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Effect of Apical Trephination on Postoperative Pain and Swelling in Symptomatic Necrotic Teeth

Ellen Nist, DDS, MS, Al Reader, DDS, MS, and Mike Beck, DDS, MA

The purpose of this prospective, randomized, blinded study was to determine the effect of apical trephination on postoperative pain and swelling in symptomatic necrotic teeth. Fifty emergency patients participated, and each had a clinical diagnosis of a symptomatic necrotic tooth with associated periapical radiolucency. After endodontic treatment, patients randomly received either an apical trephination or mock trephination procedure. The trephination procedure used a Stabident perforator to provide an initial opening in the cortical bone that was enlarged with files (#25 through #120) and an endodontic spoon. Postoperatively, each patient received: ibuprofen; acetaminophen with codeine (30 mg); and a 7-day diary to record pain, percussion pain, swelling, and number and type of pain medication taken. Results demonstrated the use of an apical trephination procedure did not significantly ($p > 0.05$) reduce pain, percussion pain, swelling, or number of ibuprofen tablets taken in symptomatic necrotic teeth with periapical radiolucencies. The trephination procedure did significantly ($p < 0.05$) reduce the use of acetaminophen with codeine overall for the 7 days. In conclusion, because there was not a significant reduction in pain, percussion pain, or swelling we cannot recommend the routine use of an apical trephination procedure, as used in this study, in symptomatic necrotic teeth with radiolucencies.

After emergency treatment of a symptomatic necrotic tooth, there may be moderate to severe pain despite thorough debridement of the root canal system (1–7). Various studies (8–10) have evaluated the effectiveness of a conventional trephination procedure (mucoperiosteal incision and penetration of the apical cortical bone) to relieve postoperative pain. Chestner et al. (8) described an apical trephination procedure and reported pain resolution in most of the 50 patients studied. Peters (9) used a conventional trephination procedure and found no cases of severe pain in any of his prophylactically trephinated patients. Peters (9) also reported that patients with severe pain had pain relief after trephination. Moos et al. (10) demonstrated a conventional trephination procedure resulted in greater pain intensity, unpleasantness, and less pain relief throughout the 96-h postoperative period. The only statistical difference occurred at 4 h when compared with the nontrephinated group.

Elliot and Holcomb (11) evaluated a minimally traumatic trephination procedure in asymptomatic necrotic teeth. The authors used a #3 endodontic spreader to penetrate the alveolar mucosa, periosteum, and cortical plate of alveolar bone. Although their study was limited to anterior and maxillary premolar teeth, they reported no pain occurred in the teeth prophylactically trephinated; whereas 25% of those not trephinated had moderate to severe pain.

The conventional trephination procedure requires a surgical procedure and the minimally traumatic procedure (use of the #3 spreader) cannot be used in molar teeth. Houck et al. (12), in a study of symptomatic necrotic teeth, used a Stabident perforator to provide a pilot hole in cortical bone. The opening was then enlarged with files and a spoon excavator to gain access to the cancellous bone. They found the trephination procedure did not significantly reduce postoperative pain, percussion pain, swelling, or the number of analgesic medications taken in symptomatic necrotic teeth with radiolucencies. The trephination site was in the attached gingiva at the location of an intraosseous anesthetic injection. Perhaps an apical trephination site would be more successful in decreasing pain and need for analgesic medication.

The purpose of this prospective, randomized, blinded study was to evaluate postoperative pain and swelling after performing an apical trephination procedure in symptomatic necrotic teeth with radiolucencies.

MATERIALS AND METHODS

Fifty adult patients presenting for emergency treatment participated in this study. All patients were in good health as determined by a written health history and oral questioning. The study was approved by The Ohio State University Human Subjects Committee and written consent was obtained from each patient.

Patients included in this study had a clinical diagnosis of a symptomatic necrotic tooth and actively had spontaneous pain. Each tooth had to test negative to Endo Ice (Hygenic Corporation, Akron, OH), an electric pulp tester (Analytic Technology Corp., Redmond, WA), and had to have a periapical radiolucency.

The preoperative parameters of age, gender, weight, and tooth type (molar, premolar, anterior) were recorded on each patient

(Tables 1 and 2). An estimate of the radiographic lesion area was calculated by averaging the smallest and largest measurements and dividing this number by 2. This number served as a proxy for the lesion's radius had it been round. Lesion area was then estimated by the following formula: area $= \pi \times \text{radius}^2$. No patient had clinical swelling or the presence of a sinus tract. Two of the teeth were retreatment cases. Each patient was asked to rate their pain on a scale from 0 to 3. Zero indicated no pain. One indicated mild pain, pain that was recognizable but not discomforting. Two indicated moderate pain, pain that was discomforting but bearable. Three indicated severe pain, pain that caused considerable discomfort and was difficult to bear. Patients were asked to rate percussion pain using the same scale.

TABLE 1. Distribution of tooth type for the trephination and mock trephination groups

Tooth Type	No.	%
Maxillary Teeth		
First molar		
Trephination	3	12
Mock	2	8
Second molar		
Trephination	1	4
Mock	2	8
First premolar		
Trephination	2	8
Mock	1	4
Second premolar		
Trephination	1	4
Mock	0	0
Anteriors		
Trephination	5	20
Mock	3	12
Mandibular Teeth		
First molar		
Trephination	7	28
Mock	4	16
Second molar		
Trephination	0	0
Mock	7	28
First premolar		
Trephination	3	12
Mock	2	8
Second premolar		
Trephination	3	12
Mock	0	0
Anteriors		
Trephination	0	0
Mock	4	16

$n = 25$ trephination, $n = 25$ mock trephination.

TABLE 2. Preoperative parameters for trephination and mock trephination groups

Variable	Trephination	Mock	p Value
Age*	32.2 ± 13.3	30.6 ± 9.71	0.629
Gender	9 Females 16 Males	8 Females 17 Males	1.00
Weight*	169 ± 29.7	181 ± 48.6	0.293
Estimated lesion area*	21.8 ± 19.4	19.8 ± 16.9	0.686
Tooth type			0.188

* Mean ± SD.

Conventional endodontic treatment was performed by endodontic graduate students. After local anesthetic administration, standard access openings were performed. The working length was determined to be approximately 1 mm from the radiographic apex. The canals were prepared using a step-back preparation and K-type files (L. D. Caulk, Inc., Milford, DE). The canals were irrigated with 2.62% sodium hypochlorite initially and after every other file was placed to working length. Complete biomechanical preparation of all canals was accomplished. The canals were dried and a sterile cotton pellet was placed over the canal orifices and the access opening was sealed with Cavit. The occlusion was not adjusted.

Patients randomly received either an apical trephination procedure or a mock trephination procedure. The trephination procedure was accomplished as follows. The location of the perforation was determined by the largest apical radiolucency that was accessible without endangering adjacent anatomical structures. An endodontic file was used to determine the length and direction of the root using previous radiographic and canal length measurements. The site of the trephination was anesthetized with 0.1 ml of 2% lidocaine with 1:100,000 epinephrine. A D-16 endodontic explorer was used to puncture the alveolar mucosa at the perforation site. A fistulator (Indrag/Losone, Switzerland), a metal instrument with a bend in the end which contained a hole that was 3 mm in diameter, held the mucosa against the underlying bone and served as a guide for penetration of the bone and introduction of files. The initial opening was made with a Stabident perforator (Fairfax Dental, Inc., Miami, FL). The perforator was placed into the opening of the fistulator and the handpiece was activated in a series of short bursts until a breakthrough feeling was observed. This opening was enlarged by inserting successively larger K-type endodontic files (#25 through #120) to an approximate length of 9 mm. An endodontic spoon excavator was placed through the opening and used to curette the cancellous bone and enlarge the interior opening.

The mock trephination procedure used the fistulator and mimicked the actual trephination procedure except that the Stabident perforator only penetrated mucosal tissue (not bone) and the file handles (#25 through #120) were placed on the mucosal tissue and turned to mimic the trephination procedure. The spoon excavator was placed through the mucosal perforation and moved across bone in a scraping motion. All instruments were used in the same sequence and for the same time period as during the actual trephination. For both the trephination and mock trephination procedure, patients rated the pain of the Stabident perforation, file use, and curettage with the spoon excavator using the previous pain scale.

After endodontic treatment and trephination, each patient received a labeled bottle of 400 mg tablets of ibuprofen (Advil, Whitehall Laboratories, New York, NY) along with verbal and written instructions on how to take the medication. They were instructed to take one tablet every 4 to 6 h as needed for pain and to take the ibuprofen first if an analgesic was required. Each patient also received a labeled bottle of acetaminophen with 30 mg of codeine (Tylenol #3, McNeil Consumer Products, Fort Washington, PA) along with verbal and written instructions. They were instructed to take the acetaminophen with codeine (one or two tablets every 4 h as needed for pain) only if the ibuprofen tablets did not relieve their discomfort. Each patient received twenty-eight 500-mg tablets of penicillin VK (Biocraft Laboratories, Inc., Elmwood Park, NJ) to be taken every 6 h. Three patients received erythromycin due to an allergy to penicillin. An antibiotic was administered since many patients were on penicillin when they

presented for emergency treatment and placing patients on antibiotics standardized this variable. Based on previous studies (6, 12, 13), penicillin would not effect the outcome of the present study.

Each patient received a 7-day diary to record postoperative symptoms. The symptoms were recorded upon arising, on each day, for 7 days. The information recorded was pain, percussion pain (the patient was asked to tap on her/his tooth), swelling, and number and type of pain medication taken (ibuprofen or acetaminophen with codeine). Pain and percussion pain rating scales were the same as outlined previously. Swelling was rated on a scale from 0 to 3. Zero indicated no swelling. One indicated mild swelling, mild puffiness of the face that was not bothersome. Two indicated moderate swelling, swelling that caused facial distortion and was bothersome. Three indicated severe swelling, swelling that caused serious facial distortion and was very bothersome. At the scheduled obturation appointment, the patient returned the diary and all unused medications to verify the amount of pills taken.

Data were collected and statistically analyzed. Bivariate analyses for differences between the trephination and mock trephination groups were completed as follows. Age, weight, estimated lesion area and total number of ibuprofen and acetaminophen with codeine tablets taken were analyzed using the independent *t* test, whereas gender and tooth type (anterior, premolar, molar) were assessed using the Fisher exact test. Between-group differences at baseline and at each of the 7 days for pain, percussion pain, and swelling were assessed using multiple Mann-Whitney-Wilcoxon tests. p-Values were adjusted using the step-down method of Holm. Differences were considered significant at $p < 0.05$.

RESULTS

The trephination group and the mock trephination group each consisted of 25 patients. The distribution of tooth type is found in Table 1. Table 2 shows the preoperative variables of age, gender, weight, estimated lesion area, and tooth type for the two groups. There was no statistically significant difference ($p > 0.05$) between the trephination group and the mock trephination group for any of the preoperative variables.

The postoperative pain and percussion ratings are summarized in Tables 3 and 4. The differences between the trephination and mock trephination groups were not statistically significant (Tables 3 and 4). As shown in Tables 3 and 4, the postoperative pain and percussion ratings generally decreased over the 7-day observation period for both groups.

The postoperative swelling ratings are summarized in Table 5. The differences between the trephination and mock trephination groups were not statistically significant (Table 5). As shown in Table 5, the postoperative swelling ratings generally decreased over the last 5 days for both groups.

Table 6 illustrates the number, percentage, average use and nonuse of ibuprofen and acetaminophen with codeine during the seven postoperative days. There was no statistically significant difference in the mean total number of ibuprofen tablets taken over the 7-day postoperative observation period between the trephination and mock trephination groups (Table 6). Patients with trephination took significantly ($p < 0.05$) less acetaminophen with codeine over the 7-day observation period (Table 6).

Table 7 summarizes the pain ratings of the trephination and mock trephination procedures. Generally, the pain ratings were low.

TABLE 3. Pain ratings for baseline and each postoperative day for trephination and mock trephination groups

Day	Pain Ratings			
	None	Mild	Moderate	Severe
Baseline*				
Trephination	0 (0%)	1 (4%)	8 (32%)	16 (64%)
Mock	0 (0%)	3 (12%)	11 (44%)	11 (44%)
Day 1*				
Trephination	5 (20%)	14 (56%)	4 (16%)	2 (8%)
Mock	1 (4%)	9 (36%)	11 (44%)	4 (16%)
Day 2*				
Trephination	9 (36%)	11 (44%)	5 (20%)	0 (0%)
Mock	4 (16%)	12 (48%)	6 (24%)	3 (12%)
Day 3*				
Trephination	12 (48%)	11 (44%)	2 (8%)	0 (0%)
Mock	8 (32%)	11 (44%)	6 (24%)	0 (0%)
Day 4*				
Trephination	16 (64%)	7 (28%)	2 (8%)	0 (0%)
Mock	12 (48%)	9 (36%)	3 (12%)	1 (4%)
Day 5*				
Trephination	18 (72%)	6 (24%)	1 (4%)	0 (0%)
Mock	17 (68%)	7 (28%)	1 (4%)	0 (0%)
Day 6*				
Trephination	21 (84%)	3 (12%)	1 (4%)	0 (0%)
Mock	20 (80%)	5 (20%)	0 (0%)	0 (0%)
Day 7*				
Trephination	21 (84%)	4 (16%)	0 (0%)	0 (0%)
Mock	19 (76%)	6 (24%)	0 (0%)	0 (0%)

$n = 25$ trephination, $n = 25$ mock trephination.

* There were no significant differences ($p > 0.05$) between the two groups.

DISCUSSION

The apical trephination procedure using a Stabident perforator, files, and a spoon excavator did not significantly reduce pain, percussion pain, swelling, or the number of ibuprofen tablets taken for symptomatic necrotic teeth with periapical radioluciences.

Patients took significantly ($p < 0.05$) less acetaminophen with codeine in the trephination group. Though the trephination procedure therefore apparently had some effect, 24% and 20% of the patients in the trephination group had moderate-to-severe pain on postoperative days 1 and 2 (Table 3). Also moderate-to-severe percussion pain for the trephination group, on days 1 and 2, were 24% and 32%. Therefore, trephination did not initially reduce postoperative pain to clinically manageable levels (none or mild pain). Other studies (9, 11) on trephination have reported success with the procedure. The design of these studies (9, 11) was different from that of our present study. Elliot and Holcomb (11) performed trephination only on asymptomatic teeth; therefore, comparison to our study is difficult because the majority of our patients were experiencing moderate-to-severe pain. Peters (9) did not consider preoperative pain levels (group 1) and trephinated only those teeth that had severe pain after obturation (group 2). An exact comparison of his study to our study is not possible because it is not known how many teeth, in Peter's study (9), were symptomatic at the treatment appointment.

Although the Moos et al. (10) study used symptomatic necrotic teeth, they reported that their trephination group had greater pain intensity, unpleasantness, and less pain relief throughout the 96-h postoperative period. The only statistical difference occurred at 4 h when compared with the nontrephinated group. Houck et al. (12) found a coronal trephination procedure did not significantly reduce postoperative pain, percussion pain, swelling, or the number of

TABLE 4. Percussion pain ratings for baseline and each postoperative day for trephination and mock trephination groups

Day	Percussion Pain Ratings			
	None	Mild	Moderate	Severe
Baseline				
Trephination	0 (00%)	1 (4%)	8 (32%)	16 (64%)
Mock	2 (8%)	8 (32%)	8 (32%)	7 (28%)
Day 1*				
Trephination	5 (20%)	14 (56%)	4 (16%)	2 (8%)
Mock	1 (4%)	9 (36%)	11 (44%)	4 (16%)
Day 2*				
Trephination	8 (32%)	9 (36%)	7 (28%)	1 (4%)
Mock	9 (36%)	11 (44%)	3 (12%)	2 (8%)
Day 3*				
Trephination	13 (52%)	8 (32%)	4 (16%)	0 (0%)
Mock	8 (32%)	13 (52%)	3 (12%)	1 (4%)
Day 4*				
Trephination	11 (44%)	12 (48%)	2 (8%)	0 (0%)
Mock	7 (28%)	16 (64%)	2 (8%)	0 (0%)
Day 5*				
Trephination	14 (56%)	10 (40%)	1 (4%)	0 (0%)
Mock	9 (36%)	12 (48%)	4 (16%)	0 (0%)
Day 6*				
Trephination	14 (56%)	9 (36%)	1 (4%)	1 (4%)
Mock	17 (68%)	8 (32%)	0 (0%)	0 (0%)
Day 7*				
Trephination	15 (60%)	10 (40%)	0 (0%)	0 (0%)
Mock	18 (72%)	6 (24%)	1 (4%)	0 (0%)

$n = 25$ trephination, $n = 25$ mock trephination.
* There were no significant differences ($p > 0.05$) between the two groups.

TABLE 5. Swelling ratings for baseline and each postoperative day for trephination and mock trephination groups

Day	Swelling Ratings			
	None	Mild	Moderate	Severe
Baseline*				
Trephination	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Mock	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Day 1*				
Trephination	15 (60%)	8 (32%)	1 (4%)	1 (4%)
Mock	10 (40%)	6 (24%)	9 (36%)	0 (0%)
Day 2*				
Trephination	14 (56%)	7 (28%)	2 (8%)	2 (8%)
Mock	13 (52%)	8 (32%)	4 (16%)	0 (0%)
Day 3*				
Trephination	17 (68%)	6 (24%)	2 (8%)	0 (0%)
Mock	16 (64%)	7 (28%)	2 (8%)	0 (0%)
Day 4*				
Trephination	18 (72%)	6 (24%)	1 (4%)	0 (0%)
Mock	20 (80%)	3 (12%)	1 (4%)	1 (4%)
Day 5*				
Trephination	17 (68%)	8 (32%)	0 (0%)	0 (0%)
Mock	20 (80%)	3 (12%)	1 (4%)	1 (4%)
Day 6*				
Trephination	19 (76%)	6 (24%)	0 (0%)	1 (4%)
Mock	22 (88%)	3 (12%)	0 (0%)	0 (0%)
Day 7*				
Trephination	22 (88%)	3 (12%)	0 (0%)	0 (0%)
Mock	24 (96%)	1 (4%)	0 (0%)	0 (0%)

$n = 25$ trephination, $n = 25$ mock trephination.
* There were no significant differences ($p > 0.05$) between the two groups.

analgesic medications taken in symptomatic necrotic teeth with radiolucencies.

Why didn't trephination reduce the severity of the postoperative symptoms? What exactly is the rationale for a trephination procedure? The first theory involves establishment of drainage. The trephination procedure would allow for immediate drainage or drainage at some future time when the infection becomes more localized. The basic problem is we do not know the exact condition of the periapical tissue in symptomatic necrotic teeth with radiolucencies. Pain does not indicate the histological condition in bone. Therefore, we may be dealing with a variety of periapical responses—acute inflammation, chronic inflammation, abscess formation, a spreading infection/inflammatory lesion. Additionally, there may be a mix of conditions with isolated abscess formation in regions not accessible to drainage by trephination. Therefore, if the condition periapically has not localized or is not accessible, the trephination procedure is not immediately productive and we must wait for localization, drainage, and relief of pain. However, it is unknown how long this process takes or if it occurs at all.

Another theory is that trephination could act as a valve to equilibrate the pressure periapically. Mohorn et al. (14), in 1971, evaluated pressures exerted by periapical lesions in dogs. They found periapical pressures fluctuated considerably and felt the variations in pressures were dependent on the factors contributing to edema. However, if there are actual pressure differences clinically, it is not known how much pressure would be required for the lesion to vent through the trephination site. Moos et al. (10) discussed the possibility that pressure may not be the primary cause of patients' pain with symptomatic necrotic teeth; inflammatory mediators (prostaglandins, leukotrienes, kinins, thromboxane-related substances, etc.) would also contribute to periapical pain.

The apical trephination was directed into the area of the largest periapical radiolucency. This procedure should allow drainage, relieve pressure, and disrupt or remove some of the inflammatory mediators apically. However, in multirooted teeth radiolucencies could be present on all roots. Although we choose the largest area present on the radiograph that was accessible without endangering anatomical structures, perhaps the problem causing the pain was associated with another root. This is one of the short comings of a trephination procedure, because it is impractical to trephinate all roots in multirooted teeth—even if they are all accessible.

Trephination is not a popular procedure. Dorn et al. (15), in 1977, found 16% of Diplomates would perform a trephination procedure for necrotic teeth. Gatewood et al. (16) found the use of trephination by Diplomates dropped to 8% in 1990. Trephination may be unpopular due to the time required for the procedure or its ineffective pain relief.

The complete trephination procedure took <5 min and was basically not painful—only a few patients reported moderate pain (Table 7). Houck et al. (12) recorded less overall pain with their coronal trephination procedure. The differences between Houck's et al. (12) study and ours probably relate to the tenderness of the apical site in symptomatic necrotic teeth.

The initial (baseline) pain and percussion pain (Tables 3 and 4) are representative of the pain patients experience with symptomatic necrotic teeth without swellings. Eighty-eight to 96% of patients presented with moderate-to-severe pain ratings and 60% to 96% presented with moderate-to-severe percussion ratings (Tables 3 and 4). The moderate-to-severe pain and percussion ratings decreased over the first 3 days with 4% of the patients continuing to experience moderate pain through day 6 (Table 3). Previous au-

TABLE 6. Postoperative pain medications for trephination and mock trephination groups

Day	No. Who Took Ibuprofen	No. Who Took Acetaminophen with Codeine*	No. Who Took No Acetaminophen with Codeine or Ibuprofen
Day 1			
Trephination	20 (80%)	11 (44%)	2 (8%)
No. of tablets	50	26	
Mock	21 (84%)	17 (68%)	2 (8%)
No. of tablets	61	42	
Day 2			
Trephination	16 (64%)	8 (32%)	6 (24%)
No. of tablets	44	18	
Mock	20 (80%)	18 (72%)	2 (8%)
No. of tablets	61	46	
Day 3			
Trephination	11 (44%)	5 (20%)	13 (52%)
No. of tablets	33	8	
Mock	16 (64%)	12 (48%)	7 (28%)
No. of tablets	40	27	
Day 4			
Trephination	10 (40%)	1 (4%)	17 (68%)
No. of tablets	32	2	
Mock	11 (44%)	9 (36%)	10 (40%)
No. of tablets	37	26	
Day 5			
Trephination	8 (32%)	1 (4%)	16 (64%)
No. of tablets	24	2	
Mock	11 (44%)	7 (28%)	13 (52%)
No. of tablets	26	18	
Day 6			
Trephination	4 (16%)	2 (8%)	20 (80%)
No. of tablets	12	3	
Mock	10 (40%)	6 (24%)	15 (60%)
No. of tablets	20	12	
Day 7			
Trephination	6 (24%)	1 (4%)	21 (84%)
No. of tablets	17	2	
Mock	6 (24%)	4 (16%)	16 (64%)
No. of tablets	14	7	

$n = 25$ trephination, $n = 25$ mock trephination.
* There was a significant difference ($p < 0.05$) between the two groups.

TABLE 7. Pain ratings for trephination and mock trephination groups

Procedure	Pain Ratings			
	None	Mild	Moderate	Severe
Perforation				
Trephination	17 (68%)	7 (28%)	1 (4%)	0 (0%)
Mock	25 (100%)	0 (0%)	0 (0%)	0 (0%)
File placement (#25–#120)				
Trephination	8 (32%)	14 (56%)	3 (12%)	0 (0%)
Mock	22 (88%)	3 (12%)	0 (0%)	0 (0%)
Spoon curettage				
Trephination	11 (44%)	10 (40%)	4 (16%)	0 (0%)
Mock	21 (84%)	4 (16%)	0 (0%)	0 (0%)

$n = 25$ trephination, $n = 25$ mock trephination.

thors have reported that patients who have preoperative pain will have a significantly higher incidence of postoperative pain (1, 3, 6, 12, 13). Our results would concur with these authors' findings. Fouad et al. (6) reported rapid resolution of pain in their 3-day evaluation period of the localized acute apical abscess. Henry et al. (13), in a study of the effect of penicillin on postoperative endodontic pain in symptomatic necrotic teeth, reported a decreasing number of moderate-to-severe pain ratings over the first 3 days with 4% to 26% of the patients continuing to experience moderate-to-severe pain through day 7. Moos et al. (10) also recorded a decrease in pain over the 96-h postoperative period regardless of whether a trephination procedure was done. Even though Houck's et al. (12) coronal trephination procedure was no more effective than a mock trephination in reducing pain, the majority of the moderate-to-severe pain ratings decreased after the third day. Therefore, studies by Fouad et al. (6), Moos et al. (10), Houck et al. (12), Henry et al. (13), and our study demonstrated that moderate to severe postoperative pain did decrease, in the majority of patients, after 3 days. This reduction in pain may be related to a natural recovery period (17–19). That is, once the tooth initially becomes symptomatic, the periapical inflammation/infection continues on its own course until it finally resolves naturally.

Because postoperative pain scores would be effected by analgesic use, we recorded the number of medications taken over the 7 days (Table 6). Generally, the use of ibuprofen and acetaminophen with codeine followed the pain ratings (Table 3), with the highest use initially and through day 3 followed by a decrease over the 7 days. Although patients took significantly less acetaminophen with codeine, this would have little value clinically because its use was not eliminated (Table 6). Clinically, the practitioner should administer appropriate pain medications to help reduce postoperative pain in patients presenting with symptomatic necrotic teeth with radiolucencies.

No patients had clinical swellings when they presented for endodontic treatment (Table 5). Ten patients (one trephination and nine mock trephination) reported moderate swelling on day 1, 6 on day 2, with decreasing moderate swelling ratings over the 7 days. Two patients (both trephination) reported severe postoperative swellings. We would expect some patients to have swelling postoperatively; however, trephination did not statistically effect postoperative swelling.

In conclusion, because there was not a significant reduction in pain, percussion pain, and swelling, we cannot recommend the routine use of an apical trephination procedure, as used in this study, in symptomatic necrotic teeth with radiolucencies.

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Dr. Nist was a former graduate student in endodontics. She is currently in private practice limited to endodontics, Zanesville, OH. Dr. Reader is professor and program director of graduate endodontics, Dr. Beck is associate professor and acting chairperson in the department of Health Services Research, College of Dentistry, The Ohio State University, Columbus, OH. Address requests for reprints to Dr. Al Reader, Program Director of Graduate Endodontics, College of Dentistry, The Ohio State University, 305 West 12 Avenue, Columbus, OH 43210.

References

1. Harrison JW, Baumgartner JC, Svec TA. Incidence of pain associated with clinical factors during and after root canal therapy. Part 1. Interappointment pain. J Endodon 1983;9:384–7.
2. Torabinejad M, Kettering JD, McGraw JC, Cummings RR, Dwyer TG, Tobias TS. Factors associated with endodontic interappointment emergencies of teeth with necrotic pulps. J Endodon 1988;14:261–6.

3. Walton R, Fouad A. Endodontic interappointment flare-ups: a prospective study of incidence and related factors. J Endodon 1992;18:172–7.
4. Mor C, Rotstein I, Friedman S. Incidence of interappointment emergency associated with endodontic therapy. J Endodon 1992;18:509–11.
5. Imura N, Zuolo ML. Factors associated with endodontic flare-ups: a prospective study. Int Endod J 1995;28:261–5.
6. Fouad AF, Rivera EM, Walton RE. Penicillin as a supplement in resolving the localized acute apical abscess. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 1996;81:590–5.
7. Eleazer PD, Eleazer KR. Flare-up rate in pulpally necrotic molars in one-visit versus two-visit endodontic treatment. J Endodon 1998;24:614–6.
8. Chestner SB, Selman AJ, Friedman J, Heyman RA. Apical fenestration: solution to recalcitrant pain in root canal therapy. J Am Dent Assoc 1968;77:846–8.
9. Peters DD. Evaluation of prophylactic alveolar trephination to avoid pain. J Endodon 1980;6:518–26.
10. Moos HL, Bramwell JD, Roahen JO. A comparison of pulpectomy alone versus pulpectomy with trephination for the relief of pain. J Endodon 1996;22:422–5.
11. Elliot JA, Holcomb JB. Evaluation of a minimally traumatic alveolar trephination procedure to avoid pain. J Endodon 1988;14:405–7.
12. Houck V, Reader A, Beck M, Nist R, Weaver J. Effect of trephination on postoperative pain and swelling in symptomatic necrotic teeth. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. Submitted for publication.
13. Henry M, Reader A, Beck M, Gallatin E. Effect of penicillin on postoperative pain and swelling in symptomatic, necrotic teeth. J Endodon (in press).
14. Mohorn HW, Dowson J, Blankenship JR. Pressure exerted by odontic periapical lesions. Oral Surg Oral Med Oral Pathol 1971;31:810–18.
15. Dorn SD, Moodnik RM, Feldman MJ, Borden BG. Treatment of the endodontic emergency: a report based on a questionnaire. J Endodon 1977;3:94–100, 153–8.
16. Gatewood RS, Himel VT, Dorn SO. Treatment of the endodontic emergency: a decade later. J Endodon 1990;16:284–91.
17. Burke JF. The effective period of preventive antibiotic action in experimental incisions and dermal lesions. Surgery 1969;50:161–8.
18. Burke JF, Miles AA. The sequence of vascular events in early infective inflammation. J Pathol Bacteriol 1958;76:1–19.
19. Burke JF. Use of preventive antibiotics in clinical surgery. Ann Surg 1973;39:6–11.

You Might Be Interested

In deploring the "mess that is medical information" in a column entitled, "Doctors' Information: excessive, crummy and bent," the editor of one of the most prestigious medical journals (Br Med J 315:9) notes that "most of what doctors do is of small benefit and potentially harmful."

That's certainly reassuring to patients.

David Wiley