Patient with oligodontia treated with a miniscrew for unilateral mesial movement of the maxillary molars and alignment of an impacted third molar

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This report describes the treatment of a 20-year-old woman with a dental midline deviation and 7 congenitally missing premolars. She had retained a maxillary right deciduous canine and 4 deciduous second molars, and she had an impacted maxillary right third molar. The maxillary right deciduous second molar was extracted, and the space was nearly closed by mesial movement of the maxillary right molars using an edgewise appliance and a miniscrew for absolute anchorage. The miniscrew was removed, and the extraction space of the maxillary right deciduous canine was closed, correcting the dental midline deviation. After the mesial movement of the maxillary right molars, the impacted right third molar was aligned. To prevent root resorption, the retained left deciduous second molars were not aligned by the edgewise appliance. The occlusal contact area and the maximum occlusal force increased over the 2 years of retention. The miniscrew was useful for absolute anchorage for unilateral mesial movement of the maxillary molars and for the creation of eruption space and alignment of the impacted third molar in a patient with oligodontia. (Am J Orthod Dentofacial Orthop 2013;144:430-40)

Oligodontia is the rare congenital absence of more than 6 permanent teeth, excluding the third molars. 1-5 The spaces created as a result of congenitally missing permanent teeth are often corrected using prosthetic appliances, tooth transplantations, or orthodontic treatment. 5-8 However, orthodontic treatment can be difficult in patients with oligodontia if the required distance for tooth movement is large and few teeth are available for anchorage. 1,5 Recently, miniscrews have been used for absolute anchorage in various types of procedures involving tooth movement. 4,5,8-15 In a patient with skeletal Class III and oligodontia, miniscrews and anchorages wires were used in the retromolar area for mesial movement of the mandibular molars. 4 In another patient with skeletal Class III, miniscrews were used to close the unilateral maxillary extraction spaces of the molars. 13 However, there have been few case reports in which miniscrews were used for absolute anchorage to move molars mesially. 4,13,14 Additionally, to our knowledge, there have been no case reports describing the use of miniscrews in the mesial movement of molars for alignment of an impacted third molar in a patient with a skeletal Class II relationship and oligodontia. This case report demonstrates successful treatment with miniscrews to enable unilateral mesial movement of the maxillary molars in a patient with oligodontia.

DIAGNOSIS AND ETIOLOGY

The patient was a 20-year-old woman with the chief complaint of maxillary and mandibular dental midline deviations to the left and crowded mandibular anterior teeth. Her facial profile was mildly convex, and she had a mildly gummy smile (Fig 1). She had a 5.0-mm overjet and a 4.0-mm overbite with a 1.5-mm mandibular arch length discrepancy. An asymmetrical relationship between the canine and the first molar, and dental midline deviations from the facial midline were observed. These abnormalities were due to oligodontia; 7 premolars were congenitally missing, and she had a maxillary...
right deciduous canine and 4 deciduous second molars. The right canines had Class III occlusion, and the right first molar had Class II occlusion. Both left canines and first molars showed Class I relationships (Figs 2 and 3). The panoramic radiograph indicated no root resorption in the deciduous molars, and the maxillary right third molar was impacted. Dental caries was noted in the maxillary right deciduous second molar (Figs 2 and 4).

Lateral cephalometric analysis indicated a skeletal Class II jaw-base relationship with an ANB angle of 6.5° and an average mandibular plane angle of 32.0°. The lingual inclination of the maxillary central incisor to the Frankfort plane angle was slightly small (104.5°). The relationship of the mandibular central incisors to the Frankfort plane angle (52.0°) was normal (Fig 4, Table I).16 The frontal cephalometric analysis showed that the mandible was not deviated, but the maxillary and mandibular dental midlines had deviated by 3.0 mm to the left of the facial midline (Fig 4).

The maximum occlusal force and the occlusal contact area were examined using an occlusal force recording system (Dental Prescale & Occluzer; Fuji Film, Tokyo, Japan)17-19 and were found to be normal compared with those in normal subjects (Table II).17

This patient was diagnosed as having a malocclusion with oligodontia, maxillary and mandibular dental
Fig 3. Pretreatment dental casts (age, 20 years 9 months).

Fig 4. Pretreatment radiographs (age, 20 years 9 months).
midline deviations, mandibular anterior crowding, an impacted maxillary right third molar, a mildly gummy smile, and a skeletal Class II jaw-base relationship.

**TREATMENT OBJECTIVES**

Treatment was planned as follows: (1) extraction of the maxillary and mandibular right deciduous second molars; (2) mesial movement of the maxillary molars with a miniscrew, mesial movement of the mandibular molars, distal movement of the mandibular right first premolar, and retraction of the mandibular canine with preadjusted edgewise appliances on the right side (Fig 5, A); (3) space closure to improve the mandibular midline deviation; (4) bite opening after extraction of the maxillary right deciduous canine; (5) space closure to improve the maxillary midline deviation and mesial movement of the maxillary molars after removing the miniscrew (Fig 5, B); (6) marsupialization and alignment of the impacted maxillary right third molar; and (7) establishment of an acceptable occlusion (Fig 5, C).

**TREATMENT ALTERNATIVES**

Extractions of the maxillary deciduous canine and the mandibular deciduous second molar on the right side were needed to improve the deviation of the maxillary and mandibular dental midlines. We planned to close the extraction space of the maxillary right deciduous second molar by mesial movement of the maxillary right molars. These molars were to be moved to align the impacted maxillary right third molar. The movement of these molars was expected to occur over a long treatment period, involving large distances, unilateral posterior crossbite, and excessive retraction of the anterior teeth because of difficult anchorage. Therefore, a miniscrew was used for absolute anchorage to address these problems. Preservation of the maxillary right deciduous second molar was considered because it would avoid the need for absolute anchorage for a large orthodontic tooth movement; however, this plan would not allow for the alignment of the healthy maxillary right third molar instead of the maxillary right deciduous second molar with caries. The patient chose alignment of the maxillary right third molar instead of preservation of the maxillary right deciduous second molar.

We considered extraction of the maxillary left deciduous and mandibular second molars and orthodontic closure of the extraction spaces. However, this treatment plan would have caused an asymmetric dental arch, with fewer posterior teeth on the left side because of the lack of a left premolar and a third molar. Therefore, this treatment alternative was rejected.

**TREATMENT PROGRESS**

The maxillary and mandibular right deciduous second molars were extracted, and alignment of the adjacent teeth and the mandibular second molar was initiated with a preadjusted edgewise appliance (0.018 × 0.025 in). To ensure efficient mesial maxillary molar movement, a miniscrew (diameter, 1.6 mm; length, 8.0 mm; Pro-Seed, Tokyo, Japan) was placed in the maxillary alveolar buccal bone distal to the canine on the right side. After the leveling and alignment of the teeth were completed, mesial movement of the maxillary right first molar was initiated with an elastomeric chain from the miniscrew to the maxillary right first molar with an initial force of 2 N for 20 months (Fig 6, A and B). The mandibular extraction space was closed by mesial movement of the right first molar and distal movement of the right first premolar by the elastomeric chain for 14 months. All teeth except the left deciduous second molars were then aligned with a preadjusted edgewise appliance. After retraction of the mandibular canine for 7 months, the mandibular space was closed using loop mechanics for 3 months. After extraction of the right deciduous canine, bite opening was initiated with a compensatory curve in the maxillary archwire during the mesial movement of the maxillary right molars by the miniscrew. The miniscrew was removed before retraction of the maxillary anterior teeth. The mesial movement of the maxillary right molars by a miniscrew was 7.5 mm. The space from the maxillary right molars to the anterior teeth was closed using an elastomeric chain for 8 months. After the space closure, marsupialization and traction on the impacted maxillary right third molar

**Table 1. Cephalometric measurements**

<table>
<thead>
<tr>
<th>Measurement</th>
<th>Norm (Mean or range SD)</th>
<th>Pretreatment (20 y 9 mo)</th>
<th>Posttreatment (24 y 9 mo)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angular (°)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SNA</td>
<td>82.3 ± 3.5</td>
<td>85.0</td>
<td>85.0</td>
</tr>
<tr>
<td>SNB</td>
<td>78.9 ± 3.5</td>
<td>78.5</td>
<td>78.0</td>
</tr>
<tr>
<td>ANB</td>
<td>3.4 ± 1.8</td>
<td>6.5</td>
<td>7.0</td>
</tr>
<tr>
<td>MP angle</td>
<td>28.8 ± 5.2</td>
<td>32.0</td>
<td>32.5</td>
</tr>
<tr>
<td>IMPA</td>
<td>96.3 ± 5.8</td>
<td>96.0</td>
<td>92.0</td>
</tr>
<tr>
<td>U1-FH</td>
<td>111.1 ± 5.5</td>
<td>104.5</td>
<td>101.0</td>
</tr>
<tr>
<td>L1-FH</td>
<td>54.6 ± 6.5</td>
<td>52.0</td>
<td>55.5</td>
</tr>
<tr>
<td>Linear (mm)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>U1 to APo</td>
<td>7.1 ± 2.2</td>
<td>8.0</td>
<td>4.0</td>
</tr>
<tr>
<td>L1 to APo</td>
<td>3.6 ± 2.8</td>
<td>3.0</td>
<td>1.5</td>
</tr>
<tr>
<td>Upper lip-E-line</td>
<td>–1 to –4 ±0.7</td>
<td>–1.0</td>
<td></td>
</tr>
<tr>
<td>Lower lip-E-line</td>
<td>0 ± 2.0 ±3.0</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

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were initiated (Fig 6, C). The orthodontic treatment period was 40 months (Figs 7-10). After debonding, lingual fixed retainers were bonded, and Begg-type retainers were worn on both arches.

**TREATMENT RESULTS**

The patient had a balanced profile and good occlusion. Normal overjet and overbite were achieved, and the maxillary and mandibular dental midlines coincided with the facial midline (Figs 7-10). The mildly gummy smile was improved by the intrusion of the maxillary anterior teeth (Fig 7). The cephalometric superimpositions before and after treatment showed mesial movements of 9.0 and 4.5 mm of the maxillary and mandibular molars, respectively, on the right side. The maxillary and mandibular central incisors had retracted by 4.0 and 1.5 mm, respectively. The maxillary central incisor had intruded by 2.0 mm (Figs 10 and 11). The panoramic radiographs taken before and after treatment showed no marked apical root resorption. In the frontal cephalometric analysis, the maxillary and mandibular dental midlines coincided with the facial midline (Figs 7 and 10). The occlusion and the facial profile were almost stable after 2 years of retention (Figs 12-14).

Maximum occlusal force and occlusal contact area decreased after treatment. However, these parameters increased after the 2-year retention period (Table II).

**DISCUSSION**

We performed orthodontic treatment with a miniscrew for absolute anchorage to close the extraction space of the deciduous molar and align the impacted maxillary right third molar. After treatment, the patient showed a good facial profile and a good occlusion.

Recently, miniscrews have been widely used for absolute anchorage during various types of orthodontic tooth movement procedures. Orthodontic treatment with miniscrews in patients with oligodontia was found to be particularly beneficial because these patients have few teeth to use for absolute anchorage during orthodontic tooth movement. Miniscrews have been reported to be effective for absolute anchorage in the mesial movement of maxillary and mandibular molars; no lingual tipping of the incisors was observed in patients with skeletal Class III and oligodontia or large extraction spaces. Our patient had maxillary and mandibular dental midline deviations and a 5.0-mm overjet and was classified with a skeletal Class II relationship. We planned to close the 9.7-mm extraction space from the maxillary deciduous second

**Table II.** Changes in maximum occlusal force and occlusal contact area

<table>
<thead>
<tr>
<th></th>
<th>Pretreatment</th>
<th>Posttreatment</th>
<th>Retention</th>
<th>Normative value*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum occlusal force (N)</td>
<td>872.4</td>
<td>690.0</td>
<td>1163.7</td>
<td>850.0 ± 231.9</td>
</tr>
<tr>
<td>Occlusal contact area (mm²)</td>
<td>24.9</td>
<td>11.9</td>
<td>25.1</td>
<td>19.6 ± 6.6</td>
</tr>
</tbody>
</table>

*Data are expressed as means ± SD.
molar by mesial movement of the maxillary right molars and the 7.5-mm extraction space from the maxillary deciduous canine by the retraction and right directional movement of the anterior teeth. However, mesial movement of the molars and retraction of the anterior teeth by traction of each segment of anterior teeth and molars was expected to cause unilateral posterior crossbite and excessive retraction of the anterior teeth because of the difficult anchorage. Therefore, we believed that our treatment plan would not be successful without the use of a miniscrew to close the extraction spaces because the required mesial movement of the maxillary right molars was great. We used a miniscrew for this purpose, and it resulted in the desired 9.0-mm mesial movement of the maxillary right molars. The mesial movement of the maxillary right molars by a miniscrew and the anchorage of the anterior tooth retraction were 7.5 and 1.5 mm, respectively.

In this patient with oligodontia, 7 teeth were congenitally missing, and 4 deciduous second molars and 1 deciduous canine were retained. The maxillary and mandibular right deciduous second molars were extracted, and the extraction spaces were closed to align the maxillary right third molar and improve dental mandibular midline deviation, mandibular anterior crowding, and molar and canine relationships. It was expected that the impacted third molar could survive better than the deciduous second molar with caries.\textsuperscript{20,21} Therefore, we chose to extract the maxillary right deciduous second molar.

We planned to retain the maxillary and mandibular deciduous second molars on the left side. It has been reported that deciduous molars have a good prognosis for long-term survival and have been retained to the age of 51 years without caries or periodontal degeneration.\textsuperscript{20,21} Therefore, the maxillary and mandibular left deciduous second molars were retained in our patient to prevent the creation of a short dental arch with few posterior teeth. To avoid root resorption, the preadjusted edgewise appliance was not attached to the deciduous molars.\textsuperscript{20,22} As a result, the roots of the retained deciduous molars were not resorbed. We believe that the deciduous second molars will be retained in the long term.

**Fig 6.** Treatment progress on the right side; \textit{white arrows}, miniscrew. \textbf{A}, Start of mesial molar movement with the miniscrew; \textbf{B}, 10 months later, continuation of mesial molar movement with the miniscrew; \textbf{C}, 33 months later, marsupialization and alignment of the impacted maxillary right third molar after retraction of the anterior teeth.
The maximum bite force correlates with the area of occlusal contact. It is known that the occlusal contact area and the occlusal force increase with retention after orthodontic treatment. These reports suggest that the interdigitation of the teeth improves after the removal of the orthodontic appliances because the teeth are allowed to settle. In this patient, the occlusal contact area and the maximum occlusal force increased over the 2 years of retention, reaching values greater than those before treatment, although the left deciduous second molars were not aligned by the preadjusted edgewise appliance. It is suggested that the interdigitation of the retained deciduous molars without alignment by the preadjusted edgewise appliance might improve during retention as well as after removal of the orthodontic appliances. The treatment results show that stomatognathic functions in the patient with oligodontia, such as occlusal force and occlusal contact area, might be increased with improvement of the malocclusion, including improvement in the deciduous molars not aligned with a preadjusted edgewise appliance.

Fig 7. Posttreatment facial photographs (age, 24 years 9 months).

Fig 8. Posttreatment intraoral photographs (age, 24 years 9 months).
Fig 9. Posttreatment dental casts (age, 24 years 9 months).

Fig 10. Posttreatment radiographs (age, 24 years 9 months).
CONCLUSIONS

A miniscrew was useful as an absolute anchor for the mesial movement of the maxillary right molars and the alignment of an impacted maxillary right third molar in a patient with oligodontia. Additionally, improvement of the malocclusion, including improvement in the retained deciduous molars that were not treated by the preadjusted edgewise appliance,
prevented root resorption of the deciduous molars and increased the occlusal force and occlusal contact area during retention.

Fig 13. Intraoral photographs obtained 2 years posttreatment (age, 26 years 9 months).

Fig 14. Dental casts obtained 2 years posttreatment (age, 26 years 9 months).

REFERENCES


