Case Report

Case of Severe Maxillary Protrusion Accompanied by Crowding and Scissor Bite

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Abstract

This case involved a 30-year-old woman who visited our hospital with the main complaint of protrusion of the maxillary incisors and upper and lower lips. She had difficulty closing her lips, and a chin button was observed when the lips were closed. The skeletal pattern showed maxillary protrusion and mandibular retrusion, and the mandible showed severe high angle. Labial inclination of both the maxillary and mandibular incisors was found, as well as crowding. In addition, the maxillary left second molar showed buccal displacement, and scissor bite was evident in the left second molar region. The bilateral molar relationship was cusp-to-cusp class II malocclusion. Angle class II maxillary protrusion accompanied by crowding and left second molar scissor bite was diagnosed. Surgical orthodontic treatment was judged as the best approach to treat the jaw deformities. However, in line with the wishes of the patient, treatment was undertaken using implant anchors instead. Straight-wire brackets with a 0.022-inch slot were fitted. A lingual arch was placed in the mandible and plate-type implant anchors in the first molar region of the maxilla. Almost no change was observed in skeletal pattern as no surgery was performed. The maxillary incisors moved back 10 mm, however, and the mandibular incisors showed an improvement of 4 mm from L1 to APo. The upper and lower lips consequently moved back 7 mm with respect to the E-line. Active treatment required 3 years and 6 months. Esthetic and functional improvements were achieved.

Key words: Maxillary protrusion — Severe high angle — Implant anchor — Orthodontic diagnosis — Scissor bite

Introduction

Recent years have seen an increase in the number of adults seeking orthodontic treatment. Esthetic improvement is in particular demand among such patients, and extraction is frequently indicated for correction of crowding or protrusion. Occasionally, however, cases are encountered in which extraction will not resolve the underlying issue, and one option in such patients is surgical improvement of the skeletal pattern. Another option is to increase the amount of tooth movement by means of implant anchors. This latter procedure has come into increasing use in recent years, and has shown good results in terms of improved outcomes. Two types of orthodontic implant anchor are
available: the plate-type and the screw-type. The type selected will depend on the direction, amount of tooth movement required, and site indicated by the diagnosis. In the case reported here, the diagnosis was jaw deformity for which surgery was initially deemed the most suitable therapeutic option. The patient was strongly opposed to this course of treatment, however, and other options were explored. Eventually, implant anchors were selected as the best alternative in terms of achieving a therapeutic outcome that would best satisfy the requirements of the patient. Satisfactory therapeutic outcomes were obtained. Patient consent was obtained for publication of this report.

**Case Report**

The patient was a 30-year-old woman who visited our hospital with the main complaint of protrusion of the maxillary incisors and upper and lower lips. She had been self-conscious about this protrusion since the upper grades of elementary school. Later, in her 20s, she became aware of increased crowding of the teeth, and was examined by an orthodontist at that time. She was subsequently told that surgery would be required, but took no further action. Her father and elder sister both showed maxillary protrusion, and her younger sister had crowding. The patient had a medical history of sinusitis from four years previously, and was concurrently attending the departments of dermatology, gynecology, and psychosomatic medicine. She also complained of anxiety and insomnia.

Examination at our department revealed marked protrusion of the upper and lower lips. The patient had difficulty closing the lips, and a chin button was observed when the lips were closed. There was no frontal view asymmetry, and in terms of balance the patient showed a slightly long face. A slightly gummy smile was also observed (Fig. 1).

Cephalometric X-ray revealed maxillary protrusion with a sagittal SNA angle of 85.5° and SNB angle of 76.5°; mandibular retrusion with a facial angle of 82.5° was also evident.

![Intraoral and facial photographs at pre-treatment](image-url)
The ANB angle thus showed a large value of $9^\circ$. Vertically, the FMA angle was $41^\circ$, the SN-MP angle $47.5^\circ$, and the Y-axis $69^\circ$. Therefore, the mandible showed a severe high angle. The maxillary incisors showed labial inclination, with U1 to SN of $110^\circ$, and considerable forward displacement, with U1 to APo of 19 mm. The mandibular incisors showed a labial inclination, with FMIA of $42^\circ$ and considerable forward displacement, with L1 to APo of 10 mm. Consequently, the interincisor angle from the labial inclination of the maxillary and mandibular incisors was small, at $105.5^\circ$. As a result of protrusion of the maxillary and mandibular incisors, the upper lip protruded 8 mm and the lower lip 9 mm with respect to the E-line, giving the impression of bi-maxillary protrusion. From the frontal facial aspect, no particular asymmetry of the skeletal pattern was found. The maxillary and mandibular right lateral incisors were lingually displaced, with the center of the maxillary lateral incisor displaced 4 mm, and that of the mandibular lateral incisor 3 mm (Fig. 2, Table 1).

On the models, the maxilla showed a V-shaped arch, with clear forward protrusion

![Fig. 2 Tracing on pre-treatment cephalometric radiograph](image)

<table>
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<tr>
<th>Table 1</th>
<th>Measurements on pre-, post-treatment and retention cephalometric radiographs</th>
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<tbody>
<tr>
<td></td>
<td>Pre-treatment 30y1m</td>
</tr>
<tr>
<td>SNA (deg.)</td>
<td>85.5</td>
</tr>
<tr>
<td>SNB (deg.)</td>
<td>76.5</td>
</tr>
<tr>
<td>ANB (deg.)</td>
<td>9</td>
</tr>
<tr>
<td>Facial angle (deg.)</td>
<td>82.5</td>
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<tr>
<td>Y-axis (deg.)</td>
<td>69</td>
</tr>
<tr>
<td>FMA (deg.)</td>
<td>41</td>
</tr>
<tr>
<td>SN-MP (deg.)</td>
<td>47.5</td>
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<tr>
<td>Gonial angle (deg.)</td>
<td>138.5</td>
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<tr>
<td>Occ. Plane to SN (deg.)</td>
<td>20.5</td>
</tr>
<tr>
<td>U1 to SN (deg.)</td>
<td>110</td>
</tr>
<tr>
<td>IMPA (L1 to MP) (deg.)</td>
<td>97</td>
</tr>
<tr>
<td>FMIA (deg.)</td>
<td>42</td>
</tr>
<tr>
<td>Interincisal angle (deg.)</td>
<td>105.5</td>
</tr>
<tr>
<td>U1 to APo (mm)</td>
<td>19</td>
</tr>
<tr>
<td>L1 to APo (mm)</td>
<td>10</td>
</tr>
<tr>
<td>E-line: Upper (mm)</td>
<td>8</td>
</tr>
<tr>
<td>E-line: Lower (mm)</td>
<td>9</td>
</tr>
<tr>
<td>Overjet (mm)</td>
<td>9</td>
</tr>
<tr>
<td>Overbite (mm)</td>
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of the maxillary central incisors, lingual displacement of the right lateral incisor, and buccoversion of the left second molar. The mandibular arch form was square, but there was severe crowding of the incisors and infra-labioversion of the right canine. The left second molar was lingually inclined, and scissor bite was observed in the left second molar region. The bilateral molar relationship was cusps-to-cusps class II malocclusion. Overall crown width was large in both the maxilla and mandible (Fig. 3).

The problems in the present case may be summarized as follows: 1) marked protrusion of the upper and lower lips; 2) severe high angle; 3) scissor bite in the left second molar region; 4) class II malocclusion of the molars; 5) excessive overjet; and 6) severe crowding. Based on these findings, Angle class II maxillary protrusion accompanied by crowding and left second molar scissor bite was diagnosed.

The treatment plan was as follows:
1) With regard to improving the skeletal pattern, the current status has to be maintained as the patient does not wish to undergo surgery. The maxillary dentition requires distal movement, however, so the direction of traction requires careful consideration if clockwise rotation of the mandible is to be avoided.
2) Crowding and labial inclination of the maxillary and mandibular incisors are to be improved by extraction of the first premolars. In the maxilla, in particular, the incisors and then the whole maxillary dentition will require distalization from the implant anchor to achieve class I occlusion of the molars.
3) The maxillary third molars will require extraction at an early stage; the second molars will need to be leveled, and the mandibular left second molar moved buccally to an upright position by a lingual arch in order to correct the scissor bite. The lingual arch will also reinforce the anchorage of the mandibular molars against mesial movement.

Treatment was performed as follows: Straight-wire brackets with a 0.022-inch slot were fitted. A lingual arch was placed in the mandible and plate-type implant anchors in the first molar region of the maxilla (Fig. 4). The active treatment period spanned 3 years and 6 months. As treatment involved adult orthodontics with no surgery, almost no change in the skeletal pattern was seen. The SNA decreased by 1° from 85.5° at pre-treatment.
to 84.5° at post-treatment. The SNB showed no change, and the ANB decreased from 9° to 8°. In terms of denture pattern, the U1 to SN of the upper incisors decreased from 110° at pre-treatment to 93° at post-treatment. The U1 to APo moved back 9 mm from 19 mm at pre-treatment to 10 mm at post-treatment. In the lower incisors, the IMPA improved from 97° to 83°, the FMIA from 42° to 56°, and the L1 to APo from 10 mm to 6 mm. Due to an improvement in the tooth axes of the upper and lower incisors, the inter-incisor angle increased from 105.5° to 136.5°. As a result, the upper E-line moved back from 8 mm to 1 mm and the lower E-line from 9 mm to 2 mm, a move of 7 mm in both the upper and lower lips. This yielded a clear esthetic improvement. The chin button, which appeared when the lips were closed, however, remained (Figs. 5–7, Table 1). Post-treatment panoramic radiography revealed considerable distal movement of the maxillary incisors, but no particular evidence of root resorption. In addition, the parallelism of the roots following treatment was satisfactory (Figs. 8, 9).

A wrap-around retainer was fitted to the maxilla and a 5-5 fixed-type retainer fitted to the mandible for retention. Use of the retainer was satisfactory: the maxillary retainer was worn throughout the day for the first 2 years, since which time is only been used at night. Use of a fixed-type retainer has con-
tinued in the mandible, with a check-up and cleaning still performed twice a year. At 2 years after the end of active treatment, no large retrogression has been observed (Fig. 10, Table 1).

Fig. 6 Tracing on post-treatment cephalometric radiograph

Fig. 7 Trace superimposition before (black line) and after treatment (dotted line)

Fig. 8 Pre-treatment panoramic radiograph

Fig. 9 Post-treatment panoramic radiograph
Discussion

The number of adults seeking orthodontic treatment has seen an increase over recent years. This particular group is characterized by the demand for esthetic improvement, problems with the number of teeth or periodontal disease, and the need to also take into account the social circumstances of the patient. Moreover, these are all issues which require a different approach to that which might be taken during orthodontic treatment during the growth period\(^\text{13}\). The present patient had very specific esthetic demands, which indicated a surgical approach as radical improvement was required due to skeletal maxillary protrusion arising from clockwise rotation of the mandible. However, the patient had previously attended a psychosomatic medicine department for anxiety and insomnia, and appeared emotionally unstable. Explanations were given on several occasions before the actual therapeutic strategy was decided, and it was more than 6 months before orthodontic treatment could be commenced. The patient wished for the labial protrusion to be corrected, but firmly resisted surgery due to fear of the procedure. Therefore, orthodontic treatment using implant anchors was eventually selected instead.

Each approach—surgical orthopedic treatment and orthodontics with implant anchors—has its own advantages and disadvantages\(^\text{1,11,16,17}\). Surgery can change the horizontal and vertical positional relationships of the maxilla and mandible\(^\text{4,9,20}\), whereas orthodontic treatment without surgery only moves the teeth, and cannot be expected to improve the skeletal pattern. However, surgery carries a number of risks associated with general anesthesia, intraoperative bleeding\(^\text{3}\), postoperative swelling and paralysis\(^\text{6}\), and postoperative temporomandibular joint problems\(^\text{7}\). Moreover, it is sometimes difficult for adults to spend the extended periods of time that will be required to recuperate in hospital.

Implant anchors used in orthodontic treatment may be either plate-type or screw-type, and each is used for different conditions. Plate-type implant anchors allow distalization of the whole dentition\(^\text{2,10,15,18}\). Placement, however, calls for a high degree of surgical skill, and problems with pain and swelling are sometimes seen postoperatively. Placement

Fig. 10 Intraoral and facial photographs at 2 years after end of active treatment
of screw-type anchors is simpler and can be performed by an orthodontist, and this type is indicated in cases where maximum anchorage is required\(^{12,19,21}\). Distalization of the whole dentition, however, is difficult, with this type. Therefore, plate-type implant anchors were selected in the present patient as it was necessary to distalize the whole maxillary dentition.

In the present case, it was realized that molar extraction would be possible due to the type of anchor being used\(^{16}\). One option was to leave the third molar and extracting the first or second molar. However, as the third molar was inferior in shape, the decision was made to extract the third molar and perform distalization with implant anchors.

In tackling the scissor bite in the left second molar region, we initially considered extracting the second molars, but eventually selected the third molar instead, as this would allow both sides to be treated with the same mechanics. The scissor bite showed an improvement early on in the course of treatment, which involved placing a lingual arch in the mandible, early leveling of the second maxillary molars, and use of cross elastics\(^{5}\).

No improvement was seen with respect to the clockwise rotation or anteroposterior relation of the mandible. Depression of the molars with implant anchors has been reported to improve open bite\(^{22}\). In the present case, however, it was necessary to distalize the whole dentition, so there was no depression or improvement of clockwise rotation. However, the maxillary premolars were extracted and the whole maxillary arch distalized, while maximum anchorage was obtained in the mandible with the lingual arch. Superimposition of the traces revealed that the maxillary incisors had distalized by 10 mm, and the maxillary molars by 3 mm. Backward movement of 7 mm was achieved with both the upper and lower lips, and the patient was satisfied with this improvement in protrusion after treatment. However, there was still some evidence of chin button after treatment, despite some improvement. If this is to be further improved, genioplasty may be required at some future time, but that will require patient consent.

The use of a retainer was satisfactory. The patient currently uses a wrap-around retainer at night for the maxilla, and still has a fixed-type retainer for the mandible. Over the course of 2 years postoperatively, almost no retrograde changes have been seen, and stable occlusion has been maintained. Retention will be continued.

### References


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