

The value of dental implant superior frontal sinus augmentation combined with orthodontic treatment

Yan Yang^{1, 2}, Yang Guo^{1, 2}, Guangming Luo^{1, 2, *}

¹Department of Kunming Medical University School and Hospital of Stomatology, Kunming 650106, China

²Yunnan Key Laboratory of Stomatology, Kunming 650106, China

*Correspondence Author

Abstract. To explore the clinical value of dental implant superior frontal sinus elevation combined with orthodontic treatment. From August 2020 to August 2021, 88 patients with maxillary posterior tooth defect were enrolled. There were 44 patients in each group. The experimental group received the combined treatment of upper frontal sinus elevation and orthodontic treatment, while the control group received general prosthodontic treatment. The evaluation indexes included the total treatment time and recovery time of teeth, chewing efficiency, bite force, clinical efficacy and treatment satisfaction data. Data summary showed that the bite force of the experimental group was similar to that of the control group before treatment, and the chewing condition was consistent with the above, $P > 0.05$; After different treatment intervention, the bite force of the control group was worse, the chewing condition of the experimental group was better, the effective rate and total satisfaction rate of the control group were less than the experimental group, at the same time, the total repair time of the experimental group was shorter, compared with the control group, there was a significant difference in data, $P < 0.05$. The combined treatment of upper frontal sinus augmentation and orthodontics can effectively improve the masticatory efficiency and occlusal ability of patients, improve the clinical treatment effect, and shorten the total treatment and repair time of patients, with higher acceptance of clinical patients, which has an important reference value.

Keywords: Oral implant; Upper frontal sinus lift; Orthodontics; Clinical curative effect.

1. Introduction

With the continuous improvement of people's living standards, the number of patients with oral diseases is increasing, such as maxillary posterior tooth defects, irregular teeth and so on. The defect of maxillary posterior teeth was the most common type of oral diseases. Maxillary posterior tooth defect on the one hand limits people's chewing power, on the other hand will seriously damage the patient's own oral mucosa, so that the quality of life of the patient continues to decline; Due to the appearance of maxillary posterior tooth defect, the alveolar atrophy of patients, the vertical bone volume decreased significantly, affecting the quality of dental implants, threatening the physical and mental health of patients. In clinical practice, the above patients can be carried out conventional repair treatment treatment, according to the actual situation of the patient to implement the tooth itself correction and repair, so as to improve the patient's oral structure, ensure the basic function of teeth, promote the elevation of maxillary sinus, accelerate the restoration of the patient's tooth defect. In addition, the implementation of routine treatment can ensure the normal use of the patient's teeth, alignment of teeth, thus reducing the damage of food residues on the mouth, improve the patient's chewing function and bite force, and thus reduce the recurrence of dental diseases. However, traditional prosthodontic intervention in orthodontic treatment will be affected by a variety of factors, and the prosthodontic effect is not ideal. With the progress of Chinese medical level, the emergence of oral implantation of superior frontal sinus lifting, which has the advantages of less trauma and quick recovery, makes the clinical efficiency of patients significantly improved. In this study, 88 patients with maxillary posterior tooth defects from August 2020 to August 2021 were enrolled as investigation samples to observe the clinical effects of dental implant superior frontal sinus lifting combined with orthodontic treatment, and the specific contents are reported as follows.

2. Data and Methods

2.1 Clinical Data

From August 2020 to August 2021, 88 patients with maxillary posterior tooth defect were enrolled. In the control group, the ratio of male to female was 24:20, age ≥ 18 , ≤ 57 , mean age was (37.56 ± 2.44) years; The ratio of female to male in the experimental group was 22:22 in 44 cases, age ≥ 19 , ≤ 28 , and the mean age was (38.21 ± 2.79) years old. There was no statistical significance compared with the baseline data of 88 patients, $P > 0.05$.

Inclusion criteria: approval of the study by the ETHICS committee; Improvement of baseline information; Organ function is normal; Cognitive correctness; Accompanied the family members and patients to sign the study consent.

Exclusion criteria: pregnant women; Diseases prone to bleeding; Lactation women; Mental illness in the family; Inconsistent with the requirements of experimental evaluation; Suffering from malignant tumor disease; Poor compliance.

2.2 Methods

Control group: general oral prosthodontics: mainly included: 44 patients were treated with oral anti-inflammatory and antitumescient drugs, and the treatment cycle was 14 days; After oral treatment, patients can be given dental prosthodontic intervention: Line first, X ray photography detection, a detection results denture crown and shape produced inside and outside activities and abutments for making, guide the patients to try, select the highest comfort prosthesis materials, and then place it on the silicone rubber impression, and smearing vaseline resin filling, at the same time, to fasten on dentures and repair operations.

Experimental group: upper frontal sinus lifting, orthodontics; It mainly includes: Step 1: Local anesthesia intervention was performed with attecaine hydrochloride, an incision was made at the top of the ridge, and the mucosal periosteum flap was passively separated and slowly raised to fully expose the top surface of the ridge. Step 2: The ball drill was used to properly lift the bone mass and mucosa at the bottom of the maxillary sinus under the influence of impact force, so as to facilitate the subsequent selection of appropriate implant depth. Step 3: The bone mass and mucosal elevation at the bottom of the maxillary sinus should be kept between 2 and 5 mm, and the implant depth should be prepared. Accurate percussive should be adopted to prevent maxillary sinus mucosa from penetrating, and then the implant should be accurately implanted. When the lifting height was above 4 mm, the stability of the implant should be $< 20\text{Ncm}$, and then the implant was sutured by embedding. When the lifting height is between 2 and 34 mm, the stability of the implant is maintained between 30 and 35Ncm, followed by semi-embedded or open sutures.

2.3 Observation Indicators

(1) Treatment effect: Significant effect criteria: the tooth defect was completely recovered, the oral function was normal, and the maxillofacial appearance was restored to normal state; Effective criteria: the tooth defect was basically recovered, and the oral function and maxillofacial appearance were significantly improved. Invalid criteria: the clinical indicators did not meet the effective criteria, or even showed no improvement.

(2) The total length of dental treatment and the time of normal dental function were recorded in detail.

(3) the actual function: summary patients chew, such as measuring material for peanuts, dose of 2 g, guiding the use of oral teeth chewing peanuts, side chew 20, after chewing out entirely, during the period of collecting residue and expectoration in catheter placed in distilled water, screen, according to requirements of the conventional instrumentation drying, calculating weight; Chewing statistics The difference between before and after chewing divided by the total weight before chewing multiplied by 100%. Bite force evaluation indicators: evaluation instrument: bite force evaluation instrument; Model No.: McF-8701 Position of the test piece: the first molar of the lower jaw;

Complete 10 tests, each lasting 2 seconds, and measure 3 times in total, with the highest value to give an average estimate.

(4) Satisfaction index: Evaluation method: Satisfaction scale (self-made); Score summary: a score of 95 or above indicates extreme satisfaction, a score of less than 95, a score of 90 or above indicates general satisfaction, and a score of less than 90 indicates satisfaction. Data sum multiplied by 100% is the overall satisfaction index.

2.4 Statistical Significance

In this paper, the number of patients, treatment effect and satisfaction were calculated by %, and X was given. The oral function, treatment duration and dental function recovery time of patients were calculated by ($\bar{x} \pm s$). SPSS21.0 was used to summarize all the data, and P value and X were summarized. And t value. If P is below 0.05, it is statistically significant.

3. The results

3.1 Therapeutic effect

Indicators are summarized in Table 1. Clinical treatment effect data show that the overall effective rate of the experimental group is higher than that of the control group ($P < 0.05$).

Table 1. Therapeutic effect of the two groups (%)

group	The number of cases	*	effective	invalid	Total effective rate
The control group	44	11	20	13	70.5%
The experimental group	44	23	19	2	95.5%
X ²		-	-	-	9.7242
P		-	-	-	0.0018

3.2 Repair time

The indicators were summarized in Table 2, and the evaluation of treatment time and dental function recovery time showed that the total repair time of patients in the experimental group was shorter ($P < 0.05$).

Table 2. Comparison of repair time between the two groups

group	The number of cases	Treatment time	Restoration time of dental function
The control group	44	6.1 ± 1.8	46.3 ± 2.1
The experimental group	44	4.6 ± 1.1	5.4 ± 1.3
t		4.7166	109.8461
P		0.0000	0.0000

3.3 Oral Function

Table 3. Evaluation of bite force and chewing efficiency of the two groups before and after intervention

group	The number of cases	The group of former		After into the group	
		bite	Masticatory efficiency	bite	Masticatory efficiency
The control group	44	83.82 ± 5.29	0.53 ± 0.08	106.38 ± 5.12	0.79 ± 0.06
The experimental group	44	83.64 ± 5.18	0.56 ± 0.07	162.39 ± 5.74	0.91 ± 0.08
t		0.1630	1.8931	48.8484	8.0498
P		0.8708	0.0616	0.0000	0.0000

The indicators were summarized as shown in Table 3. Before the bite force treatment, there was no significant data comparison between the experimental group and the control group, but the chewing efficiency comparison was consistent with the above, $P > 0.05$. After combined treatment, the bite force data of the control group was poor, while the chewing condition of the experimental group was better, $P < 0.05$.

3.4 Treatment satisfaction

Indicators are summarized in Table 4. The comparison of treatment satisfaction evaluation shows that the experimental group has higher data ($P < 0.05$).

Table 4. Orthodontic satisfaction of patients in the two groups (%)

group	The number of cases	Very satisfied with	The general satisfaction	Not satisfied with	satisfaction
The control group	44	11	23	10	77.27%
The experimental group	44	37	6	1	97.73%
X ²		-	-	-	8.4156
P		-	-	-	0.0037

4. Discussion

Some data point out that in recent years, with the increase of material level, people's diet and living habits have changed significantly, resulting in a high number of patients with oral system diseases, such as periodontitis, dental trauma, pulpitis, dental caries and so on. Other scholars have suggested that, long-standing oral disease treatment can lead to patients with missing teeth, etc., including but not limited to, dental caries, pulpitis, peri-arthritis of root, dysplasia, after maxillary teeth defect, trauma, etc., in patients with alveolar shrinking, chewing function, etc., made people language ability, oral mucosa problems, not only affect the maxillofacial beautiful degree, It also affects the patient's quality of life. Based on the above findings, it is necessary to conduct further research on the treatment of maxillary posterior tooth defects.

For patients with maxillary posterior tooth defect, the general dental repair oral treatment is used to improve the oral structure of patients, ensure the basic function of teeth, promote the elevation of the upper frontal sinus, and speed up the restoration of tooth defect in patients. In addition, the implementation of routine treatment can ensure the normal use of the patient's teeth, reduce the damage of food residues to the mouth, improve the patient's chewing function and bite force. At the same time, the general oral repair during the practical application, will neglect the tooth body itself and the surrounding tissue, makes the overall clinical therapeutic effect is not ideal, function recovery of patients with teeth for a long time, influence the patient's quality of life, so that the general oral repair treatment intervention, there is a certain improvement and rise space. Other scholars have shown that the combined treatment of dental implant superior frontal sinus lifting and orthodontics has significant improvement effect on patients with maxillary posterior tooth defect, and the overall recovery time of patients with dental defect is significantly shortened after the combined treatment[6-7]. The bottom of maxillary sinus can be affected by the tooth defect and gradually descend until it reaches the root area. However, the maxillary sinus lifting operation can continuously raise the height of the upper frontal sinus and pull it back to the original position, effectively promoting the good recovery of the implanted defect site and achieving the ideal therapeutic effect. Oral planting on frontal sinus surgery more convenient for clinical operation, has high precision, at the same time, can reduce the maximum extent to oral tissue trauma, and repair of teeth defect at the same time, patients themselves after maxillary teeth bone mass significantly increased, to prevent the occurrence of osteoporosis, improve the effect of clinical treatment, late to speed up the patient's recovery time. During this period, the requirements of clinical operation personnel have good safety awareness, clinical surgery will have different degree of invasive, frontal sinus promotion in the actual taken

during the period of treatment, medical personnel must strictly observe the regulations on aseptic operation, nursing staff need to remind patients to the hospital within the prescribed time, ensure the durability of the oral health status.

Oral implantation of superior frontal sinus lifting combined with orthodontic treatment intervention is more convenient and has the advantages of small wound and higher safety, which effectively ensures the repair effect of maxillary tooth defect. Summary of data indicators in this paper showed that the bite force of the experimental group was similar to that of the control group before treatment, but the chewing condition was consistent with the above, $P > 0.05$. After the restoration intervention of the two treatment methods, the bite force of the control group was poor, while the chewing condition of the experimental group was better. The effective rate and total satisfaction rate of the control group were lower than the experimental group. At the same time, the total tooth defect repair time of the experimental group was shorter, and there was significant difference in data compared with the control group, $P < 0.05$. Indicates that two groups of patients before treatment of the indicators are in a similar state, but clinical comparison, and after the intervention, after different treatments between the two groups of index data difference to be markedly increased, visible, oral planting on frontal sinus surgery and orthodontics method combined type treatment, the patients can chewing function and bite back to normal status, clinical effect is good, It has high clinical application value. Meanwhile, the application of orthodontic method makes the recurrence rate of dental diseases significantly reduced. In addition, this treatment can improve the patient's maxillofacial beauty, effectively reduce the accumulation of food residues, to avoid bad oral diseases.

To sum up, the frontal sinus lift and the combination of orthodontics treatment, make the patient's chewing efficiency, increase the patient's mouth bite ability, reduce the tooth defect repair time, let the treatment of patients with oral status to normal, healthy values, further enhance the stability of treatment, patients' satisfaction is higher, clinical can increase the sample size for deep analysis.

References

- [1] Liu Yanping, LIU Jing, DENG Mei, et al. Effect of microimplant anchorage and traditional orthodontic methods on orthodontic treatment [J]. Medical aesthetics & beauty, 2020, 29(2): 10-11.
- [2] Min Lifang, YU LAN, Yang Jun, et al. Study on the effect, safety and compliance of micro-implant anchorage in orthodontic treatment of adolescents [J]. Chinese journal of primary care medicine, 2020, 27(7): 832-835.
- [3] Yang Yang, Lu Jiao, Luo Chunyan. Effect of micro-implant anchorage therapy on the incidence of adverse reactions in orthodontic patients [J]. Yunnan medicine, 2020, 41(2): 148-150.
- [4] Yang Yi. Effect of orthodontic treatment combined with implant on dental function, plaque attachment and soft scale index of anterior malocclusion and dentition defect [J]. Modern medicine and health research, 2020, 4(9): 57-59.
- [5] Zheng Kai, ZHOU Yun, KOU Tingting. Treatment of maxillary posterior teeth defect with dental implant and orthodontic treatment [J]. Special Health, 2020(28): 150-151.
- [6] Lu D. Quantitative study of bone increment space in maxillary sinus lift based on CBCT [D]. Southwest Medical University, 2019.
- [7] Min Xiaoyong. Application and prognostic evaluation of upper frontal sinus implantation for maxillary posterior tooth defects [J]. Chinese journal of medical research, 2019, 17(7): 166-167.
- [8] WANG Guanchao, SUN Qiang, MA Penghua, et al. Treatment of adult anterior malocclusion by orthodontics and implant denture [J]. Journal of clinical stomatology, 2019, 35(12): 748-751.
- [9] Wang Y, Wang Y, Wang Y, et al. Application of microscrew anchorage implant and external pedicle anchorage in orthodontic treatment [J]. Health Essential Reading, 2019(35): 254.
- [10] Zhao Huijie. Effect of implant anchorage and traditional orthodontic methods on orthodontic treatment [J]. Chinese journal of practical medicine, 2019, 14(1): 83-84.