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Improvement in the facial profile of an adult patient with bimaxillary protrusion: A case report

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Abstract

We herein present a case report of a 20-year-11-month-old Japanese female patient with bimaxillary dental protrusion and dental Class I malocclusion. The facial profile was a convex profile. A cephalometric analysis showed a skeletal class II relationship (ANB 6.5 degrees) with an overjet measuring 5.0 mm and an overbite measuring 1.0 mm. Both the upper and lower incisors were labially inclined. After treatment with straight edgewise appliances, the overjet and overbite measured 2.4 mm and 2.0 mm, respectively, and the patient showed an excellent improvement in the occlusion and a positive profile change. The occlusion was stable without relapse after a retention period of six years.

1. Introduction

Bimaxillary protrusion is a condition characterized by protrusive and proclined upper and lower incisors[1)]. Excessive protrusion of the incisors is revealed by prominent lips that are separated at rest, so that the patient must strain to bring the lips together over the protruding teeth[2)]. From a perspective of orthodontic treatment, there are two challenging points regarding bimaxillary protrusion. One point is the difficulty in deciding how much to treat the incisor prominence, because the lip prominence is strongly influenced by racial and ethnic characteristics. Bimaxillary protrusion is commonly observed in African-origin and Asian[3)-5)] populations. Additionally, the public preference for both lip and chin prominence are influenced by societal developments[6)]. A previous study reported that Japanese people tended to prefer a slightly more retruded lip position than the average[7)], while another suggested that bimaxillary protrusion had a high attractiveness and is well accepted in the Japanese population[8)]. The second point is the predictability of the soft tissue response to hard tissue retraction. Some authors have found a strong correlation between incisor and upper lip retraction, suggesting a close relationship between the soft tissue and the underlying hard tissue. Others have found that a definite proportional change or improvement in the soft tissue profile does not necessarily accompany extensive changes in the dentition[9)]. The present case report describes an adult patient who had bimaxillary dentoalveolar protrusion and was treated orthodontically by four premolar extractions, resulting in a change in the lip posture.

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2. History and diagnosis

A female Japanese patient presented to our practice at 20 years and 11 months of age. She complained of protrusion of the lips and an unstable occlusion. A clinical examination showed that her facial profile was of the convex type, with chin tension (Fig. 1). She showed an acceptable degree of incisal and gingival display on smiling. Her lips separated at rest and she demonstrated soft tissue chin strain during lip closure. No facial asymmetry was evident in the frontal view of the face. In centric occlusion (CO), the overjet and overbite measured +5.0 mm and +1.0 mm, respectively. The molar relationship was the Angle Class I on both sides. A shallow overbite was present at the anterior regions due to dentoalveolar protrusion of both the upper and lower jaws (Fig. 2). The maxillary dentition exhibited a V-shaped dental arch. The arch length discrepancies in the maxillary and mandibular arches measured -0.4 mm and -2.7 mm, respectively (Fig. 3). Temporomandibular joint disorders were not found.

A panoramic radiographic examination revealed the presence of all teeth, including erupted upper and lower third molars. There were no signs of root resorption or bone resorption (Fig. 4). A cephalometric analysis indicated a skeletal Class II relation-

Fig. 1.　Facial photographs (frontal and lateral views): A: Before treatment (20 years and 11 months old); B: Post-active treatment (23 years and 3 months old); C: Post-retention (29 years and 1 months old)

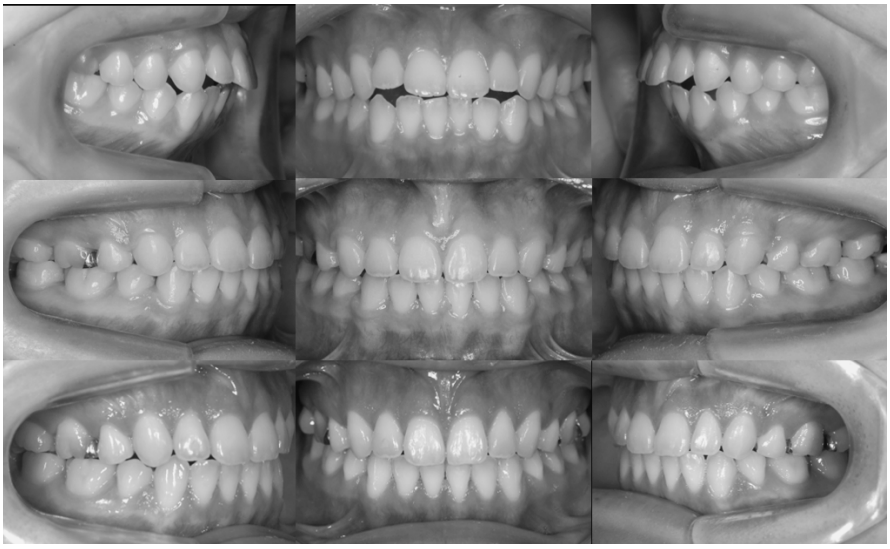

Fig. 2.　Oral photographs (frontal and lateral views): A: Before treatment (20 years and 11 months old); B: Post-active treatment (23 years and 3 months old); C: Post-retention (29 years and 1 months old)

Fig. 3. Oral photographs (occlusal views of the maxillary and mandibular dental arch): A: Before treatment (20 years and 11 months old); B: Post-active treatment (23 years and 3 months old); C: Post-retention (29 years and 1 months old)

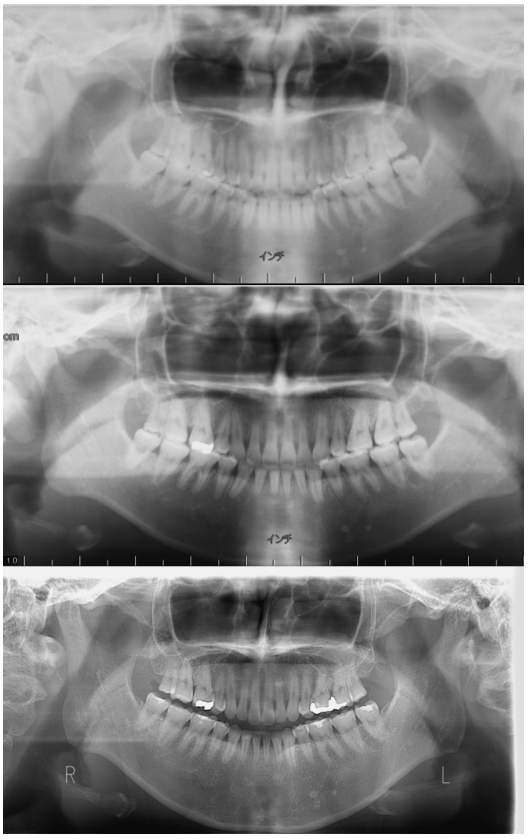

Fig. 4. Panoramic radiographs. A: Before treatment (20 years and 11 months old); B: Post-active treatment (23 years and 3 months old); C: Post-retention (29 years and 1 months old)

ship (ANB = 6.5°) (Table 1). The mandibular plane angle was within the normal range. Both the upper and lower incisors were labially inclined. The upper lip and the lower lip were 3.5 mm and 6.5 mm ahead of Rickett's E-plane.

3. Treatment plan and progress

The case was diagnosed as skeletal Class II with Angle Class I molar relationship malocclusion with bimaxillary dentoalveolar protrusion. The treatment objectives were to improve bimaxillary lip protrusion and obtain a good facial profile. The treatment plan was determined and included the following steps:

1) Extraction of the upper and lower first premolars;
2) Alignment of the upper and lower arches using 0.022-inch slot preadjusted edgewise appliances;
3) Distal movement of the canines; power chains were activated between the maxillary canine and the first molar with stainless steel rectangular wires;
4) Closure of spaces; after canine retraction, four incisors were retracted and space closure was performed with sliding mechanics for the anterior teeth of the upper arch;
5) Retraction of the lower incisors; the lower incisors were retracted en masse with stainless steel rectangular wires.

The active treatment time was 28 months. After removal of the edgewise appliance, wrap-around type

retainers were placed on both jaws. They were used full-time (except for meals and oral hygiene) for six months, 12 hours per day, during the following six months and while sleeping during the last six months of retention. After a retention period of 1.5 years, the patient was advised to use the retainer three nights a week while sleeping for an indefinite period of time. An acceptable overjet and overbite were achieved. The molar relationship was maintained at Angle Class 1. The cephalometric analysis indicated desirable and expected skeletal and dentoalveolar changes. The ANB angle was reduced from 6.5° to 3.0°, the SNA was reduced by 1.5° and the SNB was increased by 1.0°. The upper and lower incisors showed lingual inclination with a 13.0° decrease in the U1 to SN angle and a 10.5° decrease in the L1 to Mp. The superimposed cephalometric tracing illustrates the changes achieved with treatment (Fig. 5). Lip protrusion relative to the E-line improved: the upper lip, from 3.5 mm to 0.0 mm; the lower lip, from 6.0 mm to 0.5 mm (Table 1). The facial profile showed a remarkable improvement after treatment, and soft tissue chin strain disappeared during lip closure.

An acceptable occlusion was maintained without recurrence of the anterior open bite, indicating the long-term stability of the occlusion throughout the retention period.

4. Discussion

Bimaxillary protrusion is often accompanied by lip incompetence. Patients with an incomplete lip seal have a tendency to elevate the lower lip in order to maintain a lip seal. This elevation, due to contraction of the mentalis muscle, tends to flatten the mentolabial fold[10]. In the present case, the patient showed mentalis strain in her chin with attempted lip closure before the treatment. Lip incompetence in itself is not a clinical problem. Proffit[2] stated that mild separation is considered to be acceptable. However, inadequate lip coverage of the maxillary incisors was found to be a significant risk factor for traumatic injury to the maxillary incisors. Burden[11] concluded that inadequate lip coverage was the most important predictor of traumatic injury. There is some uncertainty about the influence of the lip posture on gingival health, however, a commonly occurring clinical phenomenon

Table 1.　Cephalometric Measurements

Measurement	Pre-treatment 20 years 11months	Post-treatment 23 years 3 months	Post-retention 29 years 2 months	Normative mean for Japanese female adult	
				Mean	SD
Angular(°)					
SNA	80.5	78.0	78.0	80.8	3.6
SNB	74.0	75.0	75.0	77.9	4.5
ANB	6.5	3.0	3.0	2.8	2.4
SN-Mp	40.0	39.0	38.7	37.1	4.6
FH-Mp	32.8	31.8	31.5	30.5	3.6
GoA	123.0	123.0	123.0	122.1	5.3
U1-SN	110.0	97.0	97.4	105.9	8.8
U1-FH	117.2	104.2	104.6	112.3	8.3
L1-FH	44.0	56.0	56.0	56.0	8.1
L1-Mp	100.5	90.0	90.0	93.4	6.8
IIA	99.3	127.8	131.4	123.6	10.6
Linear(mm)					
S-N	70.0	70.0	70.0	67.9	3.7
G-Me	75.5	75.5	75.5	71.4	4.1
Overjet	5.0	2.4	2.5	3.1	1.1
Overbite	1.0	2.0	2.1	3.3	1.9
Soft tissue profile(mm)					
Upper lip to the E-line	3.5	0.0	0.3	-0.4	1.7
Lowe lip to the E-line	6.0	0.5	0.0	1.6	1.7

is hyperplastic gingivitis in the upper incisor regions, where there is a lack of lip seal. Addy et al.[12] found that plaque and bleeding scores increased with decreasing upper lip coverage at rest. Kolawole et al.[13] described that the absence of lip coverage is thought to diminish the normal cleansing action of saliva so that plaque accumulation is encouraged, and dehydration of the tissues may also impair their resistance, making them more susceptible to gingivitis. According to Naini, the etiology of the lip prominence depends on several factors, such as lip thickness, reduced lower anterior face height, maxillary and/or mandibular dentoalveolar protrusion, and proclination of the incisors. This indicates that retraction of the incisor teeth will not always improve lip posture and reduce lip prominence. Furthermore, the diagnosis of bimaxillary protrusion is difficult because different racial groups and individuals within those groups have varied degrees of lip prominence that are independent of tooth position. Whether it should be treated or not depends on both the patient's perception and the cultural setting, not just on the objective evaluation. As a result, excessive bimaxillary protrusion must be a clinical diagnosis. It cannot be made accurately from cephalometric radiographs alone[2], such as an incisor angle. In conclusion, the esthetic lip profile preferences are subjective, thus the treatment goal of bimaxillary protrusion should be decided under the mutual agreement between the patient and the orthodontist. In the present case, we evaluated soft tissue lip protrusion progressively with the patient from the commencement of anterior teeth retraction. This method is useful for determining the amount of incisors retraction, which is difficult to precisely estimate before treatment because soft tissue reflection with respect to tooth movement is unpredictable. The patient, who was treated orthodontically by four premolar extractions, showed an improvement in the occlusion and an esthetically pleasing face with harmonious lip relationship was achieved. According to Keating[14], bimaxillary protrusion showed a 21% relapse in the interincisal angle during the retention period. One of the plausible reasons for the relapse of bimaxillary protrusion is the failure of tongue posture adaptation subsequent to orthodontic treatment. Retraction of the anterior teeth leads to a relative

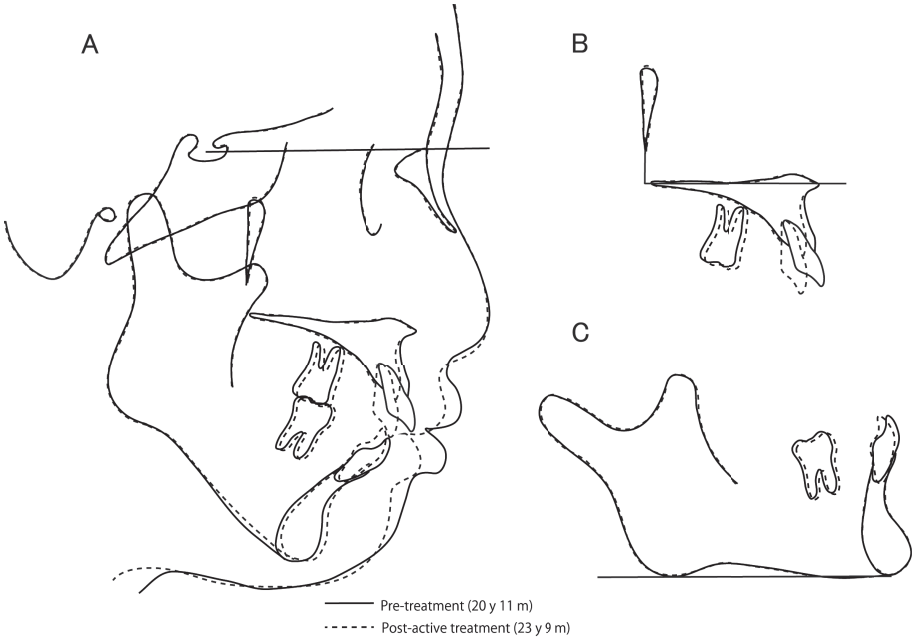

Fig. 5. Superimposition of the pretreatment and post-active treatment lateral cephalometric tracing: A: Superimposed on the SN plane at S; B: Superimposed on the palatal plane at Ptm'; C: Superimposed on the mandibular plane at Me. Solid line: before treatment (20 years and 11 months old); Dotted line: Post-active treatment (23 years and 3 months old)

increase in the tongue volume in the oral cavity. In this situation, the tongue will be pushed forward to increase the pharyngeal space, overcoming the lip force and resulting in the recurrence of bimaxillary protrusion. However, the thrusting tongue represents a brief, transient force application of the tongue against the anterior dentition, not a cause of malocclusions. Taslan et al.[15] studied adaptive changes in the tongue pressures when the tongue crib was placed on the palate using a pressure transducer. They stated that the significant decreases in the resting and swallowing pressures on the crib appliance at the 10th month after placement suggest tongue adaptation to the new position created by the appliance. Retraction of the anterior teeth appears to result in the tongue adapting to the new environment and subsequent elimination of the tongue thrust. For this reason, it is not surprising that the present case showed a stable occlusion without remarkable relapse and maintained an adequate lip seal after a long-term retention period of six years. Further investigations are necessary to confirm an evidence-based standardized orthodontic approach for bimaxillary dentoalveolar protrusion.

5. Conflicts of Interest

The author declares that there is no conflict of interest to disclose.

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