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CASE REPORT

Orthodontic Camouflage Treatment of a High-Angle Severe Skeletal Class II Discrepancy

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ABSTRACT

Proper orthodontic treatment in adult patients with severe skeletal Class II discrepancy can be challenging. Recently, miniscrew implants have been used as a strategy to treat skeletal Class II patients. **Objective:** This report illustrates a skeletal Class II malocclusion management combining straight wire technique and miniscrew implant anchorage. **Case report:** The patient was a 21-years- old Indonesian female with Class II skeletal discrepancy, a retrognathic mandible, a high mandibular plane angle, and a mouth breathing habit due to a history of allergic rhinitis. Anchorage control is important in the sagittal and vertical directions. Miniscrew implants were placed in the interradicular area between the upper second premolar and first molar on both sides. Furthermore, en-masse retraction of the six anterior teeth was performed using miniscrew implants as the anchorage. After 16 months of treatment, esthetics and function were improved and the chief complaint of the patient was resolved. Class I canine and incisor relationship was achieved. These mechanics contributed to the correction of the gummy smile of this patient. **Conclusion:** Placement of miniscrew implants in the posterior regions of the maxilla effectively camouflaged a high-angle skeletal Class II discrepancy. This technique requires minimal patient compliance and is useful for the correction of high-angle cases in adult patients.

Key words: Class II malocclusion, high angle, miniscrew implant, orthodontic camouflage

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INTRODUCTION

Malocclusion is an appreciable deviation from ideal occlusion, which may affect function and esthetics. Malocclusion has been described in many ways, ranging from dental classifications to indices of treatment need. Class II malocclusion is a common problem in orthodontics. According to Angle (1899), Class II malocclusion is characterized by the distobuccal cusp of the first permanent molar occludes in the buccal groove of the lower first permanent molar and proclined upper incisors with a resultant increase in overjet. The prevalence of Class II malocclusion in Deutro-Malay populations reached 33.1%. As many as 83.3% of adolescents aged 12–14 years in Indonesia experience malocclusion. Malocclusion not only causes physical pain but also interferes with psychological and social development, thereby affecting the overall quality of life. Therefore, the treatment of Class II malocclusion is needed.[1,2]

The diagnosis and treatment of Class II skeletal malocclusion are challenging for orthodontists. Alternative treatments for Class II skeletal malocclusion in adult patients include orthognathic surgery or camouflage orthodontic treatment. Orthognathic surgical treatment is performed in patients with severe skeletal discrepancies that cannot be treated with camouflage orthodontics. If the patient is not willing to be treated with orthognathic surgery, the alternative treatment is dentoalveolar orthodontic camouflage treatment, which improves the patient's profile but in a limited way.[3]

Anchorage control is an important aspect in orthodontic treatment. Miniscrew implants are often used for various purposes in orthodontic treatment, such as an anchor during the space closure phase.[4] This case report discusses the management of Class II skeletal malocclusion with vertical hyperdivergent facial growth in 21-year-old female patients by using

pre-adjusted appliances with additional anchors in the form of miniscrew implants.

CASE REPORT

The patient has provided informed consent for publication of the case. This case report involves a 21- year-old Indonesian female that came to the Orthodontic Clinic Faculty of Dentistry Universitas Indonesia because of her protrusive anterior teeth that bite her lower lip and cause recurrent stomatitis. A review of her medical history shows that she has allergic rhinitis. The patient's face was symmetric with a convex profile and had a gummy smile with incompetent lips (Figure 1). Occlusal analysis revealed a Class II division 1 malocclusion with Class I molar relationship on the right side, Class II molar relationship on the left side, Class II canine relationship on both sides, 7 mm overjet, 4.5 mm overbite, and mandibular midline 1 mm shifted to the left (Figure 1).

Figure 1. Pretreatment extraoral and intraoral photographs

A panoramic radiograph of the patient taken a month before the consultation showed that the alveolar bone and periodontal tissues were within normal limits. In addition, the maxillary sinuses appeared hazy and the upper respiratory tract showed an obstruction. Pretreatment cephalometric analysis revealed a skeletal Class II relationship (ANB 12°) associated with mandibular retrusion (SNB 68°). Analysis of vertical skeletal relationships showed an increased mandibular plane angle (MMPA 35°). The maxillary and mandibular incisors were proclined (UI-MxP 115°; LI-MP 100°). The soft tissue profile was convex (angle of convexity 31°; Upper Lip-E Line 9 mm; Lower Lip- E Line 10 mm) (Figure 2, Table 1). Based on this information, the patient was diagnosed with an Angle Class II malocclusion, high mandibular plane angle, mild lower anterior crowding, and lip protrusion.

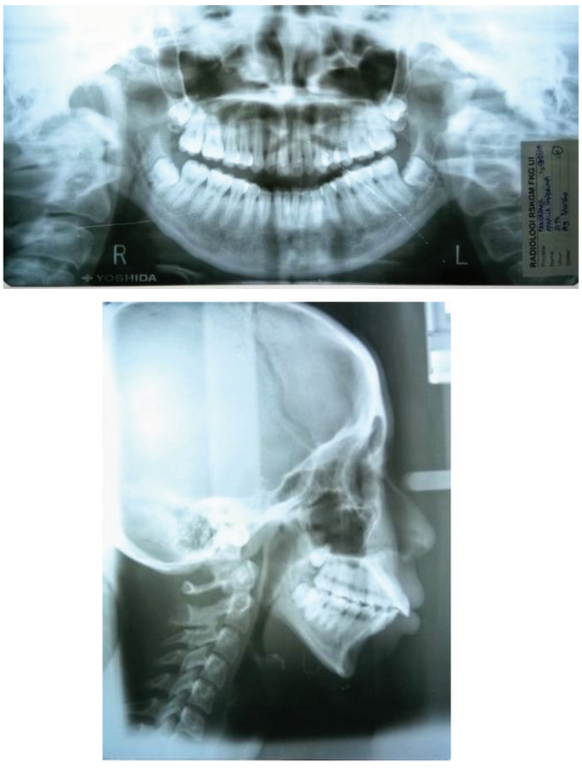

Figure 2. Pretreatment panoramic and lateral cephalometric radiograph

The combined approach of orthodontic treatment and orthognathic surgery with the extraction of all first premolars was considered because of the predictability of this treatment to reduce skeletal discrepancy in terms of facial esthetics. In the case report presented here, however, the surgical approach to treatment was refused by the patient. The second alternative was a dentoalveolar camouflage treatment using an orthodontic fixed appliance, with extraction of the upper first premolars and the use of miniscrew implants to provide maximum anchorage.

Treatment objectives were correcting lip protrusion and lower anterior crowding, reducing overbite and overjet, achieving a stable and functional occlusion by establishing Class I incisor and canine relationship, and obtaining pleasant smile and profile. We planned to extract the maxillary first premolars and use the miniscrew implants as the anchorage to reduce the labial inclination of the upper incisors.

After extraction of the maxillary first premolars, a 0.022 in. pre-adjusted edgewise appliance with a 0.014 in. nickel-titanium wire in both arches was applied. After leveling and alignment of the maxillary and mandibular arch, two miniscrew implants (diameter: 1.6 mm; length: 5 mm; JEIL dental implant system; JEIL Medical Corp., Korea) were placed in the interradicular area between the upper second premolar

Figure 3. Post-treatment extraoral and intraoral photographs

Figure 4. Post-treatment panoramic and cephalometric radiograph

and first molar on both sides as the anchorage and a 0.017×0.025 in. stainless steel wire was applied to induce space closure of the extraction spaces using sliding mechanics. The total active treatment period was 16 months. Essix retainers were placed on the maxillary and mandibular dentition after removing the fixed appliance.

The treatment objectives were achieved after 16 months of treatment. An improved facial profile, stable functional occlusion, and pleasant smile were achieved. Post-treatment intraoral photographs showed well-aligned arches and proper intercuspation. Acceptable overbite and overjet were achieved with Class II molar relationships and Class I canine relationships on both sides (Figure 3).

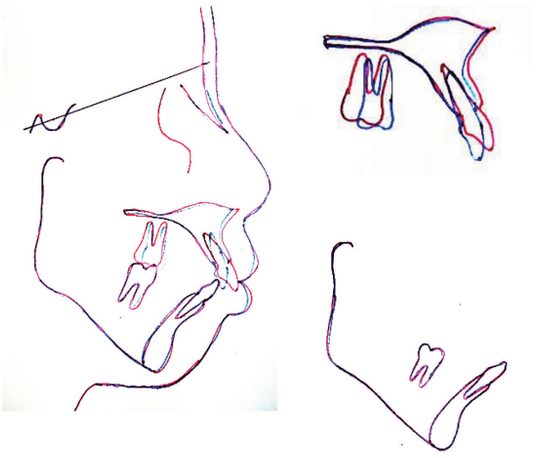

Figure 5. Superimposition of pretreatment and post-treatment cephalometric radiograph

Table 1. Pretreatment and post-treatment cephalometric analysis

Parameter	Pretreatment	Post-treatment
SNA	82°	80°
SNB	68°	69°
ANB	14°	11°
The Wits	7 mm	4 mm
Angle of Convexity	31°	26°
Interincisal Angle	102°	107°
UI-SN	109°	105°
UI-PP	115°	111°
UI-APg	15 mm	10 mm
Upper lip – E line	9 mm	6 mm
Lower lip – E line	10 mm	9 mm

A post-treatment panoramic radiograph showed a decent root parallelism without distinct apical root resorption (Figure 4). Post-treatment cephalometric radiograph showed some improvements. Although a skeletal Class II relationship and the hyperdivergent growth pattern remained, the jaw–base relationship was improved by the change in the ANB angle from 14° to 11°. The maxillary incisors were retracted. An acceptable upper incisor inclination (UI-MxP 111°) was achieved (Figure 4).

DISCUSSION

This case report discusses the management of severe skeletal Class II division 1 malocclusion in a 21- year-old Indonesian female complaining the appearance of her protrusive anterior teeth that bite her lower lip and cause recurrent stomatitis. Extraoral examination showed the lips are incompetent with a 5 mm distance between the upper and lower lips, whereas intraoral examination revealed an upper incisor protrusion with a 7 mm overjet and mild crowding on the lower anterior. Cephalometric examination before treatment showed ANB 14° angle value (SNA 82°; SNB 68°), convex skeletal profile (angle of convexity 31°), and protrusive inclination of upper incisors (UI- PP 115°).

The diagnosis of this patient was established by considering the characteristics of skeletal Class II malocclusion. In these patients, the lower incisors are proclined because of dentoalveolar compensation that directed the upper and lower incisors to occlude. In addition, the patient has Class II canine relationships on both sides. On the basis of the results of the medical history, objective examination and radiographic examination showed the patient had Class II skeletal malocclusion with the retrognathic mandible. On the basis of this examination, we can conclude that one of the causes of malocclusion in these patients is skeletal factors. In addition, the soft tissue factor that plays a role in this case is the patient's lips are incompetent and thus require circumoral muscle activity to achieve lip- to-lip seal. This phenomenon caused dentoalveolar compensation in these patients, characterized by inclination of the protrusive lower incisor (LI-MP 100°).[5]

Appropriate diagnosis and anchorage control in adult patients with severe skeletal Class II discrepancy are key to successful orthodontic treatment. This patient was suspected to have a mouth breathing habit due to a history of allergic rhinitis. The presence of upper airway obstruction caused the patient to find an alternative way of breathing through the mouth; however, this way of breathing affects the orofacial muscles and head posture, which can lead to deviation of facial growth pattern and emergence of dentofacial deformity, respectively.[6–9] In this patient, upper airway obstruction was characterized by obstruction in the nasal cavity as observed in the panoramic radiograph and obstruction in the nasopharynx as observed in the lateral cephalometric radiograph. In addition, the lateral cephalometric radiograph showed a severe skeletal Class II pattern with clockwise mandibular rotation and protrusive incisor inclination.

The ideal treatment for severe Class II skeletal discrepancy of this patient is a combination of orthodontic and orthognathic surgery. According to Berg et al. (1979), a combination of orthodontic and orthognathic surgeries is indicated in patients with large overjet (≥10 mm), ANB angle ≥7°, and MMPA angle ≥40°. After explanation of various treatment options, the patient refused to undergo orthognathic surgery. Therefore, camouflage orthodontic treatment was selected in this case.[10]

Treatment of Class II division 1 malocclusions is generally performed to correct overjet by retracting the upper anterior teeth accompanied by the extraction of the upper first premolar to obtain space. On the basis of the envelope of the discrepancy diagram, the change that can be achieved by orthodontic tooth movement is a maximum of 7 mm for correction of overjet by retracting the upper incisor teeth. Extraction of the upper premolar provides 7–8 mm of space and a 7 mm incisor retraction requires bone anchoring at the space closure phase to correct overjet. Maximum anchorage using the bone anchor (miniscrew implants) is required in this case to allow 75% of the extraction space to be used for anterior teeth retraction, which can improve the patient's facial profile. The biomechanics of en-masse space closure using miniscrew implants is also beneficial for high-angle cases with less molar mesialization or anchorage loss because reactive force does not occur in molars.[4,11,12]

After 16 months of treatment, a 2 mm overjet, 2 mm overbite, Class I incisor relationship, Class I canine, and Class II molar relationship on both sides were achieved. According to Uhde et al. (1983), treatment of Class II malocclusion with extraction of upper premolars is obtained in Class II molar relationships.[10] After 16 months of treatment, the lateral cephalometric measurements of the patients showed some changes in the horizontal skeletal parameters: the ANB angle value from 14° to 11° and the angle of convexity value from 31° to 26°. Changes also occurred in the dental parameters: in the interincisal angle value from 102° to 107°, UI-SN angle value from 109° to 105°, and UI-PP angle value from 115° to 111°. These changes occurred because of the change in point A caused by retraction of the upper anterior teeth. The change in point A also affected the angle of convexity and the inclination of upper incisors. Changes also occurred in soft tissue parameters, namely, the position of the upper and lower lips to the E-line. Retraction of the upper anterior teeth caused changes in the position of the upper lip to the E-line from 9 mm to 6 mm in front of the E-line. In addition, the patient's interlabial gap changed from 5 mm to 2 mm.[4,11,12]

CONCLUSION

An accurate orthodontic diagnosis allowed the identification of the components of the skeletal discrepancy and the successful correction of the malocclusion. Non-surgical orthodontic treatment using fixed appliance and extraction of the upper first premolars followed by placement of miniscrew implants

in the posterior regions of the maxilla as the anchorage are effective for camouflaging a high- angle skeletal Class II discrepancy. This technique minimizes possible reciprocal effects, requires minimal patient compliance, and is useful for the correction of high-angle cases in adult patients.

CONFLICT OF INTEREST

No conflicts of interest are related to this case report.

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