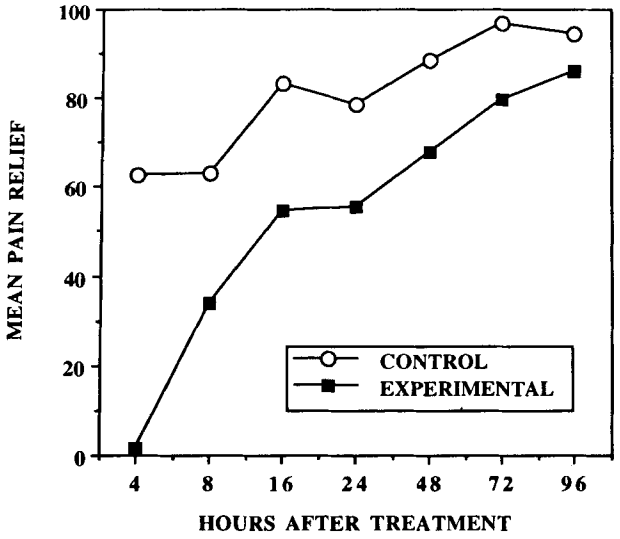

FIG 5. Mean postoperative pain relief for control and experimental groups.

The two groups did not differ in the need for analgesics. In the control group, 8 of 11 subjects took the analgesic, 5 within the first 24 h, and 4 between 24 and 48 h. Four of the subjects in the experimental group took the analgesic within the first 24 h.

DISCUSSION

In cases of acute periapical pain of pulpal origin, an ongoing inflammatory process might be expected to elicit pain as a result of tissue edema and release of algogenic inflammatory agents. Trephination might reduce this pain by providing release from the pressure of tissue exudate. That did not occur in this study. The build-up of pressure from tissue exudation may not have been the primary cause of the patients' pain. Chemical mediators of inflammation known to lower pain thresholds, such as histamine, 5-hydroxytryptamine, the kinins, prostaglandins, and leukotrienes, may have also contributed to the presence of pain (18). Trephination, although having the potential to relieve exudation, may not rid the periradicular area of these chemical mediators. It would seem from this study that trephination added to the pain process.

The method of trephination used was similar to that of Peters (16). Whereas other studies (16, 17) used predominantly asymptomatic patients with a diagnosis of chronic periradicular periodontitis, this study used patients presenting with acute spontaneous pain and remarkable pain to digital percussion. Patients in this study were diagnosed as having APP nearly twice as often as those with CPPS (control group 7:4, experimental group 4:2). This occurred because the inclusion criteria specifically included patients with periradicular pain to percussion, regardless of radiographic appearance. What influence the degree of periradicular bone loss had on postoperative pain levels could not be evaluated because of the small number of subjects.

This study also differed from previous studies (16, 17) in the method of pain evaluation. VASs are proven to be a reliable and accurate means of measuring pain (1–3). Pain measurements were taken four times within the first 24 h (4, 8, 16, and 24 h). Previous studies (16, 17) first evaluated pain the next day. Their main criterion for moderate to severe pain was the inability of aspirin or acetaminophen to control pain. In the present study, the VAS provided a means to quantify and, thus, compare preoperative pain to postoperative pain at seven specific time intervals. Moreover, it allowed an immediate (4 h) postoperative pain evaluation of the two treatment modalities.

The trephination procedure was not without morbidity. Although none of the patients returned unscheduled, two patients exhibited a firm submucosal swelling beneath the closed incision site. In one case, the edema was decompressed by simple aspiration and irrigation. The second case resolved within 2 wk without treatment. Given the added pain experience and morbidity associated with this procedure, trephination should not be used prophylactically as an adjunct to pulpectomy in cases of acute periradicular pain of pulpal origin.

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NSAIDS are increasingly used on a long-term basis. A new study indicates that these anti-inflammatory agents have the unfortunate side effect of elevating blood pressure (Ann Intern Med 121:289). The effect is not large, about 5 mm Hg, and is seen with ibuprofen and indomethacin most markedly. Aspirin has the least effect.

Ed Breitbach