Orthodontic Treatment of Class II Malocclusion with Single Maxillary Incisor

Chien-cheng Chen
Division of Orthodontics, Department of Dentistry, Taipei Tzu Chi General Hospital, Taipei, Taiwan, francoisken@hotmail.com

Yi-horng Chen
Division of Orthodontics, Department of Dentistry, Taipei Tzu Chi General Hospital, Taipei, Taiwan

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INTRODUCTION

The condition of single maxillary central incisor was not uncommon in orthodontic patients. It may be caused by congenital reasons, early extraction of maxillary central incisor or facial trauma. The presence of a single maxillary incisor without a previous history of trauma should always be considered as a possibility of a potentially serious developmental anomaly, such as solitary median maxillary central incisor (SMMCI) syndrome.\(^1\) SMMCI was previously presumed to be a simple midline defect of the dental lamina, but it is now recognized as a possible predictor of holoprosencephaly of varying degrees.\(^2\)

Since it may influence upper anterior teeth esthetics, to extract the single incisor or to create the space for prosthesis fabrication of another central incisor may become very important while we establish the treatment plan.

Generally, there are three treatment options for a patient with single maxillary central incisor and concomitant malocclusion.\(^3\) The first is to reopen the space allowing for a definitive prosthetic replacement. The second approach includes premolar autotransplantation followed by restorative modification to simulate a central incisor.\(^4,5\) The last treatment choice consists of total orthodontic space closure with substitution of the lateral incisors for the central incisors.\(^6\)
This case report demonstrated a patient with single maxillary central incisor that SMMCI was ruled out. Determined treatment plan is to extract the single central incisor in order to relieve the maxillary arch crowding. Following the tooth extraction, lateral incisors were moved to the position of central incisors for substitution.

CASE REPORT

A 27-year-old male came to our orthodontic department whose chief complaint was dentition crowding. He also wanted to improve the esthetics of upper anterior teeth since he had only one maxillary central incisor. He had dental history of OD and Endo treatment. The patient denied any systemic disease and trauma history.

Extraoral findings

The extra-oral examination demonstrated symmetric face in appearance. His profile showed convex type face (Figure 1). No occlusal plane canting. No obvious gummy smile and lip incompetence, but mild mentalis strain was still noted.

Intraoral findings

Figure 1. Extraoral photographs before orthodontic treatment.

Figure 2. Intraoral photographs before orthodontic treatment.
His upper incisor was deviated to his left side by identify the mesial edge of 11 (Figure 2). The lower dental midline was shifted to right side about 3 mm relative to upper dental midline (mesial sedge of 11). Both left and right-side molar relationships were Class II relation. Crowding over upper and lower arch was noted. The overbite was 0.5 mm and overjet was 1 mm.

**Radiographic findings**

The panoramic radiograph indicated that previous root canal filling in 36, all 3rd molars were extracted (Figure 3).

According to the cephalometric radiograph analysis, SNA, SNB, and ANB were within normal range, indicated skeletal Class I malocclusion. L1 to MP was 105.6° and interincisal angle was 110.7°, indicated proclination of both upper and lower anterior teeth (Figure 4).

**Diagnosis**

Dental Class II malocclusion with single maxillary central incisor. Dental crowding over both upper and lower dentition.

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*Figure 3. Panoramic film before orthodontic treatment.*

*Figure 4. Lateral cephalometric film before orthodontic treatment.*
Treatment objective

The treatment objectives included: (1) to relieve crowding and align upper and lower dentition; (2) to achieve stable occlusion with proper overjet and overbite; (3) to resolve esthetic problem of upper anterior teeth; (4) to improve facial esthetics.

Treatment plan

After discussed with the patient, the final treatment plan was determined including: (1) extract 11 and 42 for creating space to relieve upper and lower arch crowding; (2) substitute maxillary central incisors with maxillary lateral incisors; (3) modify the morphology of maxillary lateral incisors with composite resin restoration.

Treatment progress

Preadjusted 0.018-inch brackets were placed, and the initial wire was 0.012 stainless steel wire. After 1 month, 11 was extracted, then it was replaced to the wire in order to keep esthetics of upper anterior area. Both upper and lower main wires were changed to 0.016 x 0.022 improved super-elastic Ni-Ti wire at the next visit. Interproximal reduction was begun on both mesial and distal side of 11, and closed the space between 12 and 22 gradually. 42 was also extracted to relieve lower arch crowding. The brackets of lateral incisors were replaced to that of central incisors. Towards the end of space closure, 12 and 22 were built-up with composite resin in order to modify tooth size and morphology of lateral incisors to mimic central incisors (Figure 5). After 34-months orthodontic treatment, all fixed appliances were removed and the patient began to wear retainer.
Table 1. Cephalometric analysis.

<table>
<thead>
<tr>
<th></th>
<th>Norm</th>
<th>Pre-treatment</th>
<th>Post-treatment</th>
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<tbody>
<tr>
<td>SNA</td>
<td>81.8±3.1</td>
<td>74.2</td>
<td>74.3</td>
</tr>
<tr>
<td>SNB</td>
<td>78.6±3.1</td>
<td>71.9</td>
<td>72.5</td>
</tr>
<tr>
<td>ANB</td>
<td>3.3±2.7</td>
<td>2.2</td>
<td>1.8</td>
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<tr>
<td>SN-MP (Me-Go)</td>
<td>40.2±4.6</td>
<td>35.6</td>
<td>35.7</td>
</tr>
<tr>
<td>U1 to NA (mm)</td>
<td>5.5±1.7</td>
<td>5.1</td>
<td>3.9</td>
</tr>
<tr>
<td>U1 to SN</td>
<td>103.1±5.5</td>
<td>108.2</td>
<td>98.7</td>
</tr>
<tr>
<td>L1 to NB (mm)</td>
<td>7.8±1.7</td>
<td>4.5</td>
<td>7.1</td>
</tr>
<tr>
<td>L1 to MP</td>
<td>94.7±7.2</td>
<td>105.6</td>
<td>102.2</td>
</tr>
<tr>
<td>Interincisal angle</td>
<td>129.7±9.0</td>
<td>110.7</td>
<td>123.4</td>
</tr>
</tbody>
</table>

Figure 6. Intraoral photographs after orthodontic treatment.

Figure 7. Extraoral photographs after orthodontic treatment.
Figure 8. Overall cephalometric superimposition of before and after treatment.

Figure 9. Lateral cephalometric film after orthodontic treatment.

Figure 10. Panoramic film after orthodontic treatment.
Treatment result

After treatment, both upper and lower dentition was well aligned (Figure 6). The overjet and overbite did not change obviously. The lip posture and mentalis strain condition also improved (Figure 7). Comparing to the pre-treatment cephalometric radiograph, both U1 to SN and L1 to MP decreased, and interincisal angle reduced to normal range. The upper lip to E-line reduced 1.5 mm and lower lip to E-line reduced 1 mm. The overall superimposition indicated increased SN-MP angle only by 1 degree, the autorotation of mandible almost did not occur (Figure 8, Figure 9 and Table 1). The post-treatment panoramic x-ray demonstrated that root parallel was acceptable (Figure 10).

DISCUSSION

In the cases with single maxillary central incisor, differential diagnosis must be made with solitary median maxillary central incisor (SMMCI) syndrome, because treatment of SMMCI must be combined with other specialties. SMMCI is a rare anomaly with reported prevalence of 1 in 50,000 newborns. The characteristic of this condition is the maxillary single incisor that develops and erupts precisely in the midline of the upper dental arch, both in the deciduous and permanent dentitions. The crown morphology of SMMCI is strictly symmetric. Other oral features are arch-shaped appearance of the upper lip with an indistinct philtrum, the absence of a labial frenulum, and a V-shaped palate with an unusual narrow ridge along the midpalatal suture. Depending on the severity of SMMCI, interdisciplinary treatment with various specialties need to be involved, including neonatal or developmental pediatrics, plastic surgery, pediatric dentistry, neurology, and otolaryngology. In this case, the morphology of the single central incisor was asymmetric, labial frenulum was normal, and his philtrum was distinct. Therefore, the SMMCI was ruled out.

In addition to the final treatment plan, an alternative treatment option for the patient was extraction of upper and lower premolars and space expansion for 21. Subsequently, prosthesis, dental implant or premolar autotransplantation could be considered for 21 restoration. It was previously reported that maxillary 1st premolar can be autotransplanted to substitute maxillary central incisor, and anterior teeth could be retracted, including the autotransplanted tooth, to close the space. It is possible to achieve excellent esthetic outcome with treatment of premolar autotransplantation. In this case, if the treatment option of autotransplantation was chosen, 24 must be extracted prior to 21 space expansion. After 21 space is created, 14 could be extracted and autotransplanted to 21 position. The first premolar is usually the first choice to be extracted for dental crowding relief, and it could be a candidate for donor tooth since its well-fitting to the recipient site in maxillary central incisor position in previous reports. However, the patient’s upper lip was coincide with E-line and lower lip to E-line was only +0.5mm, it is not an ideal solution to extract 4 premolars and retract anterior teeth; the lip profile may be deteriorated.

Clinical indication of choosing treatment plan of space closure and substitution of maxillary central incisors by lateral incisors including factors such as: patient’s motivation for orthodontic, patient’s age, maxillary arch crowding, and large lateral incisor with good root length. Since the condition of this case fitted the indication, the final treatment plan was determined to extract the single maxillary central incisor, and mesialize lateral incisors to the position of central incisors for substitution. It is important to avoid black triangle and maintain alveolar bone height while closing extraction space. A contact point must be created by bodily movement of lateral incisors. Dental tipping will lead to mesio-distal divergence of the roots and coronal location of the contact point. In consideration of tooth angulation, both lateral incisors should be positioned more parallel than normal condition. If pre-adjusted edgewise appliance was used...
during the orthodontic treatment, it is recommended to place brackets of central incisors on lateral incisors. This is because the central incisor brackets could be more efficient in maintaining the mesiodistal angulation, normal inclination and adequate torque for substituted lateral incisors.

In this case report, the treatment outcome could not satisfy to all. Extraction of 42 may lead to severe Bolton discrepancy in anterior ratio. Although perfect interdigitation relationships of maxillary and mandibular dentition could not be achieved, the result provided functional adequacy, dental longevity, and esthetic harmony for the case. However, there is a high risk of anterior space reopening following this treatment plan. Consequently, long term retention and follow-up of occlusal stability is necessary.

CONCLUSION

When patient has single maxillary central incisor, SMMCI must be ruled out. One of the treatment options is to extract the single maxillary incisor and close the space, then substitute central incisors with lateral incisors. The angulation and tooth morphology of lateral incisors should be modified to mimic central incisors and avoid black triangle. It is possible to obtain good esthetic outcome.

REFERENCE

1. Hall RK. Solitary median maxillary central incisor (SMMCI) syndromial incisor (SMMCI) syndrome. Orphanet J Rare Dis 2006;1:12.