Clinical effect of endodontic debridement for acute apical inflammation

Tran Thi Quynh Nhu, Phan Anh Chi*

Faculty of Odonto-Stomatology, University of Medecine and Pharmacy, Hue University, Vietnam

Abstract

Background: Accurate diagnosis and effective management of acute toothache is one of the important aspects of dental care. In the past, with acute periapical inflamation, 19.4% - 71.2% of the surveyed clinical endodontists would open the space between appointments, however recent literature suggests that this method is prone to complications. Currently, there is a tendency not to open for drainage but to proceed with immediate endodontic treatment. **Objectives:** To compare the results of endodontic treatment of acute periodontitis by immediate endodontic debridement and open tooth methods. **Materials and methods**: Interventional prospective study on patients with teeth diagnosed with acute periapical inflammation. Patients were randomly divided into 2 groups: group I for immediate root canal treatment and group II for open tooth. Patients recorded pain levels and the number of pain medications used 5 days after the first treatment session. Treatment results are considered successful when the patient has no pain or mild pain after surgery, failure when the pain is moderate or severe after surgery. Comparison of mean time to completion of treatment between the 2 study groups. **Results:** In group I, values of pain were recorded lower than in group II during days 3 to 5 after treatment. The immediate root canal treatment group had a higher success rate of 77.8% compared to the open tooth group of 62.9%, with pain levels ranging from no pain to mild pain. The maximum number of pain medication used in group I was 5.44 ± 0.50, in group II was 5.54 ± 0.50. Then gradually decreased in the next 4 days. However, there was no significant difference between the 2 groups in the level of pain medications use. The number of treatment times of group I was mainly 2 and 3 times: accounting for 35.1% and 48.6%, less than group 2, mainly over 3 appointments, accounting for 77.8%. **Conclusions:** Patients improved pain symptoms after 5 days in both study groups. The immediate root canal treatment group had a higher success rate than the open tooth group.

Key words: *acute periapical imflamation, endodontic debridement, endodontic pain.*

1. INTRODUCTION

Accurate diagnosis and effective management of acute toothache is one of the important aspects of dental care. An endodontic emergency is defined as a pain/or swelling caused by various degrees of inflammation or infection of pulp and/or paraapical tissue. Patients with periapical disease often have acute toothache. Pain is a combination of both mental and biological, the treatment of acute toothache needs to be comprehensive in terms of both physiological symptoms as well as mental stability of the patient. In the past, when there were acute periodontitis , 19.4% - 71.2% of the surveyed clinical endodontists would open the tooth between appointments [1], [2], however the documents recent literature suggests that this approach is prone to complications [3] so leaving tooth open between appointments is not recommended. Foreign objects have been found in tooth left open for drainage. There is one case report noted that foreign objects can enter the periapical tissue through the dental opening for drainage [4]. In addition, leaving a tooth open provides an opportunity for oral microorgannisms to invade and colonize the root canal system if the tooth is left open for an extened period. Tends to not open for drainage, which is an immediate endodontic treatment, and when multiple treatments are performed, most endodontists will use $Ca(OH)_2$ for root canal dressings [5]. However, leave tooth opening to allow drainage or pain relief is still controversial. In the world, there are many in-depth studies on this issue, including Raquel Sebastian et al in 2016 who studied the effects of no immediate endodontic treatment on teeth with pulp necrosis with inflammatory complications. periapical results showed that the immediate endodontic treatment group had a higher success rate than the analgesia group alone [6]. In 2018 at the Seminar of Dentists and Endodontists in Saudi Arabia on the topic of pulp necrosis and acute periapical complications, Masarati AA et al. reported an improved method in

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the treatment of these teeth, which is to perform an immediate endodontic treatment, limited antibiotics and no open tooth between visits [7].

In Vietnam, this is an open issue, there is no research on this topic yet, so we conducted a study with the following objectives: Compare the results of endodontic treatment of acute periodontitis with immediate endodontic debridement and open tooth methods.

2. MATERIALS AND METHODS

2.1. Research subjects

Patients who came for examination and treatment at the clinical of dentistry, Hue University of Medicine and Pharmacy Hospital, were diagnosed with acute periapical characterized by rapid onset, spontaneous pain, tenderness of the tooth to pressure, radiographically visible periapical bone resorption but with minimal or no clinical symptoms (Ingle's classification) [8] with indications for treatment from June 2019 to September 2021.

2.2. Study design: Prospective study with clinical intervention.

2.3. Sample size: 73 teeth/71 patients; Group I: 37 teeth/36 patients, group II: 36 teeth/35 patients.

2.4. Sampling method: Choose a random, non-probability, convenience sample. Group patients according to the order of arrival. Patients with odd numbered visits were classified in group I (immediate endodontic treatment). Patients who come to the clinic with an even number are placed in group II (open tooth). Note, if a patient has more than one tooth with the same condition, all of the patient's teeth will be performed by the same method.

2.5. Research Methods

Examination and selection of patients into study group I or II. Explain treatment and research procedures.

- 1st appointment

Step 1:

+ Local anesthesia of the injured tooth.

+ Use a round, cylindrical drill to open the pulp, determine the orifice of the canal, and take the pulp.

+ Pump to clean dentin and necrotic pulp by endodontic irrigating syringe with NaOCl 3% solution.

+ Group 1 (immediate endodontic treatment)

• Prepare root canal by step-back method with Protaper file.

• Dry the root canal with a paper cone.

• Use a lentulo to apply calcium hydroxide paste to the full length of the canal.

• Temporarily filling with caviton, the patient will be re-examined after 5 days.

+ Group 2 (open tooth)

• No root canal preparation.

• Instruct the patient to insert cotton during mealtimes.

• Make a follow-up appointment after 5 days (6).

After treatment, patients in both groups received a prescription for 5 days including:

+ Antibiotics: Rodogyl, each tablet contains 750000UI Spiramycin and 125mg Metronidazole, use 2 tablets every 8 hours for adults and children over 12 years old.

+ Pain relief: One box (20 tablets) of Acetaminophen, directed to take 1 tablet every 4 to 6 hours.

The patient was not allowed to take any other medications.

- 2nd appointment

+ Each patient received a diary to record the pain they experienced and the amount of pain medication used 24 hours after treatment and 5 days after.

+ The patient records the amount of painkillers taken the night of the procedure.

+ During the next 5 days, the patient recorded pain according to the VAS pain scale and the number of painkillers used each day at night.

+ Patient is required to return all unused medications after 5 days for information verification.

- Research variables:

+ Number of painkillers used in 5 days after treatment.

+ Pain level was recorded for 5 days according to the modified visual analog scale (VAS), validated in previous studies [9], [10].

• No pain (0): The treated tooth feels normal. Patient does not have any pain

• Mild pain (1): Perceivable, but no discomfort, pain, no pain medication required

• Moderate pain (2): Discomfort, but tolerable, pain (analgesics, if used, are effective in relieving pain)

• Severe pain (3): Discomfort (painkillers have little or no effect on pain relief).

+ Average time to complete treatment between the 2 study groups: the number of treatments is calculated from the first treatment session until the tooth is eligible for root canal filling.

- Evaluation of treatment results

+ Pain level and number of painkillers used for 5 days after the first treatment session. Assess pain

level according to VAS pain scale [9], [10].

+ Evaluation of treatment results 5 days after the first treatment session: Treatment results were evaluated according to the research criteria of Sebastian (2016), successful when the patient did not have pain or had mild pain after surgery. failure with moderate or severe pain after surgery [6].

+ Comparison of the mean time to completion of treatment between the 2 study groups.

2.6. Methods of data processing:

Data entry into excel and processed by SPSS 20.0 software, Chi-squared test for qualitative variables and T-student with quantitative variables, comparing the two values has statistical significance when $p < 0.05$.

2.7. Ethical considerations: Anonymity and informed consent were assured. The study was approved by the Ethical Review Committee of Hue University of Medicine and Pharmacy, Vietnam (No.3660 Dated November 22th, 2019).

3. RESULTS

3.1. General characteristics

Table 1. General characteristics of the study sample

Characteristics		n	%
Gender	Male	14	19.7
	Female	57	80.3
Age	≤ 25	29	40.8
	26 – 45	18	25.4
	> 45	24	33.8
		Average age: 37.08 ± 18.66	
Tooth location	Anterior	9	12.3
	Premolar	10	13.7
	Molar	54	74.0

Our sample haves 71 patients, including 14 male patients, accounting for 19.7% and 57 female patients, accounting for 80.3%.

The mean age of the patients was 37.08 ± 18.66 years (the youngest was 12, the oldest was 85), divided into 3 age groups: ≤ 25 years old, 26 - 45 years old and ≥ 45 years old. In which, the age group ≤ 25 has 29 patients (40.8%), the age group 26 - 45 has 24 patients (25.4%), the age group 45 has 24 patients (33.8%).

Among the 73 teeth with acute periapical imflammation examined and treated, the molar group accounted for the highest percentage (54/73 = 74.0%), followed by the premolar group (13.7%) and the lowest group is the incisor group, accounting for 12.3%. This rate was similarly distributed in both study groups I and II.

The cause of acute periapical imflammation is mainly due to dental caries, accounting for 80.8%, trauma for 8.2%, and 11% for no carious lesion.

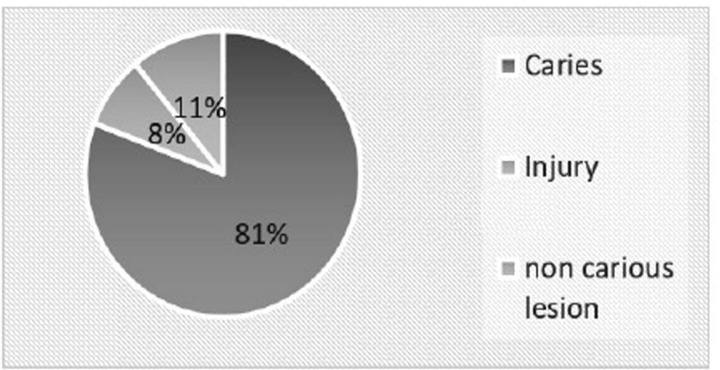

Chart 1. Causes of acute periapical imflammation

3.2. Treatment results

3.2.1. Pain level in 5 days after the first treatment session

Table 2. Percentages and severity of pain in 5 days after the first treatment session

Group	Pain level	None		Mild		Moderate		Severe		P *
		n	%	n	%	n	%	n	%	
Day 0	Group I	1	2.8	13	36.1	19	52.8	3	8.3	> 0.05
	Group II	4	11.4	13	37.1	13	37.1	5	14.3	
Day 1	Group I	2	5.6	16	44.4	17	47.2	1	2.8	> 0.05
	Group II	4	11.4	8	22.9	21	60.0	2	5.7	
Day 2	Group I	2	5.6	18	50.0	15	41.7	1	2.8	> 0.05
	Group II	3	8.6	12	34.3	16	45.7	4	11.4	
Day 3	Group I	8	22.2	15	41.7	12	33.3	1	2.8	> 0.05
	Group II	7	20.0	13	37.1	13	37.1	2	5.7	
Day 4	Group I	8	22.2	18	50.0	10	27.8	0	0	> 0.05
	Group II	6	17.1	12	34.3	15	42.9	2	5.7	
Day 5	Group I	14	38.9	14	38.9	8	22.2	0	0	> 0.05
	Group II	7	20.0	15	42.9	10	28.6	3	8.6	

(P* using Independent Sample T Test)

After the first treatment session, the pain level for 5 days of patients in 2 treatment groups was recorded. Statistics show that 52% - 62% of patients experience moderate to severe pain on the night of treatment and 50% - 67% of patients on the first day. Pain level gradually decreased in both groups over the next 4 days. Values of pain in group I were recorded lower than in group II during days 3 to 5 after treatment.

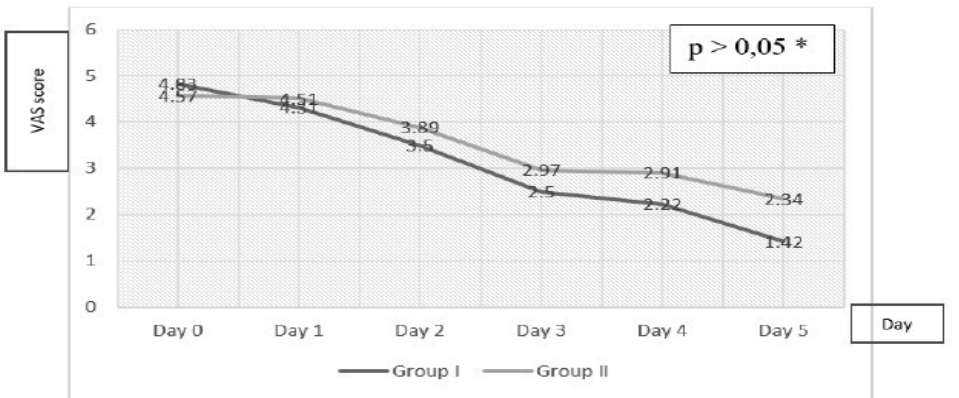

Chart 2. Postoperative pain by group and day
(P* using Independent Sample T Test)

Within 5 days after the first treatment session, the average pain level in both study groups at the treatment night was 4.83 ± 2.04 and 4.57 ± 2.72 respectively, the first night was 4.31 ± 2.03 and 4.51 ± 2.00 respectively.

Over the next 4 days, the average pain level gradually decreased in both study groups. The average pain level of patients on day 5 of group I was 1.42 ± 1.56, which was lower than that of patients of group II was 2.34 ± 2.11.

The difference in mean pain level in the 2 study groups during 5 days of follow-up was not statistically significant (p > 0.05).

3.2.2. Number of painkillers used in the 5 days after the first appointment

Table 3. Number of the painkillers taken in the 5 days after the first appointment

Group		Mean number tablets	P-value *
Day 0	Group I	3.75 ± 0.69	> 0.05
	Group II	3.57 ± 0.78	
Day 1	Group I	5.44 ± 0.50	> 0.05
	Group II	5.54 ± 0.50	
Day 2	Group I	4.36 ± 0.59	> 0.05
	Group II	4.46 ± 0.70	
Day 3	Group I	3.44 ± 0.50	> 0.05
	Group II	3.57 ± 0.50	
Day 4	Group I	2.69 ± 0.47	> 0.05
	Group II	2.77 ± 0.43	
Day 5	Group I	2.19 ± 0.40	> 0.05
	Group II	2.34 ± 0.77	

(P* using Independent Sample T Test)

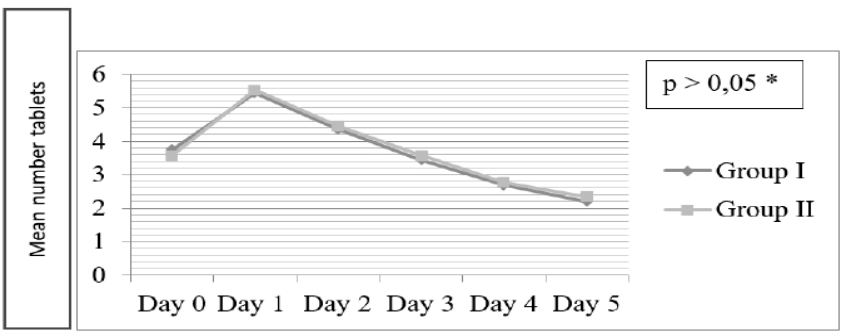

Chart 3. Number of painkillers use by day
(P* using Independent Sample T Test)

Table 3 and chart 3 record the average number of pain medication that patients in both study groups used within 5 days after the first treatment session, showing that:

The most number of painkillers were used on the night of treatment and the first day. The maximum number of pain medication used in group I was 5.44 ± 0.50, in group II was 5.54 ± 0.50. Then gradually decreased in the next 4 days, by day 5, the number of acetaminophen used in group I was 2.19 ± 0.40 and group II was 2.34 ± 0.77.

The difference in the number of pain medication used in the 2 study groups for 5 days was not statistically significant (p > 0.05).

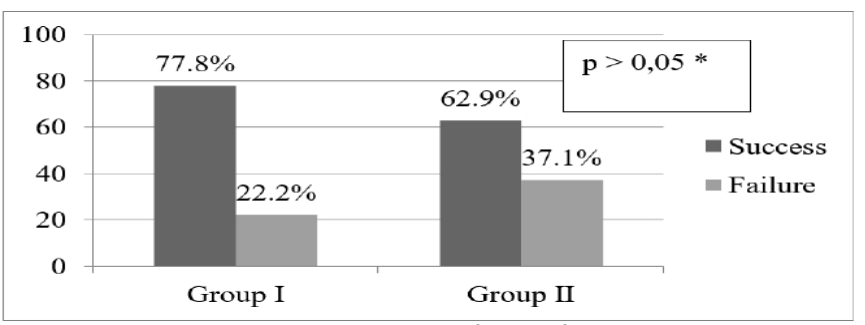

Chart 4. Treatment results 5 days after the first treatment session
(P* using Independent Sample T Test)

Chart 4 shows treatment results of 71 patients 5 days after the first treament session. There were total 50 successful cases in both groups, accounting for 70.4%, while 29.6% of cases resulted in faillure.

Table 5. Number of treatments sessions in both groups

Group / Times	Group I		Group II		Total		P *
	n	%	n	%	n	%	
2	13	35,1	1	2,8	14	19,2	
3	17	45,9	15	41,7	32	43,8	< 0,05
More than 3 times	7	18,9	20	55,6	27	37,0	
Total	**37**	**100**	**36**	**100**	**73**	**100**	

(P* using Independent Sample T Test)

The number of treatment sessions of group I was mainly 2 to 3 times: 2 times accounted for 35.1% and 3 times accounted for 45.9%. Meanwhile, the number of treatment sessiona of group II: no teeth were treated in 2 appointments, 3 times 41.7% and more than 3 times accounted for 55.6%. The difference in the number of treatments between the 2 groups was statistically significant with $p < 0.05$.

4. DISCUSSION

4.1. General characteristics

Regarding gender, it can be seen that the proportion of female patients is much higher than that of male patients. This result is similar to previous studies on dental pulp disease and periapical pathology performed in Can Tho by author Bui Huy Hoang (2018) [11] or research by Nguyen Quynh Trang (2012) [12]. However, in order to objectively determine this rate, a larger-scale study is needed because this is a hospital-based study with a convenient sampling method, so it is not really representative of a large community.

The age group with the highest number of patients coming to treatment is the age group under 25 years old, accounting for 40.8%. This result is similar to the study of Bui Huy Hoang (2018) when the group under 25 years old and the group 26 - 45 years old accounted for the majority with 47.7% and 33.8% respectively [11]. The degree of caries increased with age, however, in both studies, most of patients coming to the clinic for pulpal and periapical diseases were under 45 years of age. This can be explained by the aging of surrouding tissue of teeth around this age, causing the lossening and falling out of teeth.

We divided pathologic teeth into 3 groups according to their position: anterior, premolar and molar group. The anterior group had 8 teeth, accounted for 11.3%, while the premolar and molar group had 10 (14.1%) and 53 (74.6%) teeth respectively. The molar tooth was the most sensitive and damaged tooth with caries due to its complex anatomy, large chewing surface and abundance of hollows and grooves.

4.2. Treatment results

4.2.1. Pain level for 5 days after the first treatment session

After the first treatment session, the 5-day pain levels of the patients in the 2 treatment groups were recorded. Statistics show that 52% - 62% of patients experience moderate to severe pain on the night of treatment and 50% - 67% of patients on the first day. Pain level gradually decreased in both groups over the next 4 days. In group I, values of pain were recorded lower than in group II during days 3 to 5 after treatment. This result is aquired by opening the pulp to reduce pressure in the tissue around the apex, preparing the canal to remove necrotic tissue, infection in the canal, dentinal chips, microorganisms, pulpal tissue remnants or irrigating solutions. Pain relief for the first few nights after treatment may be the result of additive effect of the local anesthetic.

Our results are similar to the study of Raquel Sebastian et al (2016). In this study, the best clinical outcome of teeth presenting with dental emergency was associated with immediate endodontic treatment, performed by well trained and experienced dentists [6].

4.2.2. Number of painkilllers used in the 5 days after the first treatment

Acetaminophen has been recommended as first choice medication for postoperative pain management after endodontic treatment. Table 3 and chart 3 record the average number of pain medications that patients in both study groups used within 5 days after the first treatment session, showing that the number of acetaminophen used is the most on the night of treatment and the first day.

The maximum number of pain medications used in group I was 5.44 ± 0.50, in group II was 5.54 ± 0.50. Then gradually decreased in the next 4 days, by day 5, the number of painkillers used in group I was 2.19 ± 0.40 and group II was 2.34 ± 0.77.

The condition of the patients in the open tooth group did not worsen after 5 days, suggesting that painkillers may be effective in helping patients with pupal and periapical symptoms improve. The use of antibiotics is not expected to be beneficial for the resolution of symptoms in teeth presented with pulp necrosis or acute periapical abscess, as shown in the study of Henry et al. If the patient has immunocompromised or other serious medical conditions, immediate root canal therapy should be indicated rather than just open tooth [13].

4.2.3. Treatment results

5 days after the first treatment, the number of successful cases was 50/71, accounting for 70.4%, the number of failed cases accounted for 29.6%. Our results are similar to the study of Raquel Sebastian et al. (2016), the immediate root canal treatment group had a higher success rate of 77.8% than the open tooth group of 62.9%, with pain levels ranging from no pain to mild pain [6].

Despite the reduction of pain level at day 5 comparing to baseline, most of drugs were used in only first few days and decreased after 5 days together with pain relief (table 3, chart 3). The improvement of toothache at day 5 might be the natural progression of the disease to the clinical state of a tooth with pulpal and periapical symptoms. Research by the authors Houck V. (2000), Nist E. (2001), Henry M. (2001), Nusstein J.M. (2002) and Wells L.K. (2011) showed that the majority of patients began to improve pain regardless of the drug or the active treatment regimen by day 3 post-treatment. Our results in this study were similar to some other studies, according to Wells L.K. et al (2011), even without root canal therapy, most patients do not require medication. However, symptom improvement without treatment and without the use of analgesics may be important in certain clinical situations [13], [14], [15], [16], [17].

4.2.4. Number of treatments sessions in both groups

Comparing the number of treatments between the 2 groups, calculated from the first treatment session to the time when the teeth are eligible for root canal obturation and complete obturation, we find that the number of treatments sessions of group I is less than group II. The number of treatment sessions of group I was mainly 2 to 3 times: 2 times accounted for 35.1% and 3 times accounted for 45.9%. Meanwhile, the number of treatment sessiona of group II: no teeth were treated in 2 appointments, 3 times 41.7% and more than 3 times accounted for 55.6%.

The shortening of the number of treatments sessions of group I compared to the group II is because of the teeth being prepared and removing all dirt and necrosis in the canal during the day of the first appointment. There was no recontamination or the appearance of foreign bodies in the canal due to the opening. Today with the development of modern dentistry with endodontic file systems and irrigation solutions, $Ca(OH)_2$ dressings have been studied to be effective in reducing bacterial growths in the canal [2].

5. CONCLUSIONS

- General characteristics: The mean age was 31 ± 18.66 years old, the group under 25 years old accounted for 40.8%. The male to female ratio is 14/57. Cause: mainly due to complications of tooth decay (80.8%).

- Treatment results

The number of successful cases was 50/71. The average pain level was moderate on the night of treatment and the first day in both study groups, then gradually decreased in the next 4 days.

The maximum number of painkillers used in group I was 5.44 ± 0.50, in group II was 5.54 ± 0.50, number of tablets gradually decreased after 5 days.

The number of treatment times of group I was mainly 2 and 3 times: accounting for 35.1% and 48.6%, respectively, less than group 2, mainly over 3 appointments.

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