

Original Article

Influence of periodontal repair on the quality of prosthodontics and postoperative adverse events

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Abstract: Objective: To investigate the influence of periodontal repair on the oral cavity and postoperative adverse events. Methods: From June 2017 to June 2019, 96 patients with prosthodontics were selected as the research participants. According to the intervention scheme, the patients were grouped into the observation group (OG, 51 cases with periodontal repair combined with prosthodontics) and the control group (CG, 45 cases with prosthodontics). The curative effect, repair quality, masticatory function, language function, adverse reactions, quality of life (QOL) and treatment satisfaction of the two groups were evaluated and compared. Results: The curative effect, repair quality, recovery of masticatory function and language function of patients in the OG were significantly better than those in the CG ($P < 0.05$), and the incidence of adverse reactions in the OG was significantly lower than that in the CG ($P < 0.05$). Conclusion: Prosthodontics before periodontal repair can effectively improve the curative effect of prosthodontics, reduce the incidence of adverse reactions, improve patients' QOL, and improve patients' satisfaction, so it is worth popularizing in clinic.

Keywords: Periodontal repair, prosthodontics, repair quality, postoperative adverse events

Introduction

Prosthodontics uses artificial restoration to help repair tooth defects and corresponding physiological functions, which can help patients restore masticatory and digestive functions and with beneficial cosmetic effects [1, 2]. In recent years, with the increasing attention to oral health, people continue to have prosthodontics after dentition defects, dentition loss and other symptoms caused by trauma or oral diseases' [3, 4].

However, with the continuous exploration of prosthodontics, we find that patients often suffer from pain, redness, and even have adverse events such as loose and damaged prostheses, thus affecting the postoperative recovery of patients [5]. In addition, some periodontal diseases have a certain influence on the aesthetic feeling of the patients, such as the inconsistency of gingival margin caused by individual tooth dislocation [6]. With the improvement of people's requirements for oral aesthetics, there is a need for other programs to

make up for the lack of prosthodontics' [7, 8]. Periodontal repair can effectively improve the condition of patients' gums. In addition, it can repair gums and alveolar ridges, promote the aesthetics of gums, and enhance the fixation effect of prosthesis. At the same time, it has the characteristics of having less pain, less trauma and less bleeding [9]. In the past, some studies [10] have pointed out that if periodontal repair is performed before prosthodontics, it can improve the aesthetics and coordination of the periodontal area.

Therefore, we analyzed the influence and safety of periodontal repair on patients undergoing prosthodontics, thus providing more effective treatment for patients undergoing prosthodontics.

Materials and methods

Clinical data

From June 2017 to June 2019, 96 patients with prosthodontics in the Department of Stoma-

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tology of Zhuji People's Hospital of Zhejiang Province were selected as the research participants, including 50 males and 46 females. According to the intervention scheme, the patients were grouped into the observation group (OG, 51 cases with periodontal repair combined with prosthodontics) and the control group (CG, 45 cases with prosthodontics). Inclusion criteria: (1) the research met the diagnostic criteria of prosthodontics after X-ray examination; (2) informed consent was obtained from patients; (3) patients had complete clinical data and good compliance. Exclusion criteria: (1) patients with severe malignancies; (2) women during lactation and pregnancy; (3) patients with tooth extraction history; (4) patients with language and cognitive disorders, mental illness; (5) patients had received related oral treatment before intervention. This study conformed to the Ethics Committee and the Declaration of Helsinki.

Treatment method

Patients in the CG were given routine dental repair: routine physical examination (routine blood work, coagulation function) and oral examination (X-ray and bite force test were conducted), and a reasonable treatment plan was performed according to the patient's medical history. Preoperative preparations for tooth washing, tooth extraction, filling and other operations were made, the parodontium of the remaining teeth was adjusted. After that, a plaster model was used to make the prosthesis, and then it was tried and adjusted for bonding. The OG was given periodontal repair before prosthodontics, and the alveolar ridge and gums were repaired before intervention. Firstly, routine disinfection and anesthesia were carried out, and the shape and size of gums to be removed were marked with probes and staining agents. A high frequency electro-tome was used for resection. A turbo drill was applied to repair the patients' gingival cervical margin and alveolar ridge, which was a temporary crown. The flap was cut and the alveolar ridge was cleaned with a turbine drill. There was a gap about 3 mm between the porcelain fused to metal and the alveolar ridge. The tooth calcaneous was leveled, and the fibers on parodontium were scraped off. Then, the teeth were washed, reset and sutured, and periodontal dressing was applied as wound protection agent. After the operation, gargle

was performed three times a day, and stitches were removed one week later. Four weeks later, the recovery of gingival cervical margin was observed. If it was in good condition, crown repair was performed, and the gingival cervical margin was properly repaired. If the patient's alveolar ridge was seriously damaged, it was transplanted with autogenous bone material or artificial bone material and filled with artificial bone powder.

Outcome measures

(1) The therapeutic effects of two groups of patients were evaluated. The esthetic and comfort degree of the restored teeth, the parallelism of the root, the arrangement of teeth and the coverage, the first molar in Angle I, the recurrence during the wearing of the retainer, the masticatory function and language function were investigated. If all the above indexes were satisfied, it was judged as cured, 5 satisfactory items were deemed as markedly effective, 4 items as effective, and less than 4 items as ineffective. The total effective rate = cure + markedly effective + effective. (2) Quality score: The appearance and function were taken as evaluation criteria, with the application of the appearance self-scale and function self-scale developed by our hospital, the full score of both criteria was 50 points, and a higher score indicates better appearance and function. (3) Masticatory efficiency: The masticatory efficiency of patients before and after treatment for one month was measured by absorption spectrophotometry. All patients were told to sit still in an upright position, and 2 g peanuts were taken into the mouth, and chewed for 30 s at the designated tooth position without swallowing. After gargling for many times, all chewing residue was collected into a measuring cylinder, added with distilled water, diluted to 1000 ml, stirred for 1 min, and let sit for 2 min. Then, 1/3 of 5 mL suspension was placed in cuvette immediately. The photometer was placed to compare the color and calculate the masticatory efficiency. Each detection was calculated three times and the average value was taken. Masticatory efficiency = [(total amount - surplus)/total amount] × 100%. (4) Language function: Before treatment and 1 month after treatment, the writing ability, written language comprehension ability, oral expression ability, understanding ability and speech communication ability were evaluated.

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Table 1. General data

Factor	OG (n=51)	CG (n=45)	t/X ²	P
Gender			0.053	0.818
Male	26 (50.98)	24 (53.33)		
Female	25 (49.02)	21 (46.67)		
Age (years)			0.004	0.949
≤35	23 (45.10)	20 (44.44)		
>35	28 (54.90)	25 (55.56)		
BMI (kg/m ²)			0.032	0.858
≤23	24 (47.06)	22 (48.89)		
>23	27 (52.94)	23 (51.11)		
Disease type			0.016	0.992
Tooth dislocation	25 (49.02)	22 (48.89)		
Alveolar ridge defect	15 (29.42)	14 (31.11)		
Incoordination of gingival cervical margin	11 (21.57)	9 (20.00)		
Educational level			0.023	0.879
Below high school	12 (23.53)	10 (22.22)		
High school and above	39 (76.47)	35 (77.78)		
Brush teeth every day			0.014	0.906
Yes	38 (74.51)	34 (75.56)		
No	13 (25.49)	11 (24.44)		

Table 2. Clinical efficacy [n, (%)]

Curative effect	OG n=51	CG n=45	X ²	P
Cure	31 (60.78)	20 (44.44)	-	-
Markedly effective	10 (19.61)	8 (17.78)		
Effective	9 (17.65)	7 (15.56)	-	-
Ineffective	1 (1.96)	10 (22.22)	-	-
Total effective	50 (98.04)	35 (77.78)	9.673	0.002

measurement data were represented as mean ± SD. The comparison between the two groups was performed using Student t test. Paired T test was applied for before and after intervention, and LSD/t test for back testing. P<0.05 means statistical significance.

Results

Clinical data

There was no evident difference in gender, age and BMI between the two groups (P>0.05) (**Table 1**).

Curative effects

The effective rates of the two groups were tested. The results indicated that the number of cured, markedly effective, effective and ineffective patients in the OG was 31, 10, 9 and 1, respectively, while the number in the CG was 20, 8, 7 and 10, respectively. The total effective rate in the OG (98.04%) was significantly higher than that in the CG (77.78%) (P<0.05) (**Table 2**).

Repair quality

After treatment, the appearance and function scores of the patients in the observation group

The total score is 20 points, and a higher score indicates better language function. (5) Incidence of adverse reactions: The incidence of gingival atrophy, root resorption, food impaction and periodontal discomfort within 2 months after restoration were counted. (6) Quality of life (QOL): QOL scale (SF-36) [11] was used before and after intervention, with a total score of 100 points. A higher score indicates higher QOL. (7) Satisfaction: The treatment satisfaction of patients was evaluated by a self-made survey scale in our hospital, which was grouped into very satisfied, satisfied and dissatisfied (total satisfaction = very satisfied + satisfied).

Statistical method

SPSS 20.0 was applied for statistical analysis, and GraphPad 7 was used to illustrate the figures. Counting data were represented by percentage, analyzed by Chi-square test, and

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Table 3. Repair quality

Project	OG n=51	CG n=45	t	P
Appearance score	39.54±2.61	28.53±2.01	22.92	<0.001
Functional score	37.22±3.15	28.31±2.59	15.02	<0.001

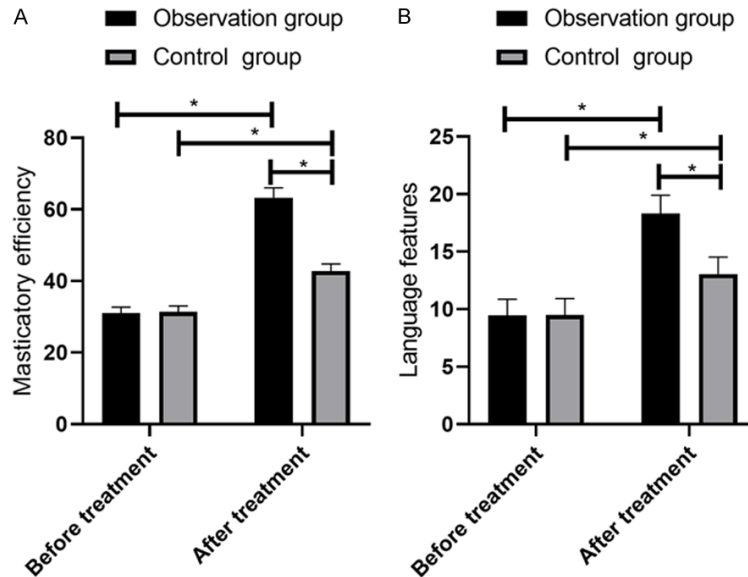


Figure 1. Comparison of masticatory efficiency and language function between two groups before and after treatment. A: Comparison of masticatory efficiency; B: Comparison of language functions. * indicates $P<0.05$.

Table 4. Adverse reaction rate [n, (%)]

Adverse reaction	OG (n=51)	CG (n=45)	χ^2	P
Gingival atrophy	0	4 (8.89)	-	-
Root resorption	1 (1.96)	2 (4.44)	-	-
Food impaction	1 (1.96)	2 (4.44)	-	-
Periodontal discomfort	1 (1.96)	3 (6.67)	-	-
Incidence of adverse reactions	3 (5.88)	11 (24.44)	6.613	0.010

Table 5. Quality of life

Project	OG n=51	CG n=45	t	P
Before treatment	51.86±2.05	51.59±2.01	1.407	0.164
1 month after treatment	72.34±3.14	59.31±2.64	17.18	<0.001

were 39.54±2.61 and 37.22±3.15 respectively, which were significantly higher than those in the control group (28.53±2.01 and 28.31±2.59) ($P<0.05$) (Table 3).

Masticatory efficiency and language function

Before treatment, there was no significant difference in masticatory efficiency and language

function between the two groups ($P>0.05$). After one month of treatment, the masticatory efficiency and language function of the OG were higher than those of the CG ($P<0.05$) (Figure 1).

Adverse reactions

The numbers of gingival atrophy, root resorption, food impaction and periodontal discomfort in the OG were 0, 1, 1 and 1, respectively, and the incidence of adverse reactions was 6.45%. Those in the CG were 4, 2, 2 and 3, respectively, and the incidence of adverse reactions was 5.36%. The incidence of adverse reactions in the two groups were both low ($P>0.05$) (Table 4).

Quality of life

There was no evident difference in QOL before treatment ($P>0.05$), but the SF-36 score of the OG was significantly higher than that of the CG one month after treatment ($P<0.05$) (Table 5).

Treatment satisfaction

We evaluated the satisfaction of the two groups of patients with an intervention plan. The results revealed that the numbers of patients in the OG who were very satisfied, satisfied and dissatisfied with the treatment plan were 39, 11 and 1, respectively, with a

treatment satisfaction of 98.39%. Those in the CG were 24, 8 and 13, respectively, with a treatment satisfaction of 76.79% ($P<0.05$) (Table 6).

Discussion

Recently, with the rapid development of the social economy and the improvement of mate-

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Table 6. Treatment satisfaction [n, (%)]

Adverse reaction	OG (n=51)	CG (n=45)	X ²	P
Very satisfied	39 (76.48)	24 (53.33)	-	-
Satisfied	11 (21.57)	8 (17.78)	-	-
Dissatisfied	1 (1.96)	13 (28.89)	-	-
Treatment satisfaction	50 (98.04)	32 (71.11)	3.730	<0.001

rial living standards, people pay more attention to the health and beauty of their teeth [12]. Some patients with dental defects caused by oral diseases have higher requirements for oral restoration. At present, clinical prosthodontics includes aesthetic restoration, functional restoration and treatment recovery. Aesthetic restoration refers to aesthetic restoration for abnormal color adjustment according to bad crown, tooth deformation and excessive interdental space, while functional restoration can repair dentition defects and dentition loss and improve patients' QOL [13, 14]. However, the conventional restoration does not take the cause into consideration, which easily leads to the rapid development of periodontal diseases after operation and the complications and failure of restoration [15]. Therefore, some studies [16] suggest that periodontal repair before prosthodontics can improve the repair quality.

In this research, the repair effects of patients who had undergone periodontal repair before prosthodontics were compared with those who had not. The results revealed that the total effective and repair quality of the OG patients were significantly higher than those of the CG. This suggested that periodontal repair before prosthodontics can effectively improve the efficiency and quality of repair. Previous studies [17, 18] have pointed out that taking corresponding periodontal repair before dental restoration can effectively repair periodontal soft and hard tissues, and provide guarantee for the success of later oral restoration, and it can not only improve the success rate, but also be helpful for the overall aesthetics of the oral cavity, ensuring the coordination of the whole oral cavity. Other studies [19] have pointed out that periodontal repair before prosthodontics can improve the function and beauty of patients' teeth to the greatest extent. This is consistent with our observation. Then, we compared the periodontal functions of the two patients after restoration, including masticatory efficiency and language function. The results

revealed that the masticatory efficiency and language function of the OG were significantly better than those of the CG. At present, some diseases that need prosthodontics, such as in dentition defects, periodontal disease will affect the chewing and language function of patients,

so prosthodontics also need to restore the periodontal function of patients' [20]. Our results suggested that periodontal repair can not only improve the curative effect of dental restoration, but also promote the recovery of patients' oral function. At present, periodontal repair often uses the combination of electric frequency electric knife and scalpel, which has good healing, accurate surgical site and less pain for patients, and is conducive to establishing a normal biological width after surgery, thus providing better conditions for subsequent oral repair and promoting the improvement of repair quality [21].

After confirming the role of periodontal repair in improving the curative effect of oral restoration, we also tested the incidence of adverse reactions and complications in the treatment safety and prognosis, and found that periodontal repair can better improve the QOL of patients and improve the treatment satisfaction. In the process of periodontal repair, we kept the distance between the height of the alveolar ridge and the edge of the restored crown at 3.0 mm. This biological width can keep continuity between the restored gingival margin and other gingival margins, and can also maintain the overall coordination of the oral cavity, inhibit the occurrence of oral inflammation, and reduce adverse reactions such as gingival atrophy caused by bone absorption [22]. Moreover, the restoration also provided a good oral environment for patients, which is conducive to the improvement of patients' QOL. The improvement of curative effect and the improvement of QOL have promoted the improvement of patients' satisfaction with treatment.

To sum up, periodontal repair before prosthodontics can effectively improve the curative effect of oral restoration, reduce the incidence of adverse reactions, improve patients' QOL, and improve patients' satisfaction, which is worthy of clinical promotion. However, there

are some limitations in this study. On the one hand, because the number of cases we included is relatively small, the conclusion of this study needs to be further confirmed. On the other hand, we need to conduct more repair schemes to make the conclusions of the study more comprehensive. However, in the follow-up study, we will have a more in-depth discussion on the above issues.

Disclosure of conflict of interest

None.

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