CASE REPORT

Treatment of Dental Class-II, Division 2 Malocclusion Associated with a Deep Anterior Overbite: A Case Report Orthodontic Camouflage

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Abstract

Aim: This study sought to correct the assessment of orthodontic camouflage treatment to provide a harmonized soft-tissue profile, consistent occlusion, and a pleasant smile.

Background: Class-II, division 2 malocclusions can be treated through dental compensation and growth modification methods instead of surgical–orthodontic treatment, which can be determined by the growth and age of the patient.

Case description: This case report was of a 14-year-old Chinese female whose chief complaint was crowding of anterior teeth and required treatment for the same. On necessary clinical and radiographical examination, diagnosis of convex facial profile with class-II, division 2 malocclusion was arrived and hence treated with orthodontic camouflage. On treatment completion of 33 months, cephalometric assessment revealed that the anterior maxillary teeth had been successfully intruded and substantially distalized, with a slight counterclockwise rotation of the mandible. The treatment results and profile changes were demonstrated with good patient cooperation.

Conclusion: Using a utility arch with orthodontic camouflage treatment can help to reinforce molar anchoring and improve a deep bite in the maxillary dentitions. The patient was treated with the devised treatment plan and acceptable results were obtained with patient satisfaction as recorded after 1 year of follow-up.

Clinical significance: To correct a maxillomandibular discrepancy, an orthodontist may conduct a process known as camouflage therapy without necessity of surgery. However, patient selection forms a crucial role, and hence systematic arrival of the diagnosis and treatment protocol is a pivotal factor.

Keywords: Deep overbite, Dental class-II, Division 2 malocclusion, Fixed orthodontic treatment, Gummy smile.

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Introduction

Angle class-II, division 2 malocclusion is uncommon in contrast to other types of malocclusion.[1] The maxillary incisors' retroclination, a deep bite, and an obtuse interincisal angle are the most common characteristics of this malocclusion.[2]

A deep bite improvement with a gummy smile in the treatment of a class-II, division 2 malocclusion is a difficult treatment goal to achieve. Conventional orthodontic methods for reducing overbite, such as an intrusive arch, have often resulted in flaring of the posterior teeth and undesirable extrusion.[3] In many patients, the extrusion of the posterior teeth causes a clockwise rotation of the jaw, which worsens the class-II convex profile; in adults, it causes an increase in the relapse incidence.[4] To decrease overbite, extraoral appliances such as the J-hook are effective in anchorage control, however, it is difficult to expect the final outcome in uncooperative subjects.[5] Age range of using such extraoral appliances was better to use in the growing patient. However, it is not also limited to growing patients, it also can be applied to no growing patients. The effectiveness of headgear is totally dependent on patient compliance in wearing the appliance, and it is well-known that patients frequently overestimate the amount of time they wear headgear.[6]

In growing patients, molar extrusion promotes the growth of the mandible, increases lower anterior facial height, and there is some degree of steadiness. On the other hand, for adult subjects, extrusion of the molar is not indicated due to concerns about the stability of the procedure.[7]

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In hyperdivergent patients, during orthodontic treatment, controlling vertical dimensions is extremely important.[8–13] Although much research has been conducted to examine this concern from various angles, the factors that influence vertical dimensions are not clearly identified.[12,13] This may be due to different methods used in each treatment.

For guiding growth in hyperdivergent individuals or controlling vertical dimensions, several strategies have been presented, involving treatment mechanics or treatment plan considerations.[8,11] These include extraction treatment to move molars forward and reduce the "wedge-type effect," high-pull headgear (instead of low-pull headgear), Nance appliance, palatal bar, posterior bite-block, or posterior magnet to control vertical molar movement or even intrude molars.[13]

This case report describes the treatment of a class-II, division 2 malocclusion patient. An unaesthetic smile can be transformed into a more attractive one by routine camouflage orthodontic treatment with extraction of premolars followed by retraction and closure of spaces.

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Conflict of interest: None

Case Report

Case Description

A 14-year-old Chinese female reported to Lanzhou University, Department of Orthodontic in August 2018, Gansu province, Lanzhou city, with a chief complaint of crowding of anterior teeth and a gummy smile and required treatment for the same. On extra-oral examination, symmetrical face on both sides with gummy smile was observed. During spontaneous smiles, the patient's gummy smile could be seen, and gingival exposure was measured at 4 mm in the present case.

No evidence of temporomandibular joint abnormalities was detected. The range of mouth opening was three fingers, and the nasolabial angle was within the normal range (Table 1).

Table 1: Pretreatment and posttreatment cephalometric measurements

Cephalometric value	*Normal*	*Pretreatment*	*Posttreatment*
Skeletal relationship			
SNA (°)	82.8 ± 4.0	80	81
SNB (°)	80.1 ± 3.9	77	78
ANB (°)	2.7 ± 2.0	3	3
Wits (mm)	−0.8 to 2.5	−2.5	−1.5
A-Np (mm)	1 ± 2	−2 mm	1 mm
Pog-Np (mm)	−2 ± 2	−5 mm	−1 mm
CO-A (mm)	78 ± 4	69 mm	71 mm
CO-GN (mm)	106 ± 2	99 mm	104 mm
Vertical relationship			
MP-SN (°)	32.5 ± 5.2	38	40
FH-MP (°)	31.1 ± 5.6	30	36
Y axis (°)	64 ± 2	65	63
S-GO/N-Me	62–65	67.2%	64.8%
ANS-Me/N-Me	55 ± 2.5	57%	75.6%
Dental relationship			
U1-L1 (°)	125.4 ± 7.9	139	127
U1-NA (mm)	5.1 ± 2.4	5 mm	3.5 mm
U1-NA (°)	22.8 ± 5.7	16	22
U1-SN (°)	105.7 ± 6.3	96	103
L1-NB (mm)	6.7 ± 2.1	5 mm	5 mm
L1-NB (°)	30.3 ± 5.8	23	29
L1-MP (°)	92.6 ± 7.0	88	92
Soft tissue			
NLA (°)	80–110	87 mm	95
LL-EP (mm)	1.5 mm	2 mm	−2 mm
UL-EP (mm)	0 mm	2 mm	−1
Airway space			
Upper airway	17.4 (≥5 mm)	11 mm	14 mm
Lower airway	10–12 (≤15 mm)	6 mm	5 mm

Lip incompetence was noted. The patient did not report any habits. On intraoral examination, retroclined maxillary central incisors, anterior teeth crowding, deep overbite, hyperdivergent facial pattern caused by mandibular anterior teeth supereruption, excessive maxillary incisor display, class-II dental connections, deep curve of Spee, and a long face were recorded. Lower incisors' retroclination and narrow intercanine width, because the lower labial portion was trapped behind the upper labial portion, was observed. The lower midline deviation to the right from the facial midline by about 1.5 mm was recorded (Fig. 1; Table 1). Class-I molar relationship on the left side and class II on the right side were observed. Due to inconsistent spacing, the relationship of the canine on the right was classified as class II. The maxillary and mandibular arch space required are –1.5 mm and –3.5 mm, respectively. The patient had a smaller anterior Bolton ratio than the normal ratio. The panoramic radiograph revealed permanent teeth in all quadrants, and all third molars were underdeveloped and impacted. Reduced labial bone was observed in the maxillary upper two central incisors and canines, and mandibular canines and first premolar (Fig. 2).

The lateral cephalometric radiograph showed the horizontal relationship: a skeletal mandibular class-I relationship (SNA, 80; SNB, 77; ANB, 3; Wits appraisal, –2.5 mm; with an increase in the interincisal angle, 139). While the vertical relationship showed a high growth pattern (SN-MP, 38), the mandibular and maxillary incisors in relation to UA, UB lines were decreased (U1-NA angle; 16, L1-NB angle; 23) with low SN, MP planes (U1-SN; 96) and (L1-MP; 88), whereas the lips were protruding (Fig. 2, Table 1). Based on the observations recorded, the patient was diagnosed with skeletal class I but dentally class-II subdivision 2 malocclusions.

Therefore, the following treatment objectives were drawn: improve the relationship of the jaws, to achieve skeletal and dental class-I relationship on the right side and an ideal overjet and overbite with correction of lower midline deviation, and hence the overall improvement of the facial profile with elimination of crowding and satisfactory alignment of teeth.

Thus, the patient was given the choice of (1) surgical orthodontic treatment with distalization of upper posterior teeth by using high-pull headgear with a trans-palatal arch or intrusion mechanics with a segmented wire and a mini-implant, (2) use of functional appliances owing to the growing period of the patient, and (3) camouflage orthodontic treatment with extraction of premolars followed by retraction and closure of spaces. The patient and her guardians refused the initial two treatments due to the comparatively long time period and chose the third treatment protocol that was implemented accordingly after obtaining their consent.

The Treatment Protocol Followed

Upon extraction of upper first premolars and lower second premolars (14–24, 35–45), fixed appliance for leveling and alignment – MBT bracket of 0.022 × 0.028 – in slots was bonded to the teeth in both arches. The maxillary and mandibular arches were first leveled and aligned using 0.012, 0.014, 0.016, 0.018, and 0.020 NiTi archwires in accordance with the MBT sequence. On completion of leveling, 2 miniscrews were implanted between 15, 16, and 25, 26.

Before miniscrew implantation, on a panoramic view, the interradicular bone integrity at the specified region was verified. This was followed by the utility arch used for the intrusion of

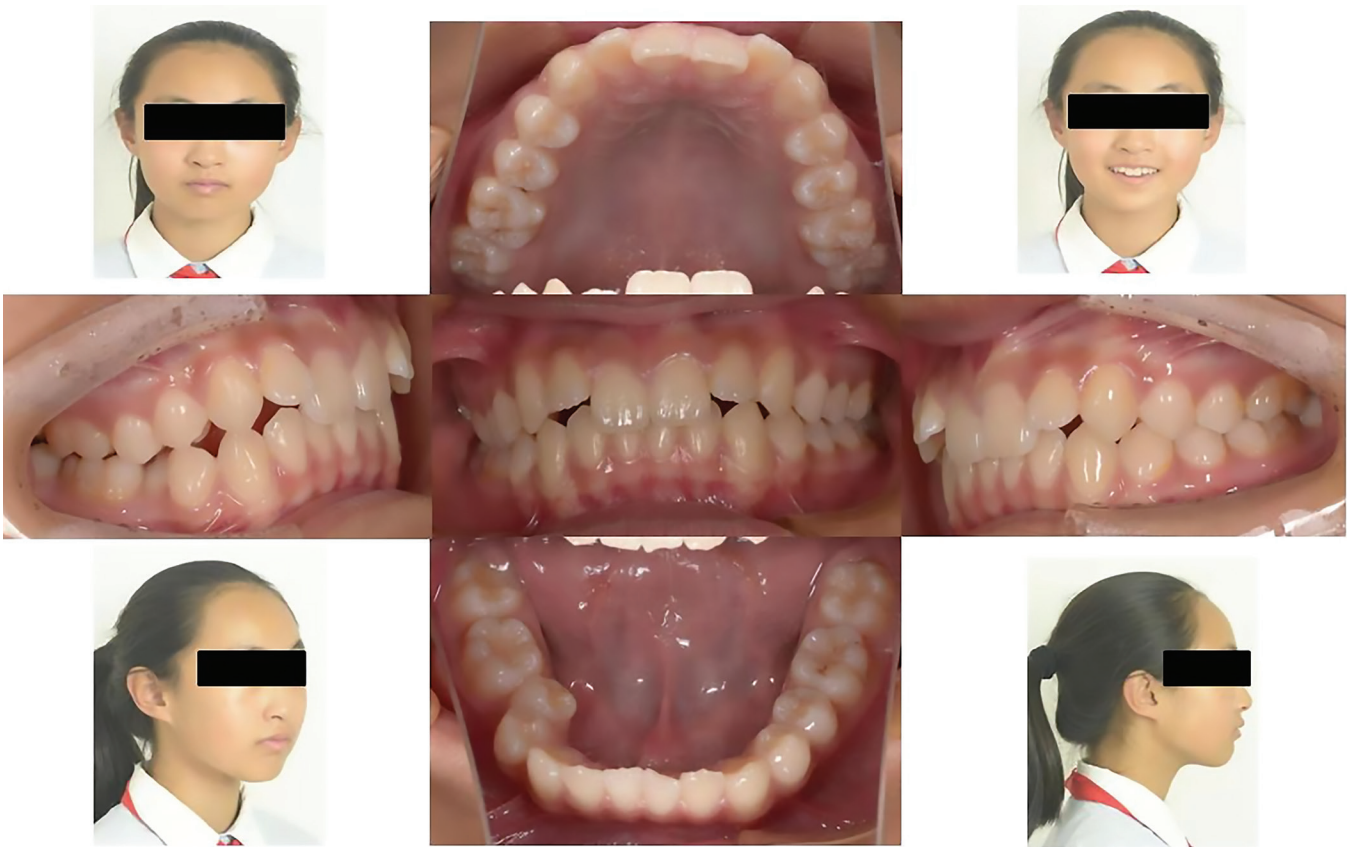


Fig. 1: Pretreatment extraoral and intraoral photographs

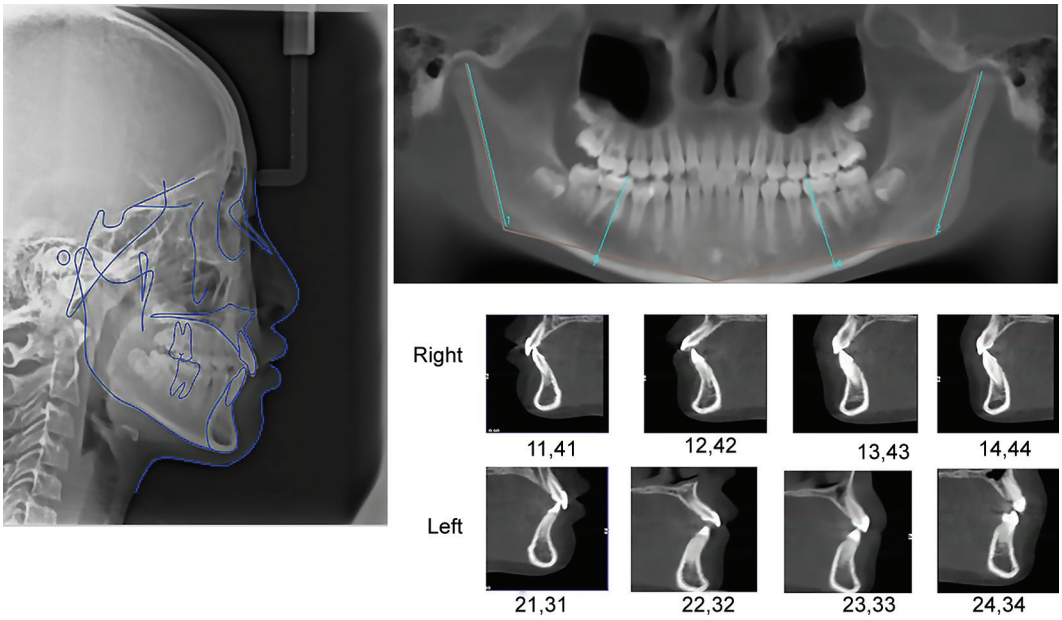


Fig. 2: Pretreatment lateral cephalogram and panoramic radiographs

the lower and upper incisors, with some molar extrusion and distalization of lower molars in order to correct the lower curve of Spee (Fig. 3). Space closure and retraction were conducted by use of 0.019|| × 0.025|| rectangular NiTi followed by 0.019|| × 0.025|| stainless-steel rectangular wires. To maintain a class-I molar relationship bilaterally, absolute anchorage with TADs in the upper and lower arches was used. After 33 months, on achieving the desired results, rebracketing was conducted, and post-treatment analysis was conducted. On intraoral examination and dental cast analysis – class-I molar and canine relationship were successfully achieved. Sufficient overjet of 1 mm and overbite of 1 mm (10%) were achieved (Fig. 4A). Intermolar width increased from 48 to 49 mm in the maxilla and 46.9 to 47 mm in the mandible. The midline shifted closer to the middle, and the spee curve shifted to 1 mm on the left and 1 mm on the right side. Lips competence was achieved (Figs 4A and B). Skeletal and dental class I on the right side was achieved as presented by post-treatment panoramic radiograph with parallel roots, except for mandibular second molars (Fig. 5A). The post-treatment cephalometric analysis revealed that anterior maxillary teeth had been successfully intruded and had been substantially distalized, with a slight counterclockwise rotation of the mandible (Fig. 5B). The SNA and SNB angle was increased by 1°, this helped in the remaining ANB angle in the same boundaries as before treatment, and decreased Wits appraisal value to –1.5°. Vertically, the angle of the mandibular plane was slightly increased by 2°. The lower anterior facial height increased and the maxillary and mandibular incisors were labially proclined, and the angle formed between U1 and L1 was decreased to 127° (Fig. 5B) (Table 1). The superimpositions showed that the intrusion of the anterior maxillary teeth was the primary factor responsible for the deep overbite correction (Fig. 6A). This was followed by retention by means of Hawley's retainer that was provided with its maintenance instructions. The use of the retainer was advised for 2–3 years. The patient was recalled at regular intervals for follow-up and was also suggested to seek restorative treatment for the molars. Upon 1-year follow-up, the orthodontic treatment results were stable, and the patient was satisfied with the treatment (Fig. 6B).

Discussion

There are several factors that contribute to the development of gummy smiles, including the excessive eruption of the maxillary incisors, the upper-lip elevator muscle hyperactivity, short upper lip, and vertical maxillary excess (including a posterior smile).[14]

In some circumstances, the crown length of the upper lateral incisors is short that escapes the lower-lip action, they will rest at an average inclination, while the central incisors will lie at a retroclined position with slight mesiolabial rotation and crowding. In other words, when the lower-lip line is high relative to the upper incisors, a class-II, division 2 malocclusion can result.[15] The maxillary incisors' excessive eruption appeared to be the most significant component in this patient's case. Thus, we believed that after remodeling the alveolar bone and gingiva of the incisors, intruding the extruded maxillary incisors would improve the gummy smile. Intrusion archwire systems such as an intrusion base arch or utility arch are frequently used for incisor intrusion.[3]

In the Asian population, a bimaxillary dentoalveolar protrusion is quite common.[16] Kocadereli et al.[17] found that retracting incisors and extracting premolars are a viable option when a decrease in lip procumbency is desirable.

It is recognized that closing of the extraction sites can be accomplished through the anterior-segment retraction, posterior-segment protraction, or a combination of the two. When it is indicated to prevent posterior-segment mesial movement in the anteroposterior dimension, this is referred to as maximum anchoring.[18]

This patient was a hyperdivergent growth pattern. Control of anchorage is crucial in hyperdivergent growth pattern patients due to their weaker musculature,[19] very weak occlusal forces,[20] and narrow lingual and buccal cortical plate.[21] Anchorage in the maxilla was achieved in this case with the placement of a miniscrew implant between the 2nd premolar and 1st molar on both sides. So far, implant anchorage, miniscrews,[22] and microscrews[23] have

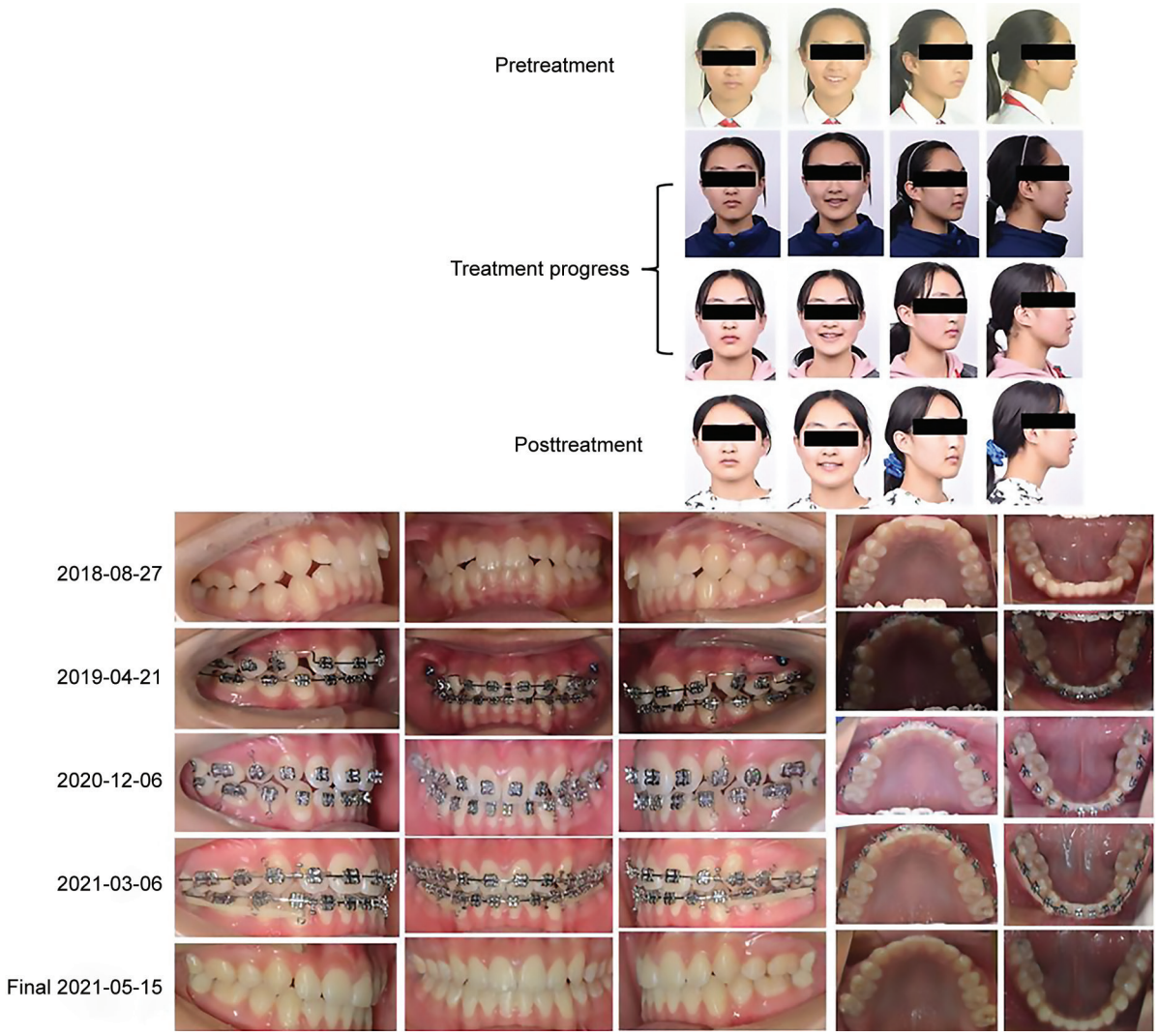


Fig. 3: Pre- and posttreatment extraoral and intraoral comparison photographs

proven to be effective skeletal anchorage devices in terms of clinical efficacy and stability. This can be used to provide a strong anchor for the movement of the tooth, which is not possible with conventional methods.

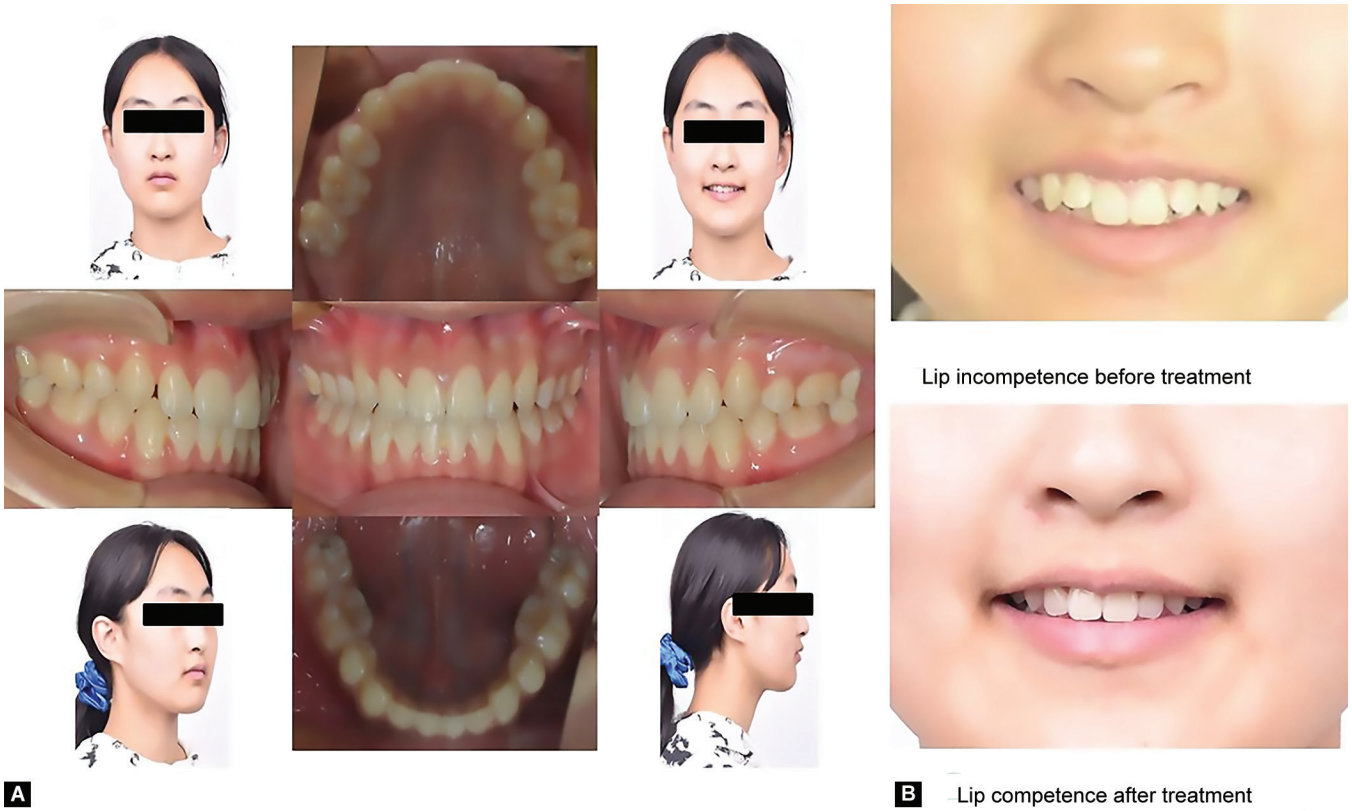
In orthodontic clinics, individuals with hyperdivergent skeletal patterns and class-II usually present with a convex profile, which is frequently their chief complaint. Orthognathic surgery can entirely resolve the restricted upper airway and the problems of abnormal profile.[24] But the majority of patients consider it too aggressive and hence refuse the treatment.

In this patient, distal movement and maxillary incisor intrusion were required to correct the overjet and overbite. The profile of those with mild-to-moderate skeletal discrepancies can be improved with orthodontic camouflage treatment. This is usually accomplished by the extraction of teeth and using maximum anchorage.[25]

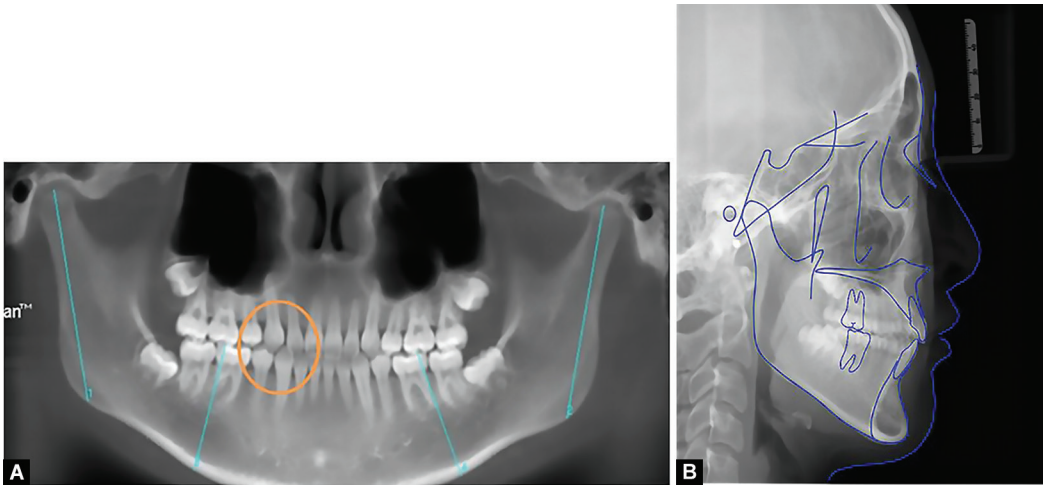
Patients with a steep mandibular plane and a class-II deformity have a smaller airway and are at higher risk of obstructive sleep apnea (OSA), especially Asians.[26]

In this case, the mandibular plane angle (Mp-SN = 38) was a high angle, however, the L1 – Mp = 88 is low. Accordingly, this deep bite was mainly caused by a dental problem, possibly related to retruclination of both the lower and upper anterior teeth.[27] There is only one way to reduce the interincisal angle: by proclinating either the mandibular or maxillary incisors, or both, and it should be corrected so that the tip of the mandibular incisor occludes onto the cingulum of the maxillary incisor.[28]

An association could be predicted between the position of the mandible and the upper-airway dimensions, including the mandible's vertical pattern[29] and the sagittal pattern.[30] Moreover, it was suggested that the mandible's vertical pattern might have a stronger effect on the upper-airway dimensions than the sagittal pattern. Measurements of airway space in neutral- and low-angle class-II patients were found to be no different from individuals with a skeletal class-I control group, according to the findings by Ozl et al.,[31] while space of the upper airway was significantly smaller in high-angle groups. The parents and patient were satisfied with the treatment result, since it improved her facial and dental esthetics substantially. Although the patient's profile and the anteroposterior relationship had improved, the MP-SN angle remained somewhat larger than normal due to the counterclockwise rotation of the mandible. And the mandible was retrusive. One year later, the patient's occlusion demonstrated an excellent class-I connection (Fig. 6B). To maintain long-term stability, continuous observation of the patient's growth is required.



Figs 4A and B: Photographs on completion of treatment of 33 months. (A) Posttreatment extraoral and intraoral photographs; (B) Lip changes pre- and posttreatment



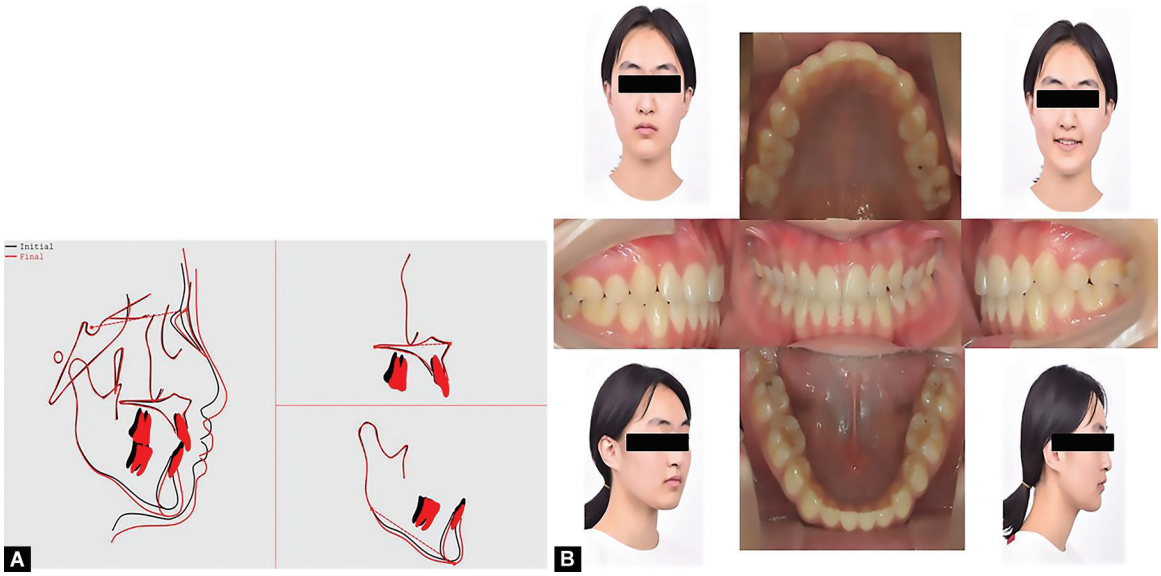
Figs 5A and B: Posttreatment. (A) Panoramic radiograph; and (B) Lateral cephalogram

Conclusion

A 14-year-old girl with a class-II molar relationship and a very deep overbite who complained of a gummy smile and anterior crowding was treated with Orthodontic Camouflage treatment with amini-implant, the utility arch, and fixed appliances. Severely retroclined and extruded maxillary incisors were proclined and intruded with utility archwire, this resolved the deep overbite and the gummy smile. The use of a utility arch in the maxillary dentitions is useful for reinforcing molar anchoring and improving a deep bite. Correcting a deep bite may be beneficial for improving stomatognathic function.

Authors' Contributions

EAA contributed to the investigation, methodology, and original draft preparation. AAA contributed to manuscript review and editing. BCC contributed to supervision and manuscript review and editing.



Figs 6A and B: (A) Pretreatment and posttreatment superimposition; (B) Posttreatment extraoral and intraoral photographs obtained after 1 year of treatment

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