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Comparative Study on the Post-treatment Stability of Impacted Wisdom Tooth Extraction and Non-extraction Orthodontics in Different Age Groups

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Abstract: *Objective*: To analyze the post-treatment stability of impacted wisdom tooth extraction and non-extraction orthodontics in different age groups. *Methods*: 83 patients undergoing orthodontic treatment in the hospital from January 2021 to June 2024 were selected as the study subjects. All patients received orthodontic treatment with the straight wire appliance technique. They were divided into groups according to whether they received a tooth extraction. The control group (n=39) did not undergo impacted tooth extraction, while the observation group (n=44) underwent impacted tooth extraction. The PAR index, changes in inflammatory response factors PGE2, IL-6, and TNF-α, and the incidence of complications were compared between the two groups. *Results*: Before treatment, there was no difference in the PAR index between the two groups (P>0.05). However, after nearly 2.5 years of follow-up orthodontic treatment, there was a significant difference (P<0.05), with the observation group having a lower PAR index than the control group. Before treatment, P>0.05 for both groups. Within 7 days after tooth extraction, the levels of PGE2, IL-6, and TNF-α in the observation group were significantly higher than those in the control group, with a statistically significant difference (P<0.05). After nearly 2.5 years of follow-up treatment, the incidence of complications was found to be lower in the observation group. *Conclusion*: For patients with impacted wisdom teeth, orthodontic treatment after tooth extraction can maintain the teeth in normal dentition, adjust the relationship between the upper and lower jaws, improve occlusion function, and reduce the rebound phenomenon and complications after orthodontic surgery.

Keywords: Impacted wisdom tooth extraction; Non-extraction of impacted wisdom teeth; Inflammatory response; Post-orthodontic stability; Complications

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1. Introduction

Impacted wisdom teeth refer to the last molars in the mouth, which are partially or completely covered by gums due to obstruction from adjacent teeth, jaws, and soft tissues. The lower third molars are the most common [1].

Impacted wisdom teeth can cause many problems, such as pericoronitis, marginal osteomyelitis of the jaw, caries damage to the impacted wisdom teeth and adjacent teeth, and even the formation of cysts or tumors, which can lead to occlusal deformities in the mouth. Currently, whether the presence and eruption of third molars affect the formation of malocclusion and the recurrence after orthodontic treatment is a focus of attention in the orthodontic field. In orthodontic treatment, doctors usually need to make comprehensive judgments based on the specific conditions of patients and consider the management of third molars from the perspective of what is most beneficial to the patients [2]. Tooth extraction can effectively avoid various symptoms and complications caused by impacted wisdom teeth. For certain orthodontic patients, extracting impacted wisdom teeth is the best choice [3]. However, non-extraction orthodontic treatment methods also have their rationality. Among them, although tooth extraction is effective, it may also bring complications, such as bleeding, swelling, pain, fear, infection, and dry socket problems that may occur after the procedure. In addition, the choice of extraction or non-extraction of impacted wisdom teeth also affects the stability of orthodontic treatment. In this study, 83 patients undergoing orthodontic treatment in our hospital from January 2021 to June 2024 were selected as the study subjects to analyze the post-treatment effects of impacted wisdom tooth extraction and non-extraction on orthodontic patients. The report is as follows.

2. Materials and methods

2.1. General information

Eighty-three patients undergoing orthodontic treatment in the hospital from January 2021 to June 2024 were selected as study subjects. All patients received the straight-wire appliance technique for orthodontic treatment. They were grouped based on whether they underwent tooth extraction. The control group (n=39) consisted of patients aged 15–23 years, with a mean age of 19.47 ± 1.92 years, and a male-to-female ratio of 21:18. The observation group (n=44) consisted of patients aged 14–24 years, with a mean age of 20.32 ± 1.96 years, and a male-to-female ratio of 24:20. There were no significant differences in general information between the two groups (P>0.05).

2.2. Methods

The observation group underwent orthodontic treatment with the extraction of impacted wisdom teeth. The specific steps were as follows: ensuring the patient's comfort and central position, using a non-invasive technique, applying a high-speed handpiece, extraction burs, elevators, forceps, and ultrasonic bone scalpels, and slowly extracting the teeth in the direction of the long axis of the tooth through elevation, forceps extraction, or sectioning with a high-speed handpiece (ultrasonic bone scalpel). During the extraction process, the goals were to minimize operative time and trauma, and to avoid fracture of the extraction socket and tooth roots. After extraction, an oral cleanser was used for local cleaning. Once the wound healed, a specific and reasonable orthodontic treatment plan was developed based on the patient's age, gender, relationship between the upper and lower jaws, relationship between facial features and facial shape, and the condition of the dentin and alveolar bone.

The control group underwent orthodontic treatment while preserving the impacted wisdom teeth. The specific steps were as follows: directly developing a reasonable orthodontic treatment plan based on the patient's age, gender, relationship between the upper and lower jaws, relationship between facial features and facial shape, and the condition of the impacted wisdom teeth and adjacent teeth, as well as the alveolar bone. Fixed orthodontic appliances were used to move the teeth, improving tooth alignment and occlusion. During the orthodontic process,

patients received painless treatment, regular follow-up and adjustments, and regular cleaning and disinfection of the impacted wisdom teeth in their oral cavity.

2.3. Evaluation indices and criteria

(1) The PAR index before and after treatment was compared, including measurements of tooth malposition, posterior occlusion, midline, overjet, and overbite, with scores ranging from 0 to 6. Higher scores indicated more severe dental deformities [4]. (2) Inflammatory markers, including prostaglandin E2 (PGE2), interleukin-6 (IL-6), and tumor necrosis factor-alpha (TNF-α) concentrations, were compared before and after treatment to evaluate the patient's postoperative physical response and recovery. (3) Complications were compared between the two groups, including dry socket, pericoronitis, caries of impacted wisdom teeth or adjacent teeth, and recurrence of crowded or maloccluded dentition.

2.4. Statistical methods

Statistical analysis was performed using SPSS 22.0 software. Measurement data were expressed as mean and standard deviation (Mean ± SD). Count data were analyzed using the chi-square test and expressed as percentages (%). A *P*-value less than 0.05 indicated a statistically significant difference between the two groups.

3. Results

3.1. Comparison of the PAR index before and after orthodontic treatment with wisdom tooth extraction

There was no difference in the PAR index between the two groups before treatment ($P>0.05$). However, after approximately 2.5 years of follow-up orthodontic treatment, there was a significant difference ($P<0.05$), with the observation group having a lower PAR index than the control group. The details are shown in **Table 1**.

Table 1. Compares the PAR index after treatment

Group	Anterior teeth alignment		Posterior teeth alignment		Posterior occlusion		Overjet		Midline		Overbite	
	Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment
Control Group (*n*=39)	4.86 ± 3.22	0.63 ± 0.25	5.20 ± 1.26	2.10 ± 0.19	4.76 ± 1.10	1.52 ± 0.22	3.44 ± 1.20	0.39 ± 0.14	3.81 ± 1.26	1.22 ± 0.25	4.06 ± 1.11	1.08 ± 0.25
Observation Group (*n*=44)	4.63 ± 2.15	0.31 ± 0.14	5.31 ± 1.08	0.93 ± 0.15	4.81 ± 1.18	1.43 ± 0.15	3.52 ± 1.34	0.20 ± 0.05	3.84 ± 1.03	0.63 ± 0.14	4.12 ± 1.19	0.82 ± 0.41
t	0.387	7.300	0.428	31.304	0.199	2.198	0.285	8.422	0.119	13.460	0.237	3.433
P	0.700	0.001	0.670	0.001	0.843	0.031	0.776	0.001	0.905	0.001	0.814	0.001

3.2. Comparison of inflammatory factors before and after extraction of impacted wisdom teeth

Before treatment, the *P* value for both groups was >0.05. Within 7 days after tooth extraction, the levels of PGE2, IL6, and TNFα in the control group were significantly lower than those in the observation group, with a statistically significant difference ($P < 0.05$). The details are shown in **Table 2**.

Table 2. Comparison of inflammatory factors (±s)

Group	PGE2 (pg/mL)		IL-6 (μg/L)		TNF-α (μg/L)	
	Before treatment	After treatment	Before treatment	After treatment	Before treatment	After treatment
Control group (*n*=39)	76.42 ± 5.47	112.63 ± 9.74	1.27 ± 0.21	5.78 ± 0.64	2.49 ± 0.43	5.12 ± 1.01
Observation group (*n*=44)	75.73 ± 5.35	148.77 ± 10.32	1.31 ± 0.22	8.63 ± 0.79	2.52 ± 0.41	10.55 ± 1.73
t	0.580	16.378	0.845	17.911	0.325	17.172
P	0.563	<0.001	0.401	<0.001	0.746	<0.001

3.3. Comparison of complication rates

In terms of the incidence of complications after the extraction of impacted wisdom teeth for orthodontic purposes, after nearly 2.5 years of follow-up observation, it was found that the observation group was significantly better than the control group, with a statistically significant difference ($P < 0.05$). The details are shown in **Table 3**.

Table 3. Comparison of complications (n/%)

Group	Dry socket (Cases)	Pericoronitis (Cases)	Impacted wisdom teeth and adjacent caries (Cases)	Recurrent crowding/ malalignment (Cases)	Total incidence (%)
Control group (*n*=39)	0 (0.00)	7 (17.95)	5 (12.82)	5 (12.82)	17 (43.59)
Observation group (*n*=44)	3 (6.82)	1 (2.27)	0 (0.00)	0 (0.00)	4 (9.09)
x^2	-	-	-	-	13.019
P	-	-	-	-	<0.001

4. Discussion

The third molar is the tooth with the highest impaction rate in the dentition among impacted wisdom teeth, and the impaction rate varies among different populations. There are many factors that can cause third molar impaction, mainly related to insufficient eruption space and excessively oblique eruption angles [5]. When the third molar is impacted, food debris can easily get trapped locally, causing a large accumulation of plaque. If the factors causing impaction persist, it can lead to pericoronitis of the wisdom tooth and decay of the tooth itself and adjacent teeth, and even cause temporomandibular joint pain. Studies have shown that when the third molar erupts, it exerts a forward thrust, which aggravates the crowding of the anterior segment of the dental arch, thereby affecting the maintenance of orthodontic alignment after treatment [6]. Given the harms caused by impacted wisdom teeth, some scholars believe that early extraction of the third molars is advisable, while another viewpoint favors keeping the third molars for future orthodontic treatment or restoration. For some orthodontic patients who have already had four premolar teeth extracted, keeping the third molars can avoid the psychological impact of having eight teeth extracted [7]. In this study, the authors analyzed the effects of orthodontic treatment with and without the extraction of impacted wisdom teeth on orthodontic patients.

The PAR index, developed at the British Orthodontic Standards Working Conference in 1987, is an index used to record occlusal features. It is an objective indicator that can effectively evaluate the occlusal index and has been widely used domestically and internationally. It can effectively reflect the situation after successful treatment

and can effectively evaluate the degree of improvement and treatment methods for different types of malocclusions. Therefore, it is suitable for evaluating the results of all types of occlusions, treatment methods, and cases with and without tooth extraction [8–9]. Specifically, the PAR index can assess the overall effectiveness of treatment, including changes in tooth position, adjustment of jaw relationships, improvement in occlusal function, and evaluation of aesthetic effects. Thus, the PAR index is not only used to evaluate treatment effectiveness but also to assess treatment stability, providing an important reference for clinical orthodontic treatment [10–11]. In this study, by observing the PAR index before and after treatment in the observation and control groups, it was found that the observation group had a significantly lower than the control group after treatment. This data effectively reflects that orthodontic treatment after the extraction of impacted teeth can effectively improve the occlusal relationship of orthodontic patients, bringing their dental indices closer to normal values. Conversely, in the control group, due to the forward thrust caused by the impacted wisdom teeth, the anterior segment of the dental arch becomes crowded, resulting in insignificant improvement in occlusion after orthodontic treatment. Therefore, the improvement effect is lower than that of the observation group. Simultaneously, this reflects the better stability of the observation group after treatment. This article also compares the level of decay in the wisdom teeth themselves and adjacent teeth before and after orthodontic treatment with and without the extraction of impacted wisdom teeth. The results suggest that the observation group had a lower decay level after extraction treatment compared to the control group.

By comparing the frequency of complications between the two groups, it was observed that the observation group had a significant reduction in the occurrence of pericoronitis, decay of impacted wisdom teeth and adjacent teeth, and recurrence of crowded and misaligned dentition. This suggests that after tooth extraction, the stability of orthodontic treatment in the observation group was better. The reason for this is that although patients in the control group did not experience the pain associated with tooth extraction, some of them experienced a rebound effect of crowded and misaligned teeth after the completion of orthodontic treatment, when the impacted wisdom teeth continued to erupt or partially erupt, exerting a forward thrust. This resulted in poor stability of tooth alignment, and some patients who had undergone orthodontic treatment may require additional treatment. However, patients in the observation group who underwent tooth extraction experienced minimal rebound effects after the completion of orthodontic treatment, particularly in the lower anterior teeth region, where there was almost no recurrence of crowding and misalignment. Therefore, the risk of pericoronitis and decay of wisdom teeth and adjacent teeth was significantly reduced [12]. Simultaneously, this phenomenon further demonstrates the positive and profound impact of tooth extraction on the overall effectiveness of orthodontic treatment. By reducing the risk of rebound effects, it enhances the long-term stability of teeth after orthodontic surgery, reduces treatment uncertainties and potential complications, and brings greater benefits to patients' oral health. Additionally, when observing the levels of inflammatory factors after treatment in both groups, the results showed no significant difference in PGE2, IL6, and TNFα levels between the observation group and the control group before treatment. However, after tooth extraction treatment, the levels of PGE2, IL6, and TNFα were higher in the observation group compared to the control group, especially for PGE2 and TNFα, which showed a more significant increase. This suggests that the inflammatory response increases after the extraction of impacted wisdom teeth, affecting the levels of inflammatory factors. This not only increases the risk of dry socket syndrome in some patients but also increases fear and anxiety, leading some patients to choose orthodontic treatment without tooth extraction.

5. Conclusion

In summary, the impact of orthodontic treatment with and without the extraction of impacted wisdom teeth

is significant for patients. Therefore, it is essential to conduct comprehensive preoperative assessments and accurately diagnose the condition. When the treating physician identifies adverse factors related to impacted wisdom teeth that may affect the postoperative recovery process after orthodontic treatment, early extraction of the affected teeth should be performed to avoid any negative impact on the recovery of the teeth after the completion of orthodontic treatment.

Disclosure statement

The author declares no conflict of interest.

References

[1] Mu MK, Lu XL, Zhan W, et al., 2008, Evaluation of the Orthodontic Effect of Extraction and Non-Extraction Treatment for Angle's Class III Malocclusion Using the PAR Index. Journal of Harbin Medical University, 42(2): 174–175 + 178.

[2] Zou H, Peng YJ, 2024, Comparison of Clinical Efficacy between Invisalign Appliance and Damon Q Self-Ligating Bracket in Non-Extraction Treatment of Dental Crowding. Chinese Journal of Aesthetic Medicine, 33(1): 125–129.

[3] Zhou XR, Yang QQ, Feng H, et al., 2022, Study on the Effect of Invisalign Appliance in Non-Extraction Treatment of Dentition Defect with Malocclusion. Chinese Journal of Aesthetic Medicine, 31(12): 153–156.

[4] Lai SY, Hou JX, 2020, Progress in the Application of Alveolar Ridge Preservation at Extraction Sites of Non-Periodontal and Periodontal Teeth. Chinese Journal of Stomatology, 55(4): 266–270.

[5] Chai A, Lei RC, Jiang ZS, et al., 2023, Overview of Methods for Assessing the Difficulty of Extracting Mandibular Third Molars. International Journal of Stomatology, 50(6): 718–722.

[6] Liu JY, Liu C, Pan J, et al., 2021, Application of Distal Triangular Flap in the Extraction of Impacted Mandibular Third Molars. West China Journal of Stomatology, 39(5): 598–604.

[7] Li TT, Wang CF, Cai Y, et al., 2024, Study on the Effect of Residual Dental Follicle after Extraction of Impacted Mandibular Third Molars on the Periodontal Health of Adjacent Teeth. Chinese Journal of Stomatology, 59(8): 784–790.

[8] Xing JH, Chen H, Chen M, et al., 2023, Study on Tooth Drift after Orthodontic Treatment Interruption Following Tooth Extraction. Journal of Prevention and Treatment of Stomatological Diseases, 31(10): 727–732.

[9] Liu L, Dong T, Yuan LJ, et al., 2019, Preliminary Morphological Study of the Temporomandibular Joint before and after Orthodontic Tooth Extraction. Chinese Journal of Orthodontics, 26(4): 209–214.

[10] Ouyang D, Hu DS, Yang JX, et al., 2021, Study on the Efficacy of Orthodontic Treatment Combined with Implant Anchorage for Dental Deformities and its Impact on the PAR Index. People's Military Surgeon, 64(4): 352–355.

[11] Wang YN, Chang L, Liu HY, 2016, Analysis of Influencing Factors in Evaluating the Orthodontic Treatment Effect of 80 Patients Using the PAR Index. Journal of Practical Stomatology, 32(2): 263–267.

[12] Li XR, Chen B, Li M, et al., 2023, Preliminary Application of PAR Index Combined with Cephalometric Measurement in Evaluating the Efficacy of Skeletal Class III Malocclusion. Shanghai Journal of Stomatology, 32(4): 417–421.