



## Unilateral Extraction is One of the Reasons for Centerline Discrepancies as well as The Relapse of Orthodontic Treatment

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### Abstract

The asymmetry of the dentition or face was caused by kinds of genetic, traumatic and functional reasons. Unilateral extraction is one of special orthodontic plan, but the esthetics, function and long term post-treatment stability are the main goals pursuit of orthodontics. There are various reasons might interrupt the long-term of posttreatment stability. In some remote area maybe due to the unprofessional of the orthodontics, the unilateral extraction plan was considered as an orthodontic plan to save orthodontic treatment time. In this study we showed a patient was inappropriately primary treated by the unilateral extraction and relapsed with her centerline discrepancy to the left and ugly smile. We analysed the mechanism of the unilateral extraction induced the relapse of orthodontic in theory, especially the effect of neuromuscular system stability. And we treated the patient by the unilateral extraction plan in the opposite side of the dentition and compensated her primary unilateral extraction to an symmetric four first premolar extraction plan. And the harmony of esthetics, function and long term of post-treatment stability was obtained. After one-year follow up, the treatment outcome still perfect and the patient got her esthetic smile and self-confidence.

**Keywords:** Unilateral Extraction; Asymmetry; Centerline of Dentition; Orthodontic Stability; Orthodontic Plan

### Introduction

Various reasons will cause the asymmetry of the dentition or face. First, the skeletal defect of maxilla or mandible such as cleft alveolus and/or cleft palate, which cause a severe intermaxillary relation. Second, the dental reasons cause dentition asymmetry which includes congenitally missing teeth, or pathologically missing teeth or traumatic tooth loss [1,2]. The third reason frequently exhibits in muscular and functional disorder, but frequently, it is the symptoms of some syndromes or some genetic defect, such as Hemifacial microsomia, Mobius syndrome or presence of malpositioned tooth and so on [3-5]. The last but not least is that the asymmetry of dentition also insist in normal population [6].

Consider the orthodontic plan, unilateral extraction is one of the options, but the cases should be carefully selected. For example,

unilateral premolar extraction is one of the methods to treat the ectopic maxillary canine [7]. Sometime due to the genetically tooth missing and pathological tooth missing such as dental caries, traumatic tooth loss and loss of teeth after surgery, in order to close the space, the orthodontist has to choose this special option of unilateral extraction, or the patient has to do the implant and fixed denture or removable denture [2].

Various reasons could interrupt the longterm stability of posttreatment and induce relapse. First, the third molars eruption in a back position is one of the reason which was reported by lots of researchers [8-10]. Second, the periodontal ligament changes after orthodontic treatment [11,12]. While in the PDL, the collagen turnover is fast and the remodeling of the gingival and transseptal fibers was slower, it is argued that the stresses and strains in the

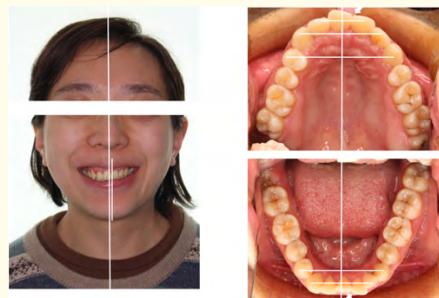
periodontal collagen fiber systems are not the main factors for relapse [13]. Third, the neuromuscular system stability is more complicated, which could be interrupted by the molar position, TMJ and so on. The relationship between the neuromuscular system stability and the longterm of posttreatment stability is little known and it needs to be further studied [14,15].

While the unilateral extraction is one of option to treat some special cases such as impact canine, but it is frequently to find that there are some cases were treated by some unprofessional orthodontist with the unilateral extraction plan just to save the effort and time of the orthodontic treatment. And this kind of case may relapse in a high rate. In this study, we reported an adult patient, who had orthodontic treatment in some remote area with the unilateral extraction and relapsed, came to us for the secondary orthodontic treatment.

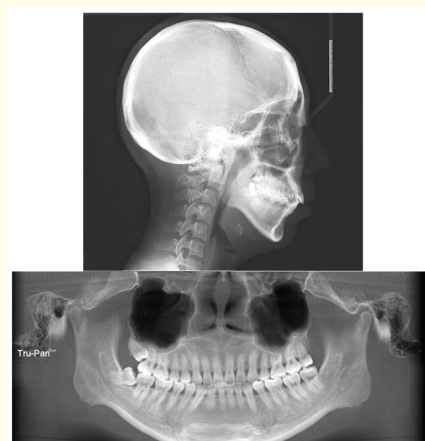
**Materials and Methods**

**Diagnose and etiology**

The 30 year-old women came to us for a secondary orthodontic treatment, and her main complain was centerline discrepancy and the unacceptable smile. She had her first orthodontic treatment in other hospital 10 years before and had the retainer for one year after that. Her upper left first premolar and lower left first premolar were extracted in the primary orthodontic treatment (Figure 1). When she smiled the upper and lower centerline was discrepancy to the left. And the centerline of the upper dentition was 2.5 mm to the left while the centerline of the lower dentition was 2 mm to the left (Figure 2), compared to the facial midline. And due to the relapse, there was 2 mm crowding in the mandible could be found. The patient smiled ugly as she reported. The gingival recession could be found in the pretreatment photograph (Figure 1) and radioation examination (Figure 3).



**Figure 2:** The centerline of dentition was discrepancy to the left.



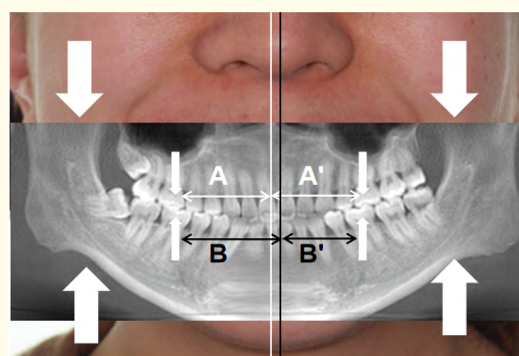
**Figure 3:** The periodontal tissue and roots situation as well as the discrepancy of centiline in the radiation examination. The alveolar bone resorption could be found, especially around the upper and lower incisor.

to the left, compared the skeletal midline. And the impacted third molars in the right side could be found (Figure 3).



**Figure 1:** The photographs before secondarily orthodontic treatment. The gingival recession could be found.

With the double check of the radiation examination, her upper left first premolar and lower left first premolar were missing and the centerline of the upper and lower dentition was discrepancy

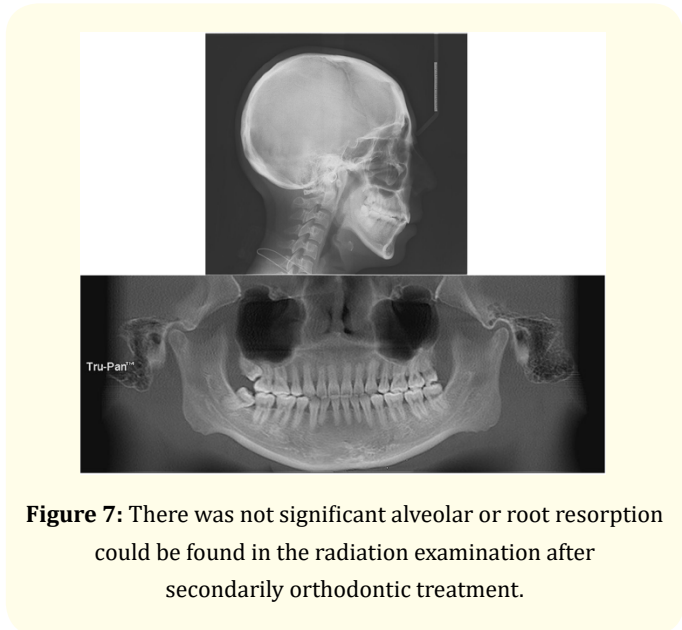


**Figure 4:** The mechanism of the unilateral extraction induced the replase of orthodontic in theory, especially the effect of neuromuscular system stability. The distance of A equals A', but B is larger than B' (White line: the skeletal centerline; Black line: the dental centerline).

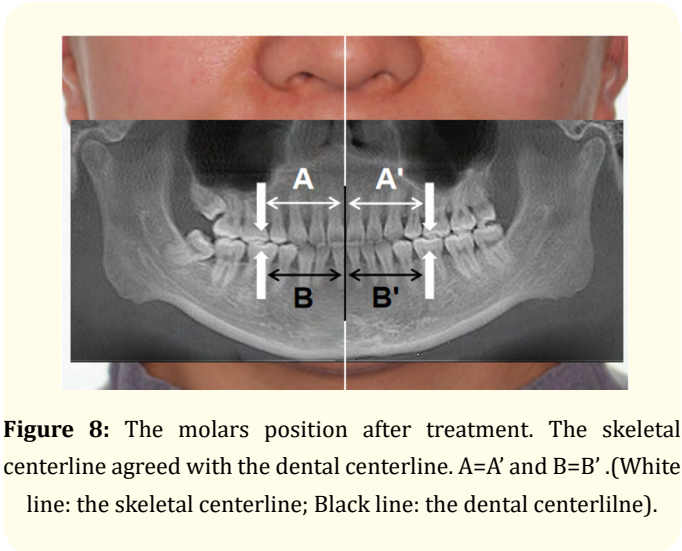
The mechanism of the unilateral extraction induced the replase of orthodontic.

After analysed the pretreatment radiation examination, the third molars on the patient’s right side might be the reason for the relapse (Figure 3 and 4). However, the inclination of the first and second molar and premolar were almost the same. What’s more the crowding in both sides of the upper and lower dentition were similar, while there was not severe inclination in the third molar in the left side. So, we could not conclude that the relapse was due to the eruption of third molars on the left side.

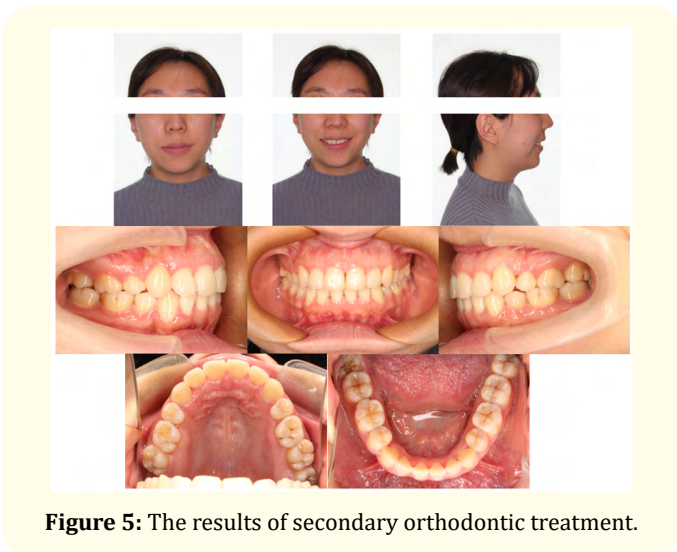
On the other hand, if we further analyse the molars position to mimic the mechanism for the relapse, we could find that while the molars position were asymmetric referred to the dental centerline (Figure 4,  $B > B'$ ), but the molars position were almost the same referred to the skeletal centerline (Figure 4,  $A = A'$ ). And our hypothesis for the mechanism was as the following. First the dentition transferred the muscle force to the alveolar and then to the maxilla and mandible. Second, when the molar position was symmetric and the neuromuscular system is stable. And the longterm of posttreatment stability could be obtained. Third, when the molar position was asymmetric, the neuromuscular system was distured and a feedback circle was formed. The neuromuscular system could force the molar to find its symmetric position in the skeletal system which could transfer a more symmetric force from the muscle. Then, the relapse was happened. And our hypothesis was proved by the result of our plan, our treatment and the patient’s longterm of posttreatment stability (Figure 5-9) in the following.



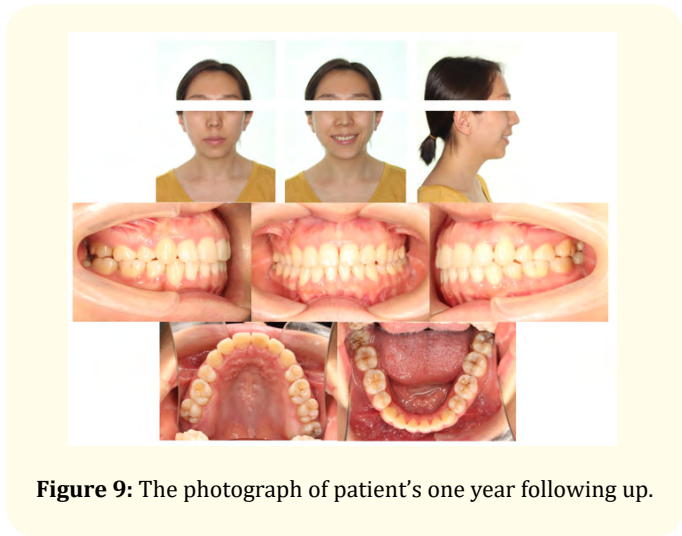
**Figure 7:** There was not significant alveolar or root resorption could be found in the radiation examination after secondarily orthodontic treatment.



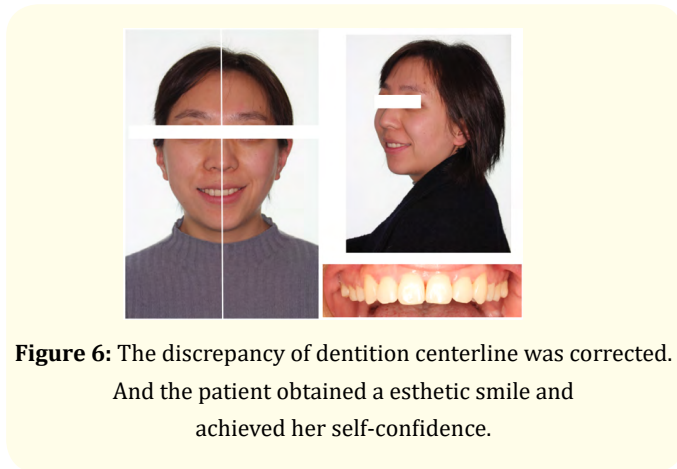
**Figure 8:** The molars position after treatment. The skeletal centerline agreed with the dental centerline.  $A = A'$  and  $B = B'$ . (White line: the skeletal centerline; Black line: the dental centerline).



**Figure 5:** The results of secondary orthodontic treatment.



**Figure 9:** The photograph of patient’s one year following up.



**Figure 6:** The discrepancy of dentition centerline was corrected. And the patient obtained a esthetic smile and achieved her self-confidence.

**Objectives and plan**

The objectives were as the following: 1) corrected the discrepancy of the centerline; 2) improved her smile; 3) corrected the crowding. With these objectives, her upper right first premolar and lower right first premolar were extracted and the third molars

in the right were encouraged to be extracted. So, combined the extracted upper left first premolar and lower left first premolar in her primarily orthodontic treatment, the patient's unilateral extraction plan was changed to be a symmetric extraction plan. While the gingival recession is obviously, especially in the upper and lower incisors, the possibility of "black triangles" after the dentition was aligned was discussed with the patient.

### Treatment progress and results

After, one and a half years treatment, all the objectives were achieved. The upper and lower dentition were aligned and leveled and the crowding was corrected. The centerline discrepancy was treated and the patient was quite satisfied with the result and achieved a wonderful and happy smile (Figure 5 and 6). Compared to the original radiation examination result, there was not significantly root resorption could be found in the patient's X ray photographs, while the patient had the secondary orthodontic treatment (Figure 7). What's more, the radiation examination showed that centerline of the upper and lower dentition agrees to the skeletal midline, which offered a balance molar position and the neuromuscular system stability (Figure 8  $A=A'$  and  $B=B'$ ). All of these offered a neuromuscular system stability which was important for the longterm of posttreatment stability.

The patient had clare retener in day and Hawley retener at night. After one year of follow up, the result of the secondary orthodontic treatment was still perfect and stable. The patient got her self-confidence and appreciated us for the treatment (Figure 9). All of these indicated that the harmony of the esthetics, function and the post-stability was important in maintaining the perfect treatment results.

### Discussion

The esthetics, function and long term post-treatment stability are the main goals pursuit of orthodontics. The esthetics, function and long term post-treatment stability interacts with each other rather than separate themselves with each other. Esthetics improvement most time will obtain functional promotion. For example, treatment of crowding will improve the occlusive function and the periodontal health. However, the temporary functional and esthetic improvement could not achieve long term post-treatment stability. In this study the patient's function and esthetics were improved in her primarily orthodontic treatment, but there were obvious shortages in the outcome, especially the centerline was discrepancy to the left and the smile was abnormal.

Most of orthodontists are keeping on trying to achieve the long-term post-treatment stability, while it is quite a challenge [16]. Kinds of reasons will cause the unstable of the occlusion and orthodontic result. On the one hand, the harmonization between the orofacial muscles and the teeth is considered as an important factor of an adequate occlusion [14]. On the other hand, persistent imbalance in the neuromuscular environments could influence

the post-treatment stability. The variability of the positions of the molars, besides the TMJ, could play an important role on the neuromuscular system stability [15]. So, the unilateral extraction absolutely causes the asymmetric of the positions of molars and the imbalance of the neuromuscular environments, which will effect the harmony of esthetic, function and long term post-treatment stability of orthodontic treatment.

In this study, we analysed the molars position and we found molars position were asymmetric referred to the dental centerline (Figure 4,  $B>B'$ ), but almost the same referred to the skeletal centerline (Figure 4,  $A=A'$ ). When the molar position was asymmetric, the neuromuscular system was disturbed and a feedback circle was formed, which could force the molar to find its symmetric position in the skeletal system and the relapse was happened. And our hypothesis was proved by the treatment result and the patient's longterm of posttreatment stability (Figure 5-9).

The asymmetric centerline of the upper and lower dentitions were corrected and the other treatment objectives were achieved, while the patient had this secondary treatment in her 30s. The esthetic smile and the occlusive function were improved. And after one-year's follow up, the results showed that the post-treatment stability was perfect. The harmony of esthetics, function and long term post-term stability was achieved, and the patient's self-confidence was obtained (Figure 9). Comparing the results of the patient's primarily orthodontic treatment and our secondary orthodontic treatment results, we could find that unilateral extraction is one of the reasons for centerline discrepancy as well as the relapse of orthodontic treatment. And a further study with larger sample size is undergoing, while it is difficult to collect the samples.

### Conclusion

1. The unilateral extraction could cause the asymmetric of the molar position and disturb the neuromuscular system stability.
2. Unilateral extraction is one of the reasons for centerline discrepancy as well as the relapse of orthodontic treatment.
3. The secondary treatment was performed with the unilateral extraction in the opposite side of dentition which made the primary unilateral extraction to a symmetric four premolars extraction

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