

# Research Paper: Evaluation of factors affecting the success and failure of endodontic re-treatment in a cross-sectional study



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## ABSTRACT

**Introduction:** Root remediation when the initial treatment fails is the most basic treatment before any other surgical procedure. The aim of this study was to evaluate the factors affecting the success and failure of endodontic treatment in a period of 6-24 months.

**Materials and Methods:** This cross-sectional analytical study was performed during 1996-94 with the participation of 76 patients, 19 (25%) male and 57 (75%) female who were referred for non-surgical re-treatment of endodontics after failure of initial treatment. Took. The re-treatment method was conventional. Radiographic and clinical signs were compared before and after re-treatment. These changes were categorized according to Heald, Healing & (success) and non-healed (Failure). The ability to chew was also recorded after the follow-up period. Wilcoxon signed test, rank regression test (Ordinal regression analysis), Mc Nemar test were used for statistical analysis.

**Results:** The improvement of clinical symptoms was 98.7% (P=0.0001). And (88.2%) patients had full ability to chew after re-treatment of the root. Following rank regression test, canine teeth had a higher chance of recovery than other types of teeth (P<0.000). With age, the chance of recovery decreased (P=0.033). The left teeth were more likely to recover (P=0.008). Goodness of Fit, measured by Pearson chi-square test, confirmed the findings ( $\chi^2=87.667$ , P=0.942). McNemar analysis confirmed the positive effect of therapeutic intervention on patients' success (success) (p<0.001).

**Conclusion:** Following re-treatment and follow-up of dental treatment in this study, re-treatment is still the first non-invasive step in achieving success in achieving tooth preservation.

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## Introduction

Root canal treatment is currently one of the most effective dental interventions. A basic principle in common dental practice is the preservation and restoration of natural teeth. Preserving a tooth with pulpal involvement usually requires endodontic treatment along with permanent crown restoration. Root canal treatment processes play a key role in preserving and repairing teeth affected by pulpal and periapical diseases. (6) The skill of the operator, equipment and materials, the presence of infection when filling the root canal, morphological complexities of the root canal, diagnosis of the disease and the condition of the tissues around the tooth root can affect the treatment and root canal treatment may fail (1-4) More specifically, the inability to kill root canal microorganisms, lack of access to all areas of the root canal system during chemical and mechanical cleaning, or errors during operation such as perforation, lodging, transport, or excessive canal placement are some of the cases. Prone to treatment failure. Also, the presence of root canal infection when filling the root canal and the presence of pre-apical lesions before work significantly reduces the chances of success of endodontic treatment results (5)

Overall, the estimated success of root canal retreatment was calculated to be 91-62% and in a systematic review to be 77% (1). Numerous studies indicate that more than 30% of all filled teeth have been associated with inflammation around the root of the tooth or disease after endodontic treatment. Non-surgical re-treatment is an attempt to restore the health of the tissues around the root after a dysfunctional canal filling or re-infected root canal due to coronal or apical leakage. (, 12,9,6)

The survival rate of re-treated teeth in a 5-year period was reported to be 89% (7), while according to two meta-analysis articles, the success rate of non-surgical re-treatment was 76.6% (13) and 78%, with a range of 62% - 86% have been reported (14) and survival rates of up to 97% have been reported (2).

Due to the importance of maintaining natural teeth, re-rooting treatment in cases that have led

to the failure of endodontic treatment to restore the ideal conditions in terms of clinical and radiographic symptoms as well as the ability to chew plays an important role. The aim of this study was to evaluate the results of non-surgical endodontic re-treatment at 6-24 months after re-treatment.

## Materials and Methods:

This cross-sectional study was performed on 76 patients who referred to the university clinic for non-surgical endodontic re-treatment during 1994-96 and the follow-up of clinical and radiographic results in the period of 6 to 24 months after re-treatment was evaluated. Ethics of Guilan University of Medical Sciences was obtained under the number IR.GUMS.REC.1396.427 and written consent was obtained from patients.

To determine the sample size, the study of Jianing He et al. (7) was used, which was determined to be 41 and for each intervening factor, 5 samples were added to the obtained sample, of which 76 teeth were obtained.

Inclusion criteria included vertical fracture, advanced periodontal disease, irreparable teeth and severe malocclusion. Inclusion criteria included 18-18 years old with good general condition, without any suppressive systemic disease. Immunity has included uncontrolled diabetes, AIDS, etc., as well as the presence of opposite teeth.

Non-surgical endodontic resection was performed in 2 to 3 sessions. After anesthesia and removal of caries and direct access to the canal by removing the previously filled material by Golchai chloroform (Golchai. Iran) and H file (Mani Japan) was done. Determining the appropriate operating length and proper canal preparation with a combination of manual files (Mani Japan) and rotary nickel-titanium Mtwo (VDW Germany) by Crown Down method according to the manufacturer's instructions (crowndown) and rinsing the canal with two milliliters of 5.25 sodium hypochlorite % (CERAMED). Poland) and 1 ml (META) 17% for two minutes after each use of different file sizes. After the above cases, the canal (ablation) was filled by lateral

compaction method by Guta Perka of South Korea META Company and AH 26 Dentsply, Tulsa, OK, and were referred for permanent repair.

Then, all patients with the above conditions who had at least 6 months and a maximum of 24 months after their endodontic treatment were examined and demographic characteristics of patients including name, tooth number, age, sex, periapical status, pain and symptoms. Clinically entered in the relevant form and were referred for a new radiograph. All radiographic signs along with clinical signs were recorded and treatment results were classified into 3 categories according to the following definitions:

1. Healed: Absence of any clinical signs or symptoms, normal periapical tissue with a periodontal ligament space and a healthy lumen of the periodontium or a slight dilation of the periodontal ligament around the material protruding from the end of the root.

2. Healing: Absence of any clinical signs or symptoms, presence of periapical radiolucency that has decreased in size.

3. Non healing: the presence of signs or symptoms and / or the appearance of new periapical radiolucency or enlarged periapical radiolucency with or without change at the root end

In this study, a combination of healed and healing is considered success and non-healing is considered failure.

The results were also evaluated based on patient-centered criteria including oral health related to chewing abilities. Using the chewing ability questionnaire, the answers were scored from 1 to 5 based on the Likert scale and the answers to the questions in the following questionnaire. 5 are considered complete. (7)

First, the data were entered into SPSS 22 software, then in the comparison of recovery after re-treatment and comparison of radiographic symptoms and the presence of clinical symptoms before and after re-treatment of the root and Wilcoxon signed test and in determining the relationship and comparison of variables with Clinical and radiographic signs Chi-square and Cramer's V tests were used. . Radiographic and clinical signs were compared before and after re-treatment. These changes were classified into Healed, Healing & (success) and Non-healed (Failure). The abili-

ty to chew was also recorded after the follow-up period. Wilcoxon signed test, Ordinal regression analysis, Mc Nemar test were analyzed.

## Results:

This study, based on the clinical and radiographic results of 76 patients, 19 (25%) male and 57 (75%) female with a mean age of 43.59 10 10.17 years (64-21 years) during the period 6 to 24 43 patients (56.7%) with clinical symptoms, 55 patients with radiographic symptoms (72.4%) and 41 patients showed both radiographic and clinical symptoms (53.9%). .

The types of teeth that needed re-treatment were 4 molars 32, premolars 27, lateral 9, central and canine, respectively, and 39 teeth from the total of the above teeth with pain, 10 teeth with simultaneous pain and swelling, 4 teeth only swelling and 14 teeth had sinus tract. Out of 76 teeth, 21 were symptomatic periodontitis in terms of normal apical status and 16 cases were asymptomatic periodontitis. The most incomplete endodontic treatment with pain was seen in the molar teeth ( $P = 0.044$ ). Of the total cases of endodontic treatment with pain, 69.2% had symptomatic periodontitis and 30.8% had apical abscess. There was a significant relationship between the cause of endodontic treatment and the apical position of the tooth before endodontic treatment ( $P = 0.0001$ ).

The maxillary teeth were asymptomatic in 43 patients and the mandibular teeth in 33 patients, with 36 cases on the right and 40 in the left. Lesion changes from radiographic ( $P = 0.02$ ) and healed ( $P = 0.023$ ) were observed on the right more than the left (7.5% vs 14.5). All people who had incomplete root canal treatment with pain were seen to have a lesion before endodontic resection. There was a significant relationship between the cause of endodontic treatment and the presence of lesion before endodontic treatment. ( $0.001/0 = P$ )

Changes in clinical signs based on Wilcoxon signed Rank test were significantly reported ( $P = 0.0001$ ). 43.4% had pain and swelling before treatment and 98.7% had no symptoms after treatment.

Percentage of change = (after treatment-before treatment )/(before treatment ) ×100  
(1-43)/|43| ×100=-97.6744% change

Based on the results, we had 97.67% changes in the sample. Of the total people with

symptoms before treatment, 97.67% had no symptoms after treatment and a reduction of 97% was obtained in these stages. Also, a significant difference was seen in comparing the radiographic changes of the lesion before and after re-treatment.

Table 1 - Comparison of radiographic results before and after re-treatment based on the studied variables

	Before		p value	After		P value
	lesion	no		lesion	no	
Age						
<45	27 (%73)	10 (%27)	0.909	9 (24/3)	28 (75/5)	0.895
>45	28 (71/8)	11 (28/2)		10 (25/6)	29 (74/4)	
gender						
Female	15 (26/3)	15 (26/3)	0.657	14 (24/6)	43 (75/4)	0.878
Male	42(73/7)	6 (31/6)		5 (26/3)	14 (73/7)	
Jaw						
Maxilla	19 (44/2)	24 (55/8)	0.072	9 (20/9)	34 (79/1)	0.35
Mandible	8 (24/2)	25(75/8)		10(30/3)	23(69/7)	
side						
right	30(83/3)	6(16/7)	0.05	14(38/9)	22(61/1)	0.008
left	25(62/5)	15(37/5)		5(12/5)	35(87/5)	

Table 2 - Comparison of changes in clinical symptoms before and after treatment

	Before				p value	After				P value
	pain	edema	Pain&ede	None		pain	edeme	Both	none	
age										
<45	12 (32/4)	3 (8/1)	7 (18/9)	15 (40/5)	0.29	1(2/7)	0(0%)	0(0%)	36(97/3)	0.301
>45	17 (43/6)	1(2/6)	(7/7) 3	18(46/2)		0(0%)	0(0%)	0(0%)	39(100%)	
gender										
Female	22 (38/6)	3(5/3)	8(14%)	24 (42/1)	0.97	1(1/8)	0(0%)	0(0%)	56 (98/2)	0.56
Male	7(36/8)	1(5/3)	2(10/5)	9 (47/4)		0(0%)	0(0%)	0(0%)	19(100%)	
Gaw										
Maxilla	14 (32/6)	2 (4/7)	4 (9/3)	23(53/5)	0.22	1(2/3)	0(0%)	0(0%)	42 (97/7)	0.378
Mandible	15 (45/5)	2 (6/1)	6 (18/2)	10(30/3)		0(0%)	0(0%)	0(0%)	33(100%)	
side										
right	18 (50%)	3 (8/3)	4 (11/1)	11 (30/6)	0.08	0(0%)	0(0%)	0(0%)	36(100%)	0.34
left	(5/27) 11	1(2/5)	6(15%)	22(55%)		1(2/5)	0(0%)	0(0%)	39(97/5)	

Of the 54 teeth that had lesions before re-treatment, 14 had shrunk lesions, 13 teeth had no radiographic lesions at all, and 5 teeth remained unchanged (22 teeth had no radiographic lesions).

Of the 76 teeth that needed endodontic treatment, 33 had no clinical signs, but eventually all but one had no clinical signs.

### *Cramers V*

The apical lesion on the right side was more ( $P = 0.046$ ) that during treatment this side changed more and the lesion became smaller. But the healing and no healing dental condition was more on the left. ( $0.23/0 = P$ )

In terms of ability to chew, a score of 1 in 3 cases, a score of 2 in one case, a score of 3 in 3 people, a score of 4 in only two people and a score of 5 in chewing were seen more than other cases (67 people) and no association with jaw and side involved. not found. The only types of molars (27 cases) and premolars (23 cases) showed more correlation with the ability to chew ( $P = 0.0001$ ) in both groups of men and women, a score of 5 was seen more in chewing than other cases and 5 10.10% of men had a chewing score of 4, while none of the women had a score of 4, but there was no significant relationship between gender and chewing ability score ( $P = 0.112$ ). There was a significant relationship between the cause of root canal treatment and lesion changes. Root was seen after re-treatment ( $P = 0.0001$ ). In both groups of men and women, a score of 5 was seen more in chewing than other cases and (88.2%) patients had full ability to chew after root re-treatment.

More than (90%) teeth (men and women) had proper root canal restoration after re-treatment. (98% / 3) Teeth with proper restoration and coronal seal, completely recovered after re-treatment. (6% / 6) of teeth that were in the treatment failure group based on clinical and radiographic evaluations after endoprosthesis; 60% did not have proper coronal restoration and flooding. In the study of the effect of independent variables on the response variable (healed level was

measured as a reference and two other levels were measured relative to this level), the analysis was performed using rank regression test (Ordinal regression analysis was performed. It was found that the variables of age, side involved and tooth type were significantly effective on the recovery of the subjects. People with left-handed conflict were more likely to recover. Canine teeth also had a higher chance of healing than other types of teeth studied ( $P < 0.000$ ). With age, the chance of recovery decreased ( $P = 0.033$ ). The left teeth were more likely to recover ( $P = 0.008$ ). However, the goodness of fit of the model, which was measured by Pearson chi-square test, confirmed the findings. ( $\chi^2 = 87.667$ ,  $P = 0.942$ )

***Independent variables include age, side involved, and tooth type***

### ***a. McNemar Test***

When the result of the two-state test (healed + Healing), the conditions of improvement (success) and non-healed (non-healed), which is the same as failure, after root canal treatment (two-state test and twice repeated) wants to check the appropriate Mc Nemar Test. The table above examines the presence of clinical symptoms before and after the intervention. The results showed that 42%, equivalent to 32 patients, their clinical symptoms remained unchanged. And 58% of the 44 clinical signs of the samples changed. Of the 44 people who had symptom changes, 43 had pain and discomfort before treatment and improved after treatment, and only one person did not have symptoms before the study and developed symptoms after treatment. McNemar analysis confirmed the positive effect of therapeutic intervention on patients' recovery ( $p < 0.001$ ).

Table 3. Regression analysis based on the effect of independent variables on the response variable (Healed level)

Ordinal regression analysis

		Estimate	Std. Error	Wald	df	Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
Threshold	no healing (failure)	-28.163	2.213	161.926	1	.000	-32.501	-23.825
	Healing+healed (success)	-26.413	2.119	155.371	1	.000	-30.567	-22.260
Location	age	-.074	.035	4.563	1	.033	-.142	-.006
	maxilla	-.063	.689	.008	1	.927	-1.414	1.288
	mandible	0a	.	.	0	.	.	.
	Right	-1.938	.730	7.047	1	.008	-3.369	-.507
	Left	0a	.	.	0	.	.	.
	Molar	-20.838	1.081	371.787	1	.000	-22.956	-18.720
	Premolar	-21.077	1.022	425.572	1	.000	-23.079	-19.074
	Lateral	-20.442	.000	.	1	.	-20.442	-20.442
	Central	-1.971	.000	.	1	.	-1.971	-1.971
	Canine	0a	.	.	0	.	.	.
	Male	-.916	.733	1.561	1	.211	-2.352	.521
	Female	0a	.	.	0	.	.	.

Link function: Logit.

a. This parameter is set to zero because it is redundant

Table 4 - Comparison of symptoms before and after treatment based on two-state analysis and twice repeated

		Existence of symptoms after treatment		Total	Siga	
		yes	no			
Existence of symptoms after treatment	Yes	Count	0	43	43	<0.001
		% within Symptoms before treatment	0.0%	100.0%	100.0%	
		% within Symptom after treatment	0.0%	57.3%	56.6%	
	No	Count	1	32	33	
		% within Symptoms before treatment	3.0%	97.0%	100.0%	
		% within Symptom after treatment	100.0%	42.7%	43.4%	
Total	Count	1	75	76		
	% within Symptoms before treatment	1.3%	98.7%	100.0%		
	% within Symptom after treatment	100.0%	100.0%	100.0%		

## Discussion:

Primary root canals have a very high durability. Some teeth that show signs of disease later will need non-surgical re-treatment after initial treatment. There are several challenges during endodontic treatment, including the removal of previous fillers, the correction of work errors made during the initial treatment, the finding of undetected channels, and the eradication of treatment-resistant bacteria. The prognosis of re-treatment is reduced compared to the initial treatment. Evaluating the results of endodontic treatment is very important for case selection and treatment plan. Evaluation of clinical and radiographic results of non-surgical root canal re-treatment in treated patients during the period of 6 to 24 months after re-treatment, including the percentage of changes (Percentage of change) of this study was 97.67%, which showed the effectiveness of the method. . In addition, the findings indicated predictors such as age, side involved and tooth type that were significantly effective in the healing process. People with left-handed conflict were more likely to recover. The most incomplete root canal treatment with pain was seen in molar teeth ( $p = 0.044$ ). Canine teeth also had a higher chance of healing than other teeth ( $p < 0.000$ ). This was while the chance of recovery decreased with age. ( $P = 0.033$ ) In the studies of Yalda Erdem et al., The incidence of pain after re-treatment was significantly higher in women than men. (29) Unlike the present study in In your studies, Firat et al., Age, sex and type of teeth did not have a significant effect on the outcome of re-treatment. (30) In the studies of Salehrabi et al., An increase in treatment failure and subsequent removal of teeth from front to back was observed. Extruded (extracted) teeth Molars with 12.2% had the highest treatment failure rate, followed by premolars with 11.2% and then anterior teeth with 7% had the lowest treatment failure rates. 27) In the studies of Jiang Hee et al., Factors such as age, sex and position of patients' teeth were examined, but no significant differences were observed and unlike the present study, they were not significant. (7)

Regarding the chewing ability score in the recent study, in both men and women, a score of 5 in chewing ability, which was the maximum score, was higher than other cases and (88.2%) patients were able to chew completely after endodontic treatment. Also, there was no significant relationship between the involved jaw and side and the sex of individuals with the ability to chew ( $P = 0.112$ ). In the study of Jiang Hee et al., The ability to chew significantly improved over time, which is similar to the present study. It seems that in the present study, according to the results of clinical and radiographic evaluations, non-surgical re-root therapy has improved the ability to chew and the quality of life. Radiographic changes after re-treatment were consistent with the study of some researchers that 9.6% of patients at the last follow-up with chronic or new lesions were identified as untreated and 71% of patients improved with complete elimination of apical periodontitis and 19% without symptoms and Were improving with radiographic evidence. (7) (5, 27, 28) Post-treatment changes in clinical symptoms (pain and swelling) have been reported in similar studies (5) (30) (7) The condition of the apical tooth before re-treatment was one of the factors influencing the treatment process. Tan Firat Ayubqlu also considered apical periodontitis as an important factor in the success rate of treatment and stated that the size of the apical periodontitis had a great impact on the results of re-treatment. (30) In the present study, a significant relationship was seen between the cause of endodontic treatment and the presence of lesion before endodontic treatment. Practically, the main reason for non-surgical re-treatment of endodontics was the presence of radiographic symptoms and then clinical symptoms. Other reasons for endodontic re-treatment, including future prosthetic treatments or lack of proper coronary seal in teeth without clinical symptoms and Radiography is in the next ranking. So that in all people who had incomplete root canal treatment with pain, the presence of lesion before root canal treatment was seen. In the studies of Friedman et al., 71% of the teeth

had radiographic signs, which are statistically similar to the present study. (1) In the studies of Jelna Nesković et al., Only% of the teeth did not have radiographic signs (radiolucency). (5) Of course, lesion measurement Radiography before and after treatment was one of the cases that most studies have mentioned, but the attention of people involved in this study has been more on variables such as the type of jaw tooth, the side involved and personal characteristics.

## Conclusion:

76 teeth were available for final evaluation. A small number of teeth were identified as non-healing at the end of asymptomatic apical periodontitis (without clinical signs). Many teeth were healed with complete removal of asymptomatic apical periodontitis (without clinical signs) and some were healed with radiographic evidence without clinical signs. The effect of age, involvement and tooth type on recovery after endodontic treatment was significant. The main reason for non-surgical re-treatment of endodontics was first radiographic symptoms and then clinical symptoms and then other reasons such as future prosthetic treatments or lack of proper coronary seal in asymptomatic teeth. Apical changes of teeth were an important factor in the presence of lesion before re-treatment. There were 97% changes in the outcomes of non-surgical endodontic re-treatment.

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