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Correcting the Anteroposterior Discrepancy of Class II Patient with Overjet by the Vertical Control of Miniscrew

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Abstract

Background: While various orthodontic appliances were designed to manage the anteroposterior and vertical discrepancy, miniscrew was one of the powerful appliances and was widely utilized as anchorage to treatment the anteroposterior relationship.

Method and Result: In the study we treated the severe Class II skeletal discrepancy subject with protrude upper incisors and mandibular hypoplasia by the vertical control with the miniscrew. After two years treatment, all the objectives were achieved. The skeletal Class II discrepancy was improved (ANB 6.3), the protrude upper incisors were treated (U1 angulation 92.8, U1-L1 120.7) and the occlusive plan was leveled (Occ Plane 8.2). Class I molars and canines relationship were obtained.

Conclusion: The vertical control was vital for the correction of anteroposterior discrepancy. The anteroposterior, vertical and transverse dimension and the time, especially the long term of post-treatment stability, interacts with each other.

Keywords: Orthodontic treatment, Orthodontic appliances, Protrude incisors, Anteroposterior discrepancy.

Introduction

The logical approach to the diagnosis and treatment of orthodontic cases is now considered as a four dimensions issue which includes the diagnose, designing and treatment for the anteroposterior discrepancy, vertical discrepancy, and transverse discrepancy, as well as the consideration for time which not only refers to the treatment time but also refers to the long term of post-treatment stability. The anteroposterior, vertical and transverse dimension issue and the time issue interacts with each other and play a vital role on the outcome of the orthodontic treatment.

Various orthodontic appliances were designed to manage the anteroposterior and vertical discrepancy, such as miniscrew, Forsus, lingual orthodontic appliance, headgear and so on [1-6]. And the miniscrew is widely utilized in orthodontic clinical practice as anchorage. Compared with the group treated with conventional transpalatal arch combined with high-pull headgear and interarch elastics, the maxillary first molars had less mesial movement in the miniscrew group in the same treatment duration [7]. The miniscrew is also a powerful technique in vertical control. Miniscrews placed in the anterior and posterior regions of maxilla efficiently treated Class II

skeletal discrepancy with high angle and gummy smile in adult patient [8].

The diagnosing, designing and treatment should carefully consider the anteroposterior discrepancy, vertical discrepancy, and transverse discrepancy rather than neglect any one of them. In this study, we showed that the anteroposterior discrepancy of the patient was treated by the vertical control.

Method and Results

Diagnose

The 20 year-old girl come to us for orthodontic treatment with the main complain of protrusion of upper incisors and unacceptable profile and smile. She reported that her medical history was nothing special. Class I molars relationship and Class II canine relationship could be found in the pre-treatment photograph (**Figure 1**). The space in the upper dentition was 3 mm, the overjet was 7 mm and the overbite was 3 mm. The protrude incisors could be found and she was shy to smile.

The cephalometric analysis showed a severe skeletal Class II relationship with mandibular hypoplasia (SNA 82.2, SNB 74.8, ANB

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7.4) and protrude upper incisors (U1 angulation 96.1, U1-L1 128.1) (Table 1 and Figure 2).



Figure 1: The pre-treatment photograph.

| Measurement | Norm | Pre-treatment | Post-treatment |
|---------------------------------|-------------|---------------|----------------|
| SNA (°) | 82.0 ± 3.5 | 82.2 | 81.3 |
| SNB (°) | 80.9 ± 3.4 | 74.8 | 74.9 |
| ANB (°) | 1.6 ± 1.5 | 7.4 | 6.3 |
| FMA (MP-FH) (°) | 23.9 ± 4.5 | 31.4 | 32.1 |
| IMPA (°) | 95.0 ± 7.0 | 93 | 93.5 |
| U1-SN(°) | 102.8 ± 5.5 | 96.1 | 92.8 |
| L1-Occ Plane (°) | 72.0 ± 5.0 | 65.7 | 62.3 |
| U1 Angulation (U1-SN)(°) | 102.8 ± 5.5 | 96.1 | 92.8 |
| Occ Plane to FH(°) | 6.80 ± 5.0 | 10.1 | 8.2 |
| Lower Face Height (ANS-Xi-Pm) % | 45.0 ± 4.0 | 52.2 | 50.4 |
| U1-L1 (°) | 130.0 ± 6.0 | 128.1 | 120.7 |
| Hinge Axis Angle (°) | 90.0 ± 4.0 | 94.3 | 96.9 |

Table 1: The comparison of pre-treatment and post-treatment cephalometric analysis.



Figure 2: The pre-treatment radiation examination.

Objectives

The objectives were as the following: 1) closed the space; 2) obtained Class I molars and canines realationship; 3) achieved the normal overbite and overjet by treating the anteroposterior discrepancy; 4) improved the profile; and 5) obtained the esthetic smile.

Treatment Progress

After discussed with the patient, the nonextraction plan was performed. After the alignment of the upper and lower dentition, the Spee curve was obviously deep; on the other hand, the anteroposterior discrepancy was still severe. After carefully analysis, we could find that the over development of the posterior part of the alveolus was the root of the problem which caused the clockwise rotation of the mandible and exhibited the symptom of overjet. Two miniscrew was placed in the

zygomatocoalveolar, which offered sufficient distant for the molar intrusion but did not interrupt the distally movement of the upper dentition (Figure 3 and Figure 4).



Figure 3: After 6 months treatment.

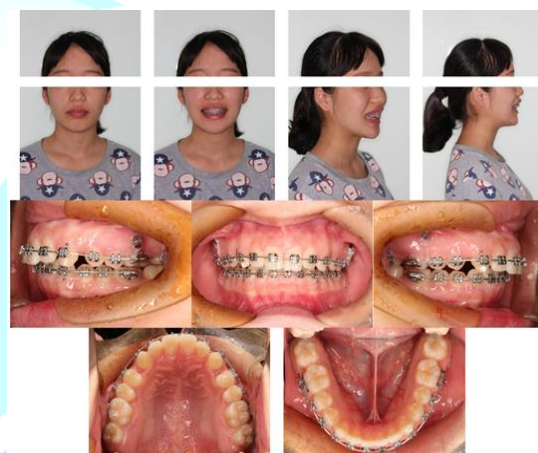


Figure 4: After 9 months treatment, miniscrews were placed in the zygomaticoalveolar bimaxillarily.

Treatment results

After two years treatment, all the objectives were achieved. The space was close, the anteroposterior discrepancy was corrected and the normal overjet and overbite were obtained. The normal Class I molars and canines relationship were achieved. And the esthetic smile was improved (Figure 5 and Figure 6).



Figure 5: Post-treatment photograph.

The radiation examination showed that the skeletal Class II relationship was reduced (ANB 6.3), the protrude upper incisors were degree (U1 angulation 92.8, U1-L1 120.7). And the occlusive plan was leveled (Occ Plane 8.2). After 2 years following up, the result was still perfect.

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The long term post-treatment stability offered the self-confidence for the patient (**Figure 7 and Figure 8**).



Figure 6: Post-treatment radiation examination.

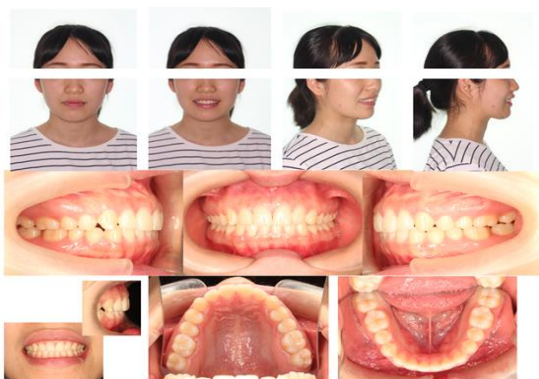


Figure 7: Photographs of 2 years follow up.



Figure 8: Comparison of the Profile of the Patient and the Improvement of the Patient's smile in different stage A: In photographs of Pre-treatment, the patient was shy to smile; B: Photograph of 9 months after treatment; C: In photographs of post-treatment, the patient smiled with self-confidence; D: Photographs of 2 year following up.

Discussion

Finding out the root of the problem is the vital logical issue in deal with the anteroposterior, vertical and transverse dimension issue and the long term of post-treatment stability of orthodontic case, rather than only focusing on the orthodontic appliances. For example, rotation effect changes during treatment with Herb appliance were minimal in the growing patients, and overall treatment was not associated with the significant forward mandibular rotation [9]. What's more, the mandibular posterior rotation will induce a severe Class II problem from a Class I [10].

Anteroposterior positions of teeth varies among different type of malocclusion, especially relating with the skeletal relationship of different kinds of maxilla and mandible relationship. It reported that in Class I bimaxillary dentoalveolar protrusion cases, the root apex of maxillary central incisor located a palatally and the lateral teeth tipped mesially, compared with subjects with balanced profile and normal occlusion [11]. The buccolingual inclination of mandibular second molars is also related to the skeletal pattern of maxilla and mandible in cone-beam computed tomography [12]. A positive correlation between anteroposterior maxillomandibular relationship (Wits appraisal) and mandibular second molar inclination could be found.

In this study the protrude incisors and over development of posterior alveolar was the root problem and the mechanism of the anteroposteriorly skeletal discrepancy in the patient. The intrusion of the upper molars with miniscrew allowed the anterior rotation of the mandible by improving the leveling of the dentition and removing the block of upper molar from the mandible. This vertical control not only dealt with anteroposterior discrepancy and offered the patient an esthetic smile and normal overjet and overbite, but also improved the patient's profile and smile and offered a long term of post-treatment stability. The anteroposterior, vertical, and transverse dimension and the time, especially the long term of post-treatment stability, interacts with each other and must be carefully considered during the diagnose, designation and treatment of orthodontic cases.

Conclusion

1. The vertical control was vital for the anteroposterior treatment.
2. The miniscrew was powerful in molar intrusion.
3. The vertical, transverse and anteroposterior dimension issue and the long term of post-treatment stability interacts with each other.

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