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Clinical Efficacy of GBR Technique Combined with Temporary Bridgework-Guided Gingival Contouring in Treating Upper Anterior Tooth Loss with Labial Bone Defects

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Abstract: *Objective:* To investigate the clinical effect of the guided bone regeneration (GBR) technique combined with temporary bridgework-guided gingival contouring in treating upper anterior tooth loss with labial bone defects. *Methods:* From July 2023 to April 2024, 80 patients with upper anterior tooth loss and labial bone defects were admitted to the hospital and selected as evaluation samples. They were divided into an observation group (n = 40) and a control group (n = 40) using a numerical table lottery scheme. The control group received treatment with the GBR technique, while the observation group received treatment with the GBR technique combined with temporary bridges to guide gingival contouring. The two groups were compared in terms of clinical red aesthetic scores (PES), labial alveolar bone density, labial bone wall thickness, gingival papillae, gingival margin levels, and patient satisfaction. *Results:* The PES scores of patients in the observation group were higher than those in the control group after surgery ($P < 0.05$). The bone density of the labial alveolar bone and the thickness of the labial bone wall in the observation group were higher than those in the control group. The levels of gingival papillae and gingival margins were lower in the observation group after surgery ($P < 0.05$). Additionally, patient satisfaction in the observation group was higher than in the control group ($P < 0.05$). *Conclusion:* The GBR technique combined with temporary bridge-guided gingival contouring for treating upper anterior tooth loss with labial bone defects can improve the aesthetic effect of gingival soft tissue, increase alveolar bone density and the thickness of the labial bone wall, and enhance patient satisfaction. This approach is suitable for widespread application in healthcare institutions.

Keywords: Upper anterior teeth loss; Labial bone defects; Guided bone regeneration (GBR) technique; Temporary bridgework-guided gingival contouring

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1. Introduction

Loss of upper anterior teeth with labial bone loss is usually caused by periodontal disease, dental caries, trauma, and other factors, which can affect facial aesthetics and mastication function. The main clinical treatment for

missing upper anterior teeth with labial bone loss is guided bone regeneration (GBR), which can improve the alveolar bone volume and create favorable conditions for dental implant restoration or removable prosthesis restoration [1]. Clinical studies have shown that the GBR technique alone has a poor contouring effect on the gingiva and cannot meet patients' aesthetic requirements. Some researchers have combined GBR technology with temporary bridges to treat missing teeth, resulting in high patient satisfaction [2]. In this study, 80 patients with missing upper anterior teeth and labial bone defects were evaluated to analyze the treatment effect of the GBR technique combined with temporary bridges to guide gingival contouring.

2. Materials and methods

2.1. General information

From July 2023 to April 2024, 80 patients with missing upper anterior teeth accompanied by labial bone defects admitted to the hospital were selected as the evaluation samples and were divided into the observation group (n = 40) and the control group (n = 40) by a numerical table lottery scheme. In the observation group, there were 23 males and 17 females, the age span was 38–55 years old, with a mean of 46.57 ± 3.08 years old, the duration of missing teeth was 4.59 ± 0.63 months, and the causes of missing teeth were trauma in 11 cases, caries in 14 cases, and periodontal disease in 15 cases. In the control group, there were 21 males and 19 females, the age span was 40–54 years old, an average of 46.62 ± 3.03 years old, the duration of missing teeth was 4.64 ± 0.55 months, the cause of missing teeth was trauma in 10 cases, dental caries in 16 cases, and periodontal disease in 14 cases. There was no significant difference in the results of comparing the general information of the patients in the two groups ($P > 0.05$).

Inclusion criteria: (1) Diagnosed as upper anterior tooth loss with labial bone defect by comprehensive oral examination, implant restoration treatment intervention; (2) No serious medical diseases, healthy, and can tolerate surgical treatment; (3) Periodontal tissues are healthy or inflammation is effectively controlled after periodontal treatment to ensure early implant stability; (4) The content and process of the study were approved by the Medical Ethics Committee and the patients agreed to participate in the study.

Exclusion criteria: (1) Suffering from serious diseases of major organs; (2) Osteoporosis, low immunity; (3) Combined periodontal disease and not effectively controlled; (4) Contraindications to anesthesia or surgery.

2.2. Methods

The treatment plan for patients in the observation group involved GBR technology combined with a temporary bridge to guide gingival contouring. Routine oral examinations were performed before surgery, using CBCT technology to measure the distance between the base of the nose and the top of the alveolar ridge, and the distance between the nasopalatine foramen and the top of the alveolar ridge. The scope and specific width of the alveolar ridge labial bone defects were observed and determined, as well as the amount and quality of the alveolar bone. An appropriate treatment plan was then formulated based on the examination results.

Before surgery, patients were instructed to take oral antibacterial drugs to prevent infection. Local infiltration anesthesia was administered, and a trapezoidal surgical incision was made in the area of the mucoperiosteal flap. The mucoperiosteal flap was carefully lifted to fully expose the labial alveolar bone and alveolar fossa. The surgeon observed the surgical area, excised and scraped any remaining periodontal membrane and tooth fragments inside the socket, and rinsed the socket several times with saline.

After completing these steps, an appropriate amount of Bio-Oss bone-filling material was used to fill the bone defect area and compacted to restore the alveolar bone to its normal shape. Bio-Gide absorbable biofilm was then used to cover the surface of the filled area. The soft tissues were reset without tension, and the area

was sutured appropriately. Based on the patient's missing teeth and bone defects, pressure-free temporary bridges were made and bonded to the adjacent teeth to achieve the effect of guiding gingival contouring. Sutures were removed after 10 days.

The control group was treated with the GBR technique using Bio-Gide absorbable biofilm, and the operation plan was the same as that of the observation group. Postoperative care for patients in both groups included the use of antibacterial drugs to prevent infection. Physicians informed patients of daily diet and other precautions to encourage good oral hygiene habits. Patients were also advised to undergo regular reviews after the completion of dental implants.

2.3. Evaluation criteria

(1) The clinical pink esthetic score (PES) of the two groups was evaluated at 3 months after surgery and 6 months after surgery. The scoring items include proximal mesial gingival papillae, distal mesial gingival papillae, the height of labial gingival margins, the curvature of the labial gingival margins, the texture of the soft tissues, and the color of the soft tissues. A higher score indicated a higher soft-tissue aesthetic effect.

(2) Dental cone beam computed tomography (CBCT) was performed in both groups at 3 months postoperatively and 6 months postoperatively to measure the bone density of the alveolar bone on the labial side, the thickness of the bone wall on the labial side, the gingival papilla, and the gingival margin level.

(3) Self-made questionnaire was used to count the treatment satisfaction of the two groups of patients.

2.4. Statistical analysis

SPSS 23.0 software was used to analyze the research data. Measurement data were expressed as mean ± standard deviation (SD) and analyzed using the *t*-test, while count data were expressed as [*n* (%)] and analyzed using the χ^2 test. $P < 0.05$ indicated statistically significant differences.

3. Results

3.1. PES

The observation group's PES was significantly higher than those of the control group after surgery ($P < 0.05$), as shown in **Tables 1–2**.

Table 1. Comparison of PES between the two groups at 3 months postoperatively (mean ± SD)

Group	Proximal mesial gingival papillae	Distal mesial gingival papillae	Labial gingival margin height	Labial gingival margin curvature	Soft tissue texture	Soft tissue color
Observation group ($n = 40$)	1.59 ± 0.22	1.61 ± 0.27	1.58 ± 0.31	1.57 ± 0.29	1.49 ± 0.28	1.52 ± 0.26
Control group ($n = 40$)	1.27 ± 0.08	1.29 ± 0.05	1.26 ± 0.09	1.21 ± 0.08	1.17 ± 0.11	1.09 ± 0.07
t-value	8.645	7.370	6.270	7.568	6.728	10.100
P-value	0.000	0.000	0.000	0.000	0.000	0.000

Table 2. Comparison of PES between the two groups at 6 months postoperatively (mean ± SD)

Group	Proximal mesial gingival papillae	Distal mesial gingival papillae	Labial gingival margin height	Labial gingival margin curvature	Soft tissue texture	Soft tissue color
Observation group (n = 40)	1.69 ± 0.29	1.72 ± 0.26	1.68 ± 0.24	1.71 ± 0.28	1.61 ± 0.33	1.69 ± 0.27
Control group (n = 40)	1.31 ± 0.12	1.32 ± 0.09	1.28 ± 0.07	1.29 ± 0.12	1.25 ± 0.14	1.18 ± 0.14
t-value	7.658	9.195	10.119	8.720	6.352	10.605
P-value	0.000	0.000	0.000	0.000	0.000	0.000

3.2. Labial alveolar bone density, labial bone wall thickness, gingival papilla, and gingival margin levels

After surgery, the bone density of the labial alveolar bone and the thickness of the labial bone wall in the observation group were higher than those in the control group, and the levels of gingival papilla and gingival margin were lower than those in the control group ($P < 0.05$), see **Table 3**.

Table 3. Comparison of labial alveolar bone density, labial bone wall thickness, gingival papilla, and gingival margin levels between the two groups (mean ± SD)

Group	Labial alveolar bone density (HU)		Lateral labial bone wall thickness (HU)		Gingival papilla level (mm)		Gingival margin level (mm)	
	3 months after surgery	6 months after surgery	3 months after surgery	6 months after surgery	3 months after surgery	6 months after surgery	3 months after surgery	6 months after surgery
Observation group (n = 40)	398.16 ± 16.44	562.09 ± 28.94	3.28 ± 0.45	3.59 ± 0.58	5.31 ± 0.48	5.18 ± 0.35	10.72 ± 1.04	10.03 ± 0.79
Control group (n = 40)	322.05 ± 10.38	477.15 ± 19.28	2.62 ± 0.27	2.71 ± 0.23	6.27 ± 0.86	6.14 ± 0.72	11.83 ± 1.95	11.62 ± 1.48
t-value	24.758	15.448	7.954	8.920	6.165	7.584	3.177	5.994
P-value	0.000	0.000	0.000	0.000	0.000	0.000	0.002	0.000

3.3. Treatment satisfaction

Table 4 shows that the treatment satisfaction of patients in the observation group is higher than that of the control group ($P < 0.05$).

Table 4. Comparison of treatment satisfaction between the two groups [n (%)]

Group	Satisfied	Dissatisfied	Satisfaction
Observation group (n = 40)	38	2	38 (95.0)
Control group (n = 40)	32	8	32 (80.0)
χ^2-value			4.114
P-value			0.042

4. Discussion

The incidence of missing upper anterior teeth with labial bone defects has been steadily increasing, primarily

due to factors such as traffic accidents, sports injuries, and other traumas. These injuries not only compromise the occlusal function of teeth but also significantly impact aesthetic appearance, necessitating prompt restorative treatment [3].

In this study, it was observed that the PES of the observation group were higher compared to those of the control group, indicating that the combined treatment approach involving the GBR technique with temporary bridge-guided gingival contouring yielded favorable soft-tissue aesthetic outcomes. Conventionally, the clinical approach to treating upper anterior tooth loss with labial bone defects involves the use of GBR technology. During treatment, the membrane barrier is utilized to create a protective space, isolating the external environment and facilitating optimal conditions for osteoblast growth. Additionally, bone-filling materials are added beneath the barrier membrane to form a biological scaffold, promoting new bone formation [4]. Bio-Oss bone-filling material is commonly used in GBR procedures due to its high biocompatibility and ability to support osteoblasts, facilitating new bone formation [5].

However, GBR technology alone may lead to poor soft tissue aesthetics, with patients experiencing asymmetrical gingival height lines, crown lengths, and inadequate gingival adherence at the bridge's gingival end, often resulting in inverted black triangles post-implantation. Moreover, removable denture prosthetics may fail to provide ideal retention and are prone to food residue accumulation, underscoring the need to preserve incremental gingival profile sites to meet aesthetic requirements [6].

In the temporary bridge-guided gingival contouring treatment model, a pressure-free temporary bridge is fabricated and bonded to adjacent teeth to maintain normal gingival conditions, thereby enhancing soft-tissue aesthetics [7].

This study confirmed that the observation group exhibited higher postoperative bone density in the labial alveolar bone and thicker labial bone walls compared to the control group, with lower levels of gingival papilla and gingival margin. GBR technology effectively establishes a biological barrier membrane, guiding osteoblasts into the bone defect area, and Bio-Oss bone-filling material facilitates bone repair [8]. However, GBR technology alone may result in aesthetic concerns, such as gingival soft tissue collapse and lack of normal gingival papillae. Combining temporary bridgework to guide gingival shaping during treatment effectively addresses these issues, maintaining normal gingival conditions and improving implant restoration aesthetics [9].

Overall, the satisfaction level of the observation group was higher than that of the control group. The combined approach of GBR technology with temporary bridge-guided gingival contouring not only addresses bone defects but also maintains optimal gingival morphology, meeting patient expectations for restorative effects and aesthetics and significantly enhancing treatment satisfaction [10].

In conclusion, the combination of GBR technique with temporary bridge-guided gingival contouring for treating upper anterior tooth loss with labial bone defects improves gingival soft tissue aesthetics, increases alveolar bone density and labial bone wall thickness, and yields high patient satisfaction. This approach is recommended for adoption in medical institutions.

Disclosure statement

The authors declare no conflict of interest.

References

[1] Liu J, Wang W, Chen Y, 2023, Effect of Alveolar Eminence Expansion Combined with GBR Bone Grafting with Simultaneous Dental Implants in Patients with Severe Bone Width Deficiency. Western Medicine, 35(7): 1036–1039

+ 1045.

[2] Wang X, Wang F, Liu S, 2023, Comparison of Bone Augmentation at Alveolar Ridge Level and Patient Pain Between Bone Chip Grafting Technique and Guided Bone Regeneration Technique. Journal of Oral and Maxillofacial Prosthetics, 24(5): 354–360.

[3] Jiang J, Gao Z, 2022, CBCT-Based Study on the Effect of GBR Technique on Alveolar Bone During Simultaneous Dental Implant Treatment in Patients with Periodontitis. Imaging Science and Photochemistry, 40(1): 165–169.

[4] Ye H, He Q, Yang W, 2021, Observation on the Treatment Effect of Insufficient Alveolar Bone Volume and Aesthetic Restoration Effect of GBR Technique Applied to Implant Denture Patients. Capital Food and Medicine, 28(19): 52–54.

[5] Ma Y, Zhang Z, Wang H, 2023, Efficacy of Simultaneous Guided Bone Regeneration with Dental Implants in Patients with Periodontitis and Its Effect on Bone Remodelling and Periodontal Status. China Aesthetic Medicine, 32(12): 153–156.

[6] Lei J, 2023, Publication of Oral Implant Prosthodontics: Analysis of the Effect of Alveolar Eminence Expansion Combined with GBR Bone Grafting in the Treatment of Dental Implants for Dysplasia. Journal of Interventional Radiology, 32(1): Appendix 1.

[7] Chen J, Wu B, Wu J, 2021, Clinical Application of CBCT-Guided Maxillary Sinus Lift and GBR Technique in Posterior Implant Restoration. Chinese and Foreign Medicine Research, 19(8): 45–47.

[8] Wen YB, 2021, Application of PRF Membrane and Bio-Gide Membrane in GBR Implant Bone Grafting in Anterior Region and Its Effect on Sleep Quality. World Journal of Sleep Medicine, 8(3): 389–390.

[9] Li S, Su Z, Mok A, 2022, Clinical Outcome of Flap GBR in Immediate Implant – Immediate Restoration of Maxillary Single Anterior Teeth with Thin Bone Wall Phenotype. Oral Disease Control, 30(8): 556–563.

[10] Yan H, Fu F, Li M, 2022, Effect of Modified Flap Combined with GBR Technique on Alveolar Bone Width, Soft and Hard Tissues and Aesthetic Results in Patients with Maxillary Anterior Region. Hainan Medicine, 33(11): 1402–1405.