

## Original Article

# Observation on the effect of periodontal treatment on patients with combined periodontal-pulpal lesions

Hongxiang Yan\*, Xuemei Mao\*, Fengchun Hu, Jie Liu, Junrong Wang

Department of Stomatology, People's Hospital of Dongying, Dongying 257091, Shandong, China. \*Equal Contributors.

Received August 25, 2020; Accepted April 25, 2021; Epub October 15, 2021; Published October 30, 2021

**Abstract:** Objective: To evaluate the effect of periodontal treatment on combined periodontal-pulpal lesions. Methods: A total of 327 patients with periodontal-pulpal lesions (360 affected teeth) were selected, and all affected teeth were treated with a complete root canal, and assigned into group A (periodontal treatment group, 180 affected teeth) and group B (non-periodontal treatment group, 180 affected teeth). Group A received periodontal basic treatment for 2 weeks after the completion of root canal treatment; 6 weeks later, if there were still more than 5 mm periodontal pockets and bleeding after detection, flap treatment was performed. Group B received root canal treatment and supragingival scaling. Follow-up was conducted at 3, 6, 12 and 24 months after surgery by observing the periodontal depth (PD), alveolar bone resorption and tooth mobility (TM). Result: In group A, the PDs before operation and 2 years after operation were  $(5.966\pm 1.877)$  mm and  $(5.133\pm 1.935)$  mm, and the PD was significantly decreased. In group B, the PDs before operation and 2 years after operation were  $(5.533\pm 1.856)$  mm and  $(6.167\pm 1.927)$  mm, and the PD was increased. There was no statistical difference in preoperative TM between the two groups ( $P>0.05$ ). Two years after operation, TM in group A was significantly lower than that in group B ( $P<0.05$ ). In terms of X-ray performance, there was no significant change in alveolar bone resorption in group A two years after operation compared with that before operation ( $P>0.05$ ); two years after operation, alveolar bone resorption in group B was significantly reduced compared with that before operation ( $P<0.05$ ). Conclusion: Periodontal treatment is a promising technique for patients with combined periodontal-pulpal lesions.

**Keywords:** Combined periodontal-pulpal lesions, periodontal treatment, root canal treatment

## Introduction

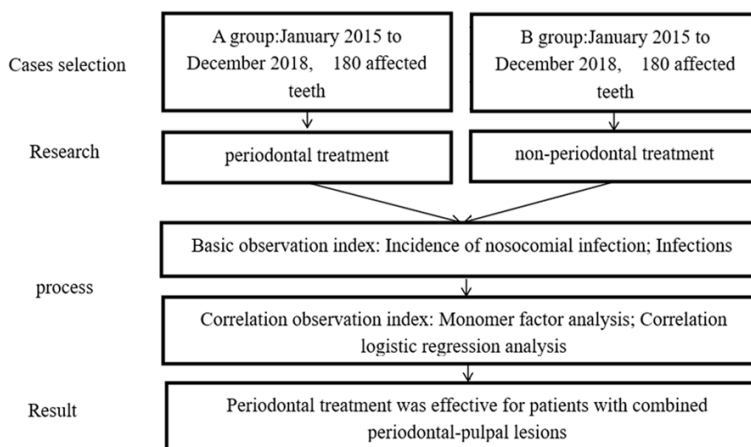
Periodontal-pulp lesions usually occur in the middle and late stages of periodontitis, and there are numerous connections between periodontal tissue and pulp tissue, and mutual infection could arise, and in turn result in combined periodontal-pulpal lesions [1, 2]. In oral clinical work, the treatment of pulp disease alone and direct extraction are the mainstay for combined periodontal-pulpal lesions [3]. Nevertheless, there are several shortcomings such as unsatisfying prognosis, high cost, and poor compliance [4, 5]. In this study, we attempted to compare the effectiveness of periodontal and non-periodontal treatment in terms of periodontal pocket depth, tooth looseness, and alveolar bone resorption, with an aim to provide theoretical basis for clinical treatment options.

## Materials and methods

### Participants

A total of 252 patients admitted from January 2015 to December 2018 to Shanghai Xuhui District Dental Treatment Center (270 affected teeth) and 75 patients with combined periodontal-pulpal lesions admitted to Zhongshan Hospital of Fudan University (90 affected teeth) were enrolled. The 360 affected teeth were assigned into either group A (periodontal treatment group, 180 affected teeth) or group B (non-periodontal treatment group, 180 affected teeth) according to the treatment method the patients received. Inclusion criteria: Periodontal periodontitis caused by periodontal pulp and periapical disease; teeth with retrograde pulpitis; a tooth with periodontal disease and pulp disease; patients who received root canal

## Observation of periodontal treatment



**Figure 1.** Study roadmap of the 2 groups of patients.

**Table 1.** Comparison of PD between 2 groups before and 2 years after treatment

Groups	Before treatment	2 years after treatment
Group A	5.966±1.877	4.133±1.935
Group B	5.533±1.856	6.167±1.927

treatment alone or received both root canal treatment and periodontal treatment and were followed up regularly within 2 years. Exclusion criteria: systemic diseases that affected treatment; those who could not undergo root canal therapy; those who were allergic to nitroimidazole and tetracycline drugs; those who could not conduct follow-up on time; those who took other antibiotics during treatment; pregnant and lactating women. This study obtained approval from the hospital's ethic committee, and all patients provided consent forms.

The study roadmap of the two groups of patients is shown in **Figure 1**.

### Treatment method

Patients in group A were treated with routine pulp opening, root canal preparation, irrigation, sealing, improvement of root canal filling, and periodontal basic treatment. After 6 weeks, flap surgery was performed for the affected teeth with PD  $\geq 5$  mm, lesion area and curettage to expose the smooth root surface, the alveolar bone and gingival flap reduction suture was performed, and finally a periodontal plug was placed. Stitches were removed 10 to 14 days after surgery. Patients in group B were routinely treated with improved root canal filling, and supracaval scaling was performed.

### Outcome measures

A total of 327 patients (360 teeth) were followed up at 3, 6, 12, 24 months after surgery in terms of PD, TM, and X-ray examination of alveolar bone resorption. The follow-up examination was performed by the same physician and the examination data were recorded in detail. The indicators at different time points were compared and analyzed.

A periodontal tester (Perwtest) was used to measure the periodontal value. When measuring,

the measuring handle was required to be in a horizontal position, perpendicular to the crown of the tooth, and the handle head was aligned with the middle 1/3 of the crown. The position of each measurement was identical to avoid errors in the values. The handle head was 0.5-2.5 mm away from the crown surface, and then the switch was pressed, and subsequently the probe in the handle would automatically tap the teeth at a speed of 16 times per minute. If there were more than 4 correct taps, it was accepted by the instrument and analyzed by computer. The periodontal measurement value of the tooth was displayed. For accurate measurement, the measurement was repeated 3 times for each tooth, and the average of these 3 times was taken as the measurement value of the tooth.

### Statistical analysis

SPSS22.0 software package was used for statistical analysis, and the measurement data was expressed with  $\bar{x} \pm s$ , and the t test was used for inter-group comparisons, and  $\chi^2$  test was used to compare the rates.  $P < 0.05$  indicated the difference was statistically significant.

### Results

#### Baseline information

Of the 327 patients, 156 cases were males and 171 cases were females; there were 160 premolars and 200 molars; patients were aged 27 to 70 years, with an average age of  $(43.7 \pm$

## Observation of periodontal treatment

**Table 2.** Paired t test of PD before and 2 years after treatment between 2 groups

Groups	$\bar{x}$	S	SE	95% CI		t	P
				Lower limit	Upper limit		
Group A	1.883	0.940	0.121	1.640	2.126	15.512	<0.05
Group B	-0.633	0.974	126	-0.885	0.382	-5.038	<0.05

**Table 3.** Comparison of tooth mobility before and 2 years after treatment between 2 groups

Groups		No looseness	I	II	III	$\chi^2$	P
Before treatment	Group A	0	18	32	10	0.636	>0.05
	Group B	0	20	33	7		
After treatment	Group A	13	25	18	4	23.72	<0.05
	Group B	3	12	34	11		

5.6) years; with 109 cases that were primary endodontic disease secondary periodontal disease, 131 that were primary periodontal disease with secondary pulp infection, and 120 had pulp combined with periodontal disease. All patients showed obvious symptoms of pulpitis. Most of the patients had hot and cold pain, spontaneous pain, night pain, biting pain or percussion pain, etc., which may be accompanied by periodontal abscess, deep blind pocket, loose teeth and other symptoms. There was no significant difference in clinical data between the two groups ( $P>0.05$ ).

### *Comparison of PD between both groups before and 2 years after treatment*

**Table 1** details the PDs of group A before treatment and 2 years after treatment, which were (5.966±1.877) mm and (5.133±1.935) mm, respectively ( $P<0.05$ ). In group B, the PDs were (5.533±1.856) mm and (6.167±1.927) mm, respectively ( $P<0.05$ ). The paired t test of PD before and 2 years after treatment between the two groups is shown in **Table 2**.

### *Comparison of tooth mobility before and 2 years after treatment between the two groups*

Preoperative TM was similar in the two groups ( $P>0.05$ ). Two years after treatment, TM in group A was significantly lower than in group B ( $P<0.05$ ). Comparison of tooth mobility before and two years after treatment between the two groups was shown in **Table 3**.

### *X-ray examination of alveolar bone absorption before and two years after treatment between the two groups*

X-ray examination showed that alveolar bone absorption at 2 years after operation in group A was not significantly different from that before surgery ( $P>0.05$ ). Alveolar bone absorption at 2 years after operation in group B was significantly reduced compared with that before operation ( $P<0.05$ ). X-ray examination of alveolar bone absorption before and 2 years after treatment

between the two groups was shown in **Table 4**. Periodontal treatment was performed after root canal treatment, bone powder and periosteum were implanted, X-ray examination before treatment (**Figure 2A**) and after treatment (**Figure 2B**) were also performed.

## **Discussion**

Periodontal-pulp lesions are common in clinic, which is one of the causes of tooth extraction in patients. The patients with combined periodontal-pulpal lesions generally have poor oral hygiene and need periodontal treatment [6]. However, some patients refused periodontal treatment after root canal treatment resulting in a reduction in the preservation rate of affected teeth [7-9]. The pathogenesis of periodontal-endodontic disease is more complicated, which is mainly caused by anaerobic infection. This disease can be divided into three types including primary periodontitis secondary dental pulp disease, periodontal disease secondary to primary pulpitis and periodontal-pulpal lesions. Lesions usually occur in the late stages of periodontitis, and how to control anaerobe infection effectively remains a key concern. Positive diagnosis and treatment of periodontal disease is conducive to the healing of pulp disease and periapical lesions [10-13]. Root canal filling for pulp lesions can also help relieve pain, and lay a solid foundation for subsequent periodontal treatment. The 360 affected teeth in this study have undergone complete root canal treatment, and the success rate of root canal treatment was 31%-98%. The possible explana-

## Observation of periodontal treatment

**Table 4.** X-ray examination of alveolar bone absorption before and 2 years after treatment between 2 groups

Groups		1/3 above the root	1/3 in the root	1/3 under the root	$\chi^2$	P
Group A	Before treatment	12	23	25	0.3828	>0.05
	After treatment	14	20	26		
Group B	Before treatment	13	28	19	6.704	<0.05
	After treatment	6	22	32		



**Figure 2.** X-ray examination before and after treatment. Note: (A) X-ray examination before treatment; (B) X-ray examination after treatment.

tion is that there is complexity in the root canal itself, and teeth with periodontal disease may have better curative effect in a short time, but the long-term curative effect is significantly reduced [14-17]. Patients with severe periodontitis were observed and followed up for 4 years, and the success rate of living pulp in the teeth was 53.33%, and the success rate of dead pulp in the teeth was 54.84%. In addition, periodontal pulp combined root canal therapy was performed, and the total effective rate was 97.5%. Of the 360 affected teeth, there was no tooth removed in 2 years, which indicates that root canal therapy is effective. Root canal treatment can relieve clinical pain. The apical area is closed, which can promote the healing of apical tissue, and the looseness of some affected teeth is alleviated to restore some or all chewing functions; however, the repair effect on periodontal tissue is very limited. There was no significant difference in the degree of looseness between the two groups before treatment, whereas two years after treatment, group A exhibited significantly less tooth looseness, as compared to group B. Tooth looseness is caused by periodontal tissue destruction, attachment loss and other causes. After system-

atic periodontal treatment, periodontal inflammation subsides, and the root surface produces new attachments, and the looseness is obviously alleviated. In this study, increased periodontal pocket depth was often associated with alveolar bone resorption, and for the 180 teeth without periodontal treatment, the alveolar bone continued to absorb to different degrees. For the affected teeth with periodontal treatment, the alveolar bone absorption is relatively stable, and there is no significant

difference before and after treatment. Periodontal therapy is effective for combined periodontal-pulpal lesions, although flap turnover cannot significantly increase the height of alveolar bone, but it can favorably control the periodontal lesions [18-20]. In short, periodontal-pulpal lesions are common in clinical practice and for the methods of how to improve the preservation rate of affected teeth, root canal therapy combined with periodontal treatment is particularly important. Additionally, for alveolar bone resorption, guided tissue regeneration (GTR), apical curettage and so on can be further adopted. Unfortunately, despite the long-term follow-up, the retrospective study still results in a certain bias. Further observation on the severity of periodontal and pulp combined lesions were not conducted. More trials are needed to provide a basis for clinical treatment in the future.

Overall, we believe that periodontal treatment is a preferable technique for patients with combined periodontal-pulpal lesions.

### Disclosure of conflict of interest

None.

## Observation of periodontal treatment

**Address correspondence to:** Junrong Wang, Department of Stomatology, People's Hospital of Dongying, Dongying 257091, Shandong, China. Tel: +86-18954603303; E-mail: bihao16910477283@126.com

### References

- [1] Asgary S, Roghanizadeh L and Haeri A. Surgical endodontics vs regenerative periodontal surgery for management of a large periradicular lesion. *Iran Endod J* 2018; 13: 271-276.
- [2] Qiu CH, Yu YC and Xu PC. Treatment of combined periodontal-pulpal lesions with periodontal therapy. *Shanghai Kou Qiang Yi Xue* 2019; 28: 636-639.
- [3] Gopal S, Kumar KP, Shetty KP, Jindal V and Saritha M. Interrelationship of endodontic-periodontal lesions an overview. *Indian J Dent Sci* 2011; 2: 55-59.
- [4] Lu GW, Yan Y and He WC. The value of microimplant anchorage in the treatment of periodontitis at rest and its effect on serum IL-2, IL-6, TNF- $\alpha$  levels in patients. *J Hebei Med Univer* 2019; 40: 1229-1233.
- [5] Cho YD, Lee JE, Chung Y, Lee WC, Seol YJ, Lee YM, Rhyu IC and Ku Y. Collaborative management of combined periodontal-endodontic lesions with a palatogingival groove: a case series. *J Endod* 2017; 43: 332-337.
- [6] Tsuchida S, Satoh M, Takiwaki M and Nomura F. Ubiquitination in periodontal disease: a review. *Int J Mol Sci* 2017; 18: 1476.
- [7] Okada T, Ikebe K, Inomata C, Takeshita H, Uota M, Mihara Y, Matsuda K, Kitamura M, Murakami S, Gondo Y, Kamide K, Masui Y, Takahashi R, Arai Y and Maeda Y. Association of periodontal status with occlusal force and food acceptability in 70-year-old adults: from SONIC Study. *J Oral Rehabil* 2014; 41: 912-919.
- [8] Kim E, Song JS, Jung IY, Lee SJ and Kim S. Prospective clinical study evaluating endodontic microsurgery outcomes for cases with lesions of endodontic origin compared with cases with lesions of combined periodontal-endodontic origin. *J Endod* 2008; 34: 546-551.
- [9] Utneja S, Nawal RR, Talwar S and Verma M. Current perspectives of bio-ceramic technology in endodontics: calcium enriched mixture cement-review of its composition, properties and applications. *Restor Dent Endod* 2015; 40: 1-13.
- [10] Liu ZY, Zhang JD, Zhang L, Yang J and Liu XH. Analysis of minocycline hydrochloride combined with Vitapex in treating senile chronic periodontal-endodontic combined lesions. *Shanghai Kou Qiang Yi Xue* 2016; 25: 465-468.
- [11] Boehm TK. Case report on managing incomplete bone formation after bilateral sinus augmentation using a palatal approach and a dilating balloon technique. *Int J Implant Dent* 2017; 3: 3.
- [12] John V, Warner NA and Blanchard SB. Periodontal-endodontic interdisciplinary treatment—a case report. *Compend Contin Educ Dent* 2004; 25: 601-602.
- [13] Walter C, Krastl G and Weiger R. Step-wise treatment of two periodontal-endodontic lesions in a heavy smoker. *Int Endod J* 2008; 41: 1015-1023.
- [14] Li Y, Xu L, Zhou YH, Ouyang XY and Cao T. Combination of periodontal, orthodontic and endodontic therapy in upper anterior teeth with hopeless prognosis and long-time follow-up: a case report. *Beijing Da Xue Xue Bao Yi Xue Ban* 2017; 49: 740-744.
- [15] Jin Y, Chen B, Ni YH and Yan FH. Time lapse between endodontic and periodontal treatments of combined periodontal-endodontic lesion: a systematic review. *Hua Xi Kou Qiang Yi Xue Za Zhi* 2018; 36: 167-173.
- [16] Zhou K, Ji PH, Yu LY, Chen Q and Xu QL. Detection of anaerobes and drug sensitivity from the periodontal pockets of patients with combined periodontal-endodontic lesions. *Shanghai Kou Qiang Yi Xue* 2013; 22: 72-76.
- [17] Li H, Guan R, Sun J and Hou B. Bacteria community study of combined periodontal-endodontic lesions using denaturing gradient gel electrophoresis and sequencing analysis. *J Periodontol* 2014; 85: 1442-1449.
- [18] Xia M and Qi Q. Bacterial analysis of combined periodontal-endodontic lesions by polymerase chain reaction-denaturing gradient gel electrophoresis. *J Oral Sci* 2013; 55: 287-291.
- [19] Li Y, Wang X, Xu J, Zhou X and Xie K. The clinical study on the use of diode laser irradiation in the treatment of periodontal-endodontic combined lesions. *Hua Xi Kou Qiang Yi Xue Za Zhi* 2012; 30: 161-4.
- [20] Zhang F, Zhang YW, Jiang XQ, Chen HT and Sun L. Endodontic-periodontal combined therapy for type III dens invaginatus in maxillary lateral incisor: a case report. *Hua Xi Kou Qiang Yi Xue Za Zhi* 2019; 37: 453-456.