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Effect of Laser Combined with Periodontal Flap Surgery on Severe Periodontitis

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Abstract: **Objective:** To explore the clinical effect of laser combined periodontal flap surgery in patients with severe periodontitis. **Methods:** Eighty patients with severe periodontitis from March 2023 to March 2024 were selected as study samples and randomly divided into two groups. The control group (a total of 40 patients) received only traditional periodontal flap surgery as a treatment option. In contrast, the observation group (which also included 40 patients) combined Er: YAG laser technology with periodontal flap surgery during treatment. The periodontal health of the two groups was compared before treatment and 3 months after treatment. Compare pain and sleep patterns; The treatment efficiency of the two groups was compared. **Results:** After treatment, the indexes of PD, PLI, GI, SBI, VAS score and PSQI score of 2 groups were lower than before treatment, and the decrease rate of observation group was higher than control group ($P < 0.05$). The effective rate of observation group was significantly higher than that of control group ($P < 0.05$). **Conclusion:** Laser combined periodontal flap surgery has significant clinical effect on patients with severe periodontitis, which can improve the periodontal condition and sleep status, and reduce the postoperative pain of patients.

Keywords: Laser therapy; Periodontal flap surgery; Severe periodontitis

Periodontitis is a common dental disease, which is characterized by the gradual destruction and loss of supporting structure of periodontal tissue under the long-term stimulation of periodontal pathogens and the dual effects of inflammation and immune response of the body, and it is difficult to repair and rebuild itself [1]. Patients with severe periodontitis often show that the alveolar bone resorption degree of two or more teeth is more than half of the root length, and PD&gt in clinical examination; 6 mm, AL≥5 mm. In the clinical manifestations, the teeth are often loose, the attachment loss of periodontal tissue is more, and the alveolar bone is less, which can lead to tooth loss and occlusal dysfunction. Studies have confirmed that periodontal flap surgery has shown remarkable effects in the treatment of severe periodontitis, so it has the practical value of widespread promotion and application in clinical medicine [2]. However, it should be pointed out that relying on this treatment alone cannot completely and effectively remove plaque, and there are certain limitations. Laser irradiation can reduce the permeability of blood vessels, thereby reducing periodontal inflammation and hyperemia and edema, and promote angiogenesis and stimulate tissue regeneration. Therefore, this study combined the two methods in the treatment of patients with severe periodontitis to determine the therapeutic effect and provide a basis for the clinical treatment of patients with severe periodontitis.

1. Data and analysis

1.1 General Information

Eighty patients with severe periodontitis in our hospital from March 2023 to March 2024 were randomly divided into two groups. The control group (40 cases) included 25 males and 15 females, with an average age of (29.14±5.37) years. Observation group (40 cases) included 18 males and 22 females, with an average age of (28.34±5.18) years. There was no statistical difference in the general information of patients in the groups ($P < 0.05$).

1.2 Inclusion and exclusion criteria

Inclusion criteria: (1) patients meeting the diagnostic criteria for severe periodontitis; (2) Have not undergone periodontal surgery. (3) The number of remaining teeth in the mouth is not less than 20.

Exclusion criteria: (1) patients with a history of smoking and drinking; (2) Patients with severe hypertension, uncontrolled diabetes and acute hepatitis; (3) lactating female patients; (4) Patients with mental illness or cognitive impairment who cannot communicate normally; (5) Two or more senior dentists judged that they could not participate in this experiment.

1.3 Research method

The control group was treated with simple periodontal flap surgery. During the operation, the oral cavity was routinely disinfected in strict accordance with the disinfection standards, and local infiltration anesthesia was taken to alleviate the pain of the patients. An internal oblique incision was made to remove the epithelial and granulation tissue from the inner wall of the pouch. To ensure a clean and healthy mouth, the dental calculus and diseased tissue under the gingiva are thoroughly removed with a curettage. After removing the diseased tissue, the wound is rinsed with saline to remove the residue. Discontinuous suture technique is used to suture tissue flap to promote wound healing. Then, apply an appropriate amount of minocycline hydrochloride ointment inside the bag to ensure an even distribution of the drug. Next, a multifunctional wound dressing is gently applied to the wound to provide comprehensive protection.

Observation group received Er: YAG laser therapy on the basis of periodontal flap surgery. The sterilized optical fiber enters the periodontal pocket at an Angle of 5° and closely fits the wall of the pocket. Move in a "Z" shape towards the crown root, 80 mJ energy, 20 Hz frequency, continuous irradiation for about 20 seconds. The optical fiber and the tooth surface are at an Angle of 30°, and the calculus and granulation tissue are completely cleaned. After normal saline irrigation, the same as the control group.

1.4 Observation index and evaluation criteria

(1) The periodontal health of the two groups before and 3 months after operation was observed. PD, PLI, GI and SBI were evaluated, with SBI scoring ranging from 0 to 5, PLI scoring ranging from 0 to 3, and GI scoring ranging from 0 to 3. The lower the average of these scores, the better the oral health. PD was detected by periodontal probe.

(2) The pain and sleep quality of the two groups were observed before and 24 hours after surgery. The total score of PSQI was 0~ 21 points, 0~5 was good sleep quality, 6~10 was good sleep quality, 11~15 was average sleep quality, 16 ~ 21 was poor sleep quality. The total VAS score was 10 points, and the score was proportional to the degree of pain.

(3) After 3 months, the treatment efficiency of the two groups was observed. Obvious effect: The periodontal inflammation of the patient has been effectively controlled, and the periodontal indicators have returned to normal level, showing a significant therapeutic effect. Effective: The patient's periodontal inflammation has been improved to a certain extent, and the periodontal indicators have also been significantly improved, but it has not completely returned to normal. Ineffective: After treatment, periodontal inflammation and related indicators did not improve significantly, and even worsened.

1.5 Statistical analysis

SPSS 26.0 software was used for data processing, the measurement data were presented using ($\bar{x} \pm s$), and the comparative analysis between different groups was conducted by t test. The counting data is expressed as a percentage (%). In this study, if $P < 0.05$, the difference was considered statistically significant.

2. Result

2.1 Periodontal health of patients in both groups before and 3 months after surgery

The indexes of PD, PLI, GI and SBI in the observation group were lower than those in the control group 3 months after surgery ($P < 0.05$).

Table 1 Comparison of PD, PLI, GI and SBI indexes between the two groups ($\bar{x} \pm s$)

group	Number of cases	GI		SBI		PLI		PD	
		pre-operation	postoperation	pre-operation	postoperation	pre-operation	postoperation	pre-operation	postoperation
Control group	40	2.26±0.04	1.47±0.62	2.44±0.21	1.85±0.36	4.68±0.57	2.13±0.17	6.54 ± 0.23	2.27 ± 0.17
Observation group	40	2.47±0.82	0.73±0.51	2.19±0.91	0.82±0.54	4.67±0.41	1.02±0.03	6.58 ± 0.56	3.03 ± 0.55
T-value		6.372	1.541	3.657	6.381	10.277	5.357	2.483	2.164
p-value		0.001	0.009	0.002	0.028	0.001	0.048	0.037	0.011

2.2 Pain and sleep quality in both groups

VAS scores and PSQI scores of observation group were lower than those of control group 24h after operation ($P < 0.05$).

Table 2 VAS scores and PSQI scores of patients before and 24 hours after surgery ($\bar{x} \pm s$)

group	Number of cases	VAS		PSQI	
		pre-operation	postoperation	pre-operation	postoperation
Control group	40	4.21±0.72	3.07±0.18	9.43±1.31	7.25±1.06
Observation group	40	4.57±0.88	2.15±0.41	2.19±0.91	6.35±1.28
T-value		5.257	3.571	3.657	5.331
p-value		0.021	0.029	0.032	0.008

2.3 The treatment was effective in both groups

The effective rate of observation group was significantly higher than that of control group ($P < 0.05$).

Table 3 Comparison of treatment effectiveness between the two groups [n, %]

group	Number of cases	remarkable	effective	In vain	Therapeutic effectiveness
Control group	40	13(32.50%)	20(50.00%)	7(17.50%)	33(82.50%)
Observation group	40	23(57.50%)	13(32.50%)	4(10.00%)	36(90.00%)
T-value					10.014
p-value					0.021

3. Discuss

Severe periodontitis has great harm to patients and requires active search for effective treatment. In this study, the results showed that Er: YAG laser combined with periodontal flap surgery had improved PD, PLI, GI and SBI indexes 3 months after surgery ($P < 0.05$). This indicates that the combination of the two treatments can improve patients' periodontal health, improve patients' oral hygiene and dental health, and reduce gum inflammation. After treatment, the periodontal health status of the patients has been significantly optimized, which fully demonstrates the effectiveness of the treatment method adopted. Therefore, the results of this study clearly show that the treatment response rate of patients in the observation group is as high as 90%. This result further confirmed the reliability and superiority of this treatment method. At the same time, the results showed that the pain and sleep quality of patients in the observation group were significantly better than those in the control group ($P < 0.05$). Toothache caused by periodontitis is closely related to inflammatory response. With the decrease of SBI index, the degree of pain will also decrease correspondingly, and the sleep quality of patients will improve [3].

In summary, Er: YAG laser combined with periodontal flap surgery has significant therapeutic effect in clinic and can be promoted.

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