Study on the effect of plasma matrix in the restoration of dental implant peripheral bone defects and its effect on aesthetics and masticatory efficiency

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Introduction. To investigate the effect of plasma matrix in dental implant and its effect on aesthetics and masticatory efficiency.

Methods. 92 patients with dental implant implants from May 2021 to December 2023 were selected, and 46 patients were divided into two groups. The control group used conventional dental implant defect repair, and the observation group used plasma matrix to repair the dental implant. After 4 weeks of treatment, the two groups evaluated the effect of patients, comparing the aesthetics, masticatory efficiency, bone tissue index and implant stability between the two groups.

Results. The observation group had mucosal color, defect appearance, defect morphology scores in the intervention group than the control group (P <0.05); the observation group had effects on chewing, type of food with denture, stability of denture, willingness to improve food and improve the digestive function of the control group (P <0.05); the observation group (P <0.05); plate width and implant stability values were higher than the control group (P <0.05).

Conclusion. Plasma matrix can help to improve the patient's appearance and chewing efficiency, improve the level of bone tissue, and improve the stability of the implant, which is worthy of promotion and application.

Keywords. Plasma matrix; dental restoration; implant; bone defects; aesthetic; masticatory efficiency; bone tissue index; implant stability; adverse reactions

INTRODUCTION

Oral implant technology is widely used in clinical practice, which can be divided into two parts: lower support and upper support implant. After implantation, the substructure in the bone tissue is used as the basis to realize the repair and fixation of the repair [1]. Previous studies have shown that [2], oral implant technology uses implants made of artificial materials, surgically implanted into the tissue, and the corresponding device is connected to support the upper dental restoration. From the above results, we can see that although oral implant technology can meet the needs of clinical treatment, the incidence of bone defects around dental implants is relatively high, which not only affects the appearance of patients, but also affects the masticatory efficiency. Therefore, searching for bone defect repair materials with good osteogenesis, inducible and biocompatibility has become a research hotspot [3]. Plasma matrix belongs to the natural regeneration scaffold of human body, containing a large number of cellular components, fibrin and cytokines, its biocompatibility is good, widely used in facial beauty, hard and soft tissue regeneration and other fields [4]. Meanwhile, it plays an important role in oral and maxillofacial bone tissue regeneration, periodontal soft tissue wound healing and dental pulp regeneration [5]. This study mainly on the effect of plasma matrix in repairing periimplant bone defects, reported below.

1. DATA AND METHODS

1.1 General information

92 patients from May 2021 to December 2023 were selected, and the envelope method was divided into two groups. The control group, 46 patients, Of the 29 men, Of the 17 women, Age (27-71) years, Mean (51.59 ± 5.23) years; Body mass index (BMI)(18.5-29.1) kg/m2, Mean (22.41 ± 3.25) kg/m2; Education level: 13 cases in primary school, 20 cases, 13 cases of senior high school and above; Affected tooth site: 31 cases in the anterior tooth areas, 15 cases in the molar region; 46 patients, Of

the 31 men, Of the 15 women, Age (25-73) years, Mean (51.62 ± 5.27) years; BMI(18.2-29.4)kg/m2, Mean (22.47 ± 3.31) kg/m2; Educational level: 11 cases in primary school, In 21 cases in junior high school, 14 cases of high school and above; Affected tooth site: 28 cases in the anterior tooth areas, And 18 cases in the molar region. There was no statistical difference between the two groups of general data (P> 0.05).

1.2 Inclusion and exclusion criteria

Inclusion criteria: (1) cases of bone defects around dental implants [6]; (2) patients with complete pathological examination results and first visit; (3) no plasma matrix or conventional treatment contraindications; exclusion criteria: (1) mental abnormalities, difficult to actively coordinate clinical treatment and effect evaluation; (2) patients with cognitive dysfunction, autoimmune system diseases and malignant tumors; (3) mucosal and jaw lesions and other systemic diseases.

1.3 Methods

Control group: intervention with conventional periimplant defect repair method. The repair was completed under local anesthesia. After the anesthesia took effect, all mouths were made at the alveolar crest and lip, the incision slightly exceeded 2-3mm above the defect margin, and the implant [7] was implanted.

Observation group: Use the plasma matrix to repair the bone defect around the dental implant.(1) Planting materials. The implant was Frialit2; Bio-oss bone powder, Bil-Gide biofilm; (2) preparation of plasma matrix. For patients with peripheral bone defects, 10 mL of venous blood was used. After two centrifugation, the upper material was aspirated from the plasma container, and the remaining plasma matrix; (3) repair method. The patient underwent conventional dental implants and received plasma matrix repair to the surrounding defect site (plasma matrix membrane made from the membrane press). Bio-oss bone powder was mixed with plasma matrix, choose 1:1 and stand aside. During the operation, the two groups strictly followed the aseptic operation and cleaned the surgical equipment to avoid infection during the operation, provided the patients with pain relief and actively assisted the patients to clean their

mouth 1-2 weeks after the operation, encouraged the patients to eat light diet and balanced nutrition, helped the patients to correct acid-base imbalance and rehydration intervention, and evaluated the patient effect after 4 weeks of treatment.

1.4 Observing indicators

(1) Beautiful. Before and after intervention, the mucosal color, the defect appearance and the defect morphology were evaluated. Each item was 100 points, the higher the score, the better [8]; (2) masticatory efficiency. After the intervention, including: whether the chewing effect, the stability of denture, whether affect food choice, willing to chew food, using the denture food type to eat, implant denture chewing food and can improve the digestive function, each evaluation of 1-4 points score, the higher the score the better [9]; (3) bone tissue index and implant stability. One beam CT was used to calculate the width and marginal bone resorption [10]; the stability was assessed by implant stability value (total score 100 points, the higher the score, the better) [11].

1.5 Statistical analysis

Processing with SPSS26.0 software, count data line χ 2 test, n (%), measurement data line t-test, and (), $P < 0.05$ significant.

2 RESULTS

2.1 Aesthetic comparison of the two groups

The appearance of the bone defect around the dental implant was improved in the two groups; the mucosal color, defect appearance and defect morphology score in the observation group were higher than that of the control group ($P < 0.05$), as shown in Table 1.

Table 1 Aesthetic comparison of the two groups (points,)

group	Example number	Mucosal color		Appearance of the defect site		The morphology of the defect site	
		Before the intervention	After the intervention	Before the intervention	After the intervention	Before the intervention	After the intervention
observation group	46	81.12±3.32	92.51±6.62#	78.45±3.17	89.78±4.87#	73.41±3.23	90.51±5.69#
control group	46	81.10±3.30	86.72±4.39#	78.47±3.19	82.15±4.23#	73.43±3.25	82.15±4.34#
t	/	0.081	6.628	0.063	5.636	0.347	6.029
P	/	0.436	0.000	0.581	0.000	0.881	0.000

Compared with the pre-intervention session,#$P<0.05$。

2.2 Comparison of the chewing efficiency between the two groups

The observation group had any effect on chewing, the type of food available with the denture, the stability of the denture, the willingness to chew food, whether it affected food choice, whether the food chewing and whether the denture improved the digestive function were higher than the control group (P <0.05), as shown in Table 2.

Table 2 Comparison of chewing efficiency between the two groups (points,)

masticatory efficiency	observation group （n=46）	control group （n=46）	t	P
There is no effect on chewing	3.41±0.32	2.15±0.16	4.395	0.000
Solidity of denture	3.37±0.29	2.24±0.19	3.632	0.000
Whether it affects the food choice	3.34±0.24	2.31±0.21	4.612	0.000
Are willing to use dentures to chew food	3.53±0.40	2.05±0.26	5.019	0.000
The type of food that can be fed with the denture	3.42±0.28	2.21±0.24	4.321	0.000
chewing food status with implant denture	3.51±0.46	2.16±0.35	4.114	0.000
Can improve the digestive function	3.44±0.31	2.24±0.26	4.092	0.000

2.3 Comparison of bone tissue indexes and implant stability between the two groupsIn both groups, the marginal bone resorption decreased, and the plate width and the implant stability were improved; the observation group was lower than the control group ($P < 0.05$); the plate width and implant stability values were higher than the control group ($P < 0.05$), as shown in Table 3.

Table 3 Comparison of bone tissue indexes and implant stability between the two groups（$\bar{x} \pm s$）

group	Example number	Width of the buccal-lingual side bone plate（mm）		Edge bone absorption（mm）		Implant stability value (points)	
		Before the intervention	After the intervention	Before the intervention	After the intervention	Before the intervention	After the intervention
observation group	46	4.32±0.61	6.81±0.97#	0.32±0.04	0.18±0.02#	71.53±5.61	79.61±6.73#
control group	46	4.34±0.63	5.45±0.72#	0.34±0.07	0.24±0.05#	71.55±5.63	74.43±5.96#
t	/	0.081	6.628	0.063	5.636	0.347	6.029
P	/	0.436	0.000	0.581	0.000	0.881	0.000

Compared with the pre-intervention session,#P<0.05。

3 DISCUSSION

The repaired bone defect around the dental implant is more harmful, which will affect the masticatory function, pronunciation and failure of patients, and will affect the health of the temporomandibular joint [12]. With the improvement of residents 'living standard, people's diet structure has changed, leading to the increasing incidence of toothache. CAI Ruolin et al. showed that in [13], the commonly used repair methods for bone defects include: bone extrusion, bone grafting technology,

distraction osteogenesis, etc. However, all the above methods have some harm, resulting in strong stress response of patients and affecting the stability of the implant. In this study, the observation group had higher mucosal color, defect appearance, defect morphology and score than the control group (P <0.05); whether the observation group had any influence on chewing, the type of food available for the denture, the stability of the denture, the willingness to chew food, the food selection, and the improvement of the control group (P <0.05). From this result, the plasma matrix used to repair the bone defect around the dental implant can obtain good appearance, improve the chewing efficiency of patients and facilitate the recovery of patients. Analysis reasons: Plasma matrix, as a regenerative scaffold, has higher leukocyte and platelet content than clots, and can release various growth factors that promote tissue regeneration, including vascular endothelial growth factor (VEGF), epidermal growth factor (E GF), and platelet-derived growth factor (PDGF). Among them, VE GF can promote the formation of neovascularization, promote the migration and differentiation of bone progenitor cells, and accelerate the proliferation of cells. It is an ideal scaffold [15] for the regeneration and restoration of dental pulp and dentin. In this study, the marginal bone resorption was lower than the control group (P <0.05); the buccal bone plate width and implant stability values were higher than the control group (P <0.05), which showed that plasma matrix could reduce the marginal bone resorption in patients with periimplant bone defects and improve the stability of the implant. Analysis: Plasma matrix can promote the proliferation, differentiation and migration of apical papillary stem cells and periodontal membrane stem cells in healthy and inflammatory states, and form the pulp dentin complex to promote the differentiation of umbilical cord stem cells. At the same time, the use of plasma matrix to repair the bone defects around the dental implant can reduce the postoperative pain and discomfort, improve the patient's language ability, obtain good beauty, accelerate the healing of bone defects, improve the depth of periodontal bags, and help improve the chewing efficiency of patients [16].

In conclusion, the plasma matrix can help to improve the beauty of patients,

improve the masticatory efficiency, improve the level of bone tissue, and improve the stability of the implant, which is worthy of promotion and application.

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