Management of Congenital Missing in Bilateral Mandibular Incisors

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INTRODUCTION

Hypodontia is defined as the developmental absence of one or more teeth (excluding the third molars) in both the primary and permanent dentition. The disorder is used to describe from one missing tooth to the complete absence of all teeth. Based on a panoramic radiographic survey among 1093 12-year-old Hong Kong schoolchildren, the prevalence of congenitally missing teeth (excluding the third molars) in Chinese children was 6.1% in boys, 7.7% in girls, and 6.9% in combination. The most commonly absent tooth was the mandibular incisor, affecting 58.7% of the children with hypodontia.

The etiologies of missing lower incisors were reviewed and summarized as following: 1) heredity or a familial distribution of congenital absence of lower incisors; 2) anomalies in the development of the mandibular symphysis may affect the dental tissue forming the tooth buds of the lower incisors; 3) a reduction in the dentition is regarded by some researchers as Nature’s attempt to fit the shortened dental arch - an expression of an evolutionary trend; 4) localized inflammation or infection in the jaw which may destroy the tooth buds; 5) disturbance of the endocrine system which may result in a localized ectodermal dysplasia.
There are three common treatment protocols for the management of bilateral congenital missing mandibular incisors. The first is to remove of the upper first premolars to balance the missing tooth number in both dental arches, and close all the space orthodontically. The second is to create a space for the missing lower incisors and fabricate a fixed bridge for missing teeth replacement. The third is to protract the whole mandibular posterior teeth forward and close the missing teeth space.9

The collaboration between orthodontists and prosthodontists is essential for management of missing teeth. Orthodontists need to predict the final finished condition/outcome for the prothesis in the orthodontic treatment plan. To simulate the outcome, the utilization of diagnostic wax up on the patient models or tooth align software may enhance the communication with prosthodontists and patients.

CASE REPORT

A 16-year-old girl complained about her crooked front teeth and retained milk teeth. The patient was in good general health and had no history of any other systemic disease. Her general dental health was taking care by a local dental clinic. No facial trauma or parafunctional habits were reported.

In frontal view, her face was slightly asymmetric within acceptable range. Her facial profile was straight with normal vertical proportions. Her nasolabial angle (95°) was obtuse, upper and lower lip relative to E-line was -1 mm and -0.5 mm respectively (Figure 1). Intraorally, her dentition presented Angle’s Class I molar and Class II canine relationships in both sides. Her maxillary midline was coincident with the facial midline. Both upper and lower arch forms were ovoid. Her oral hygiene was good with fine periodontal health. Retained lower left primary incisor and congenital missing in bilateral mandibular central incisors was noted. Her overjet and overbite were 3 mm and 0.5 mm respectively (Figure 2). The panoramic radiograph indicated presence of all third molar tooth germs (Figure 3). The cephalometric analysis demonstrated a skeletal Class I antero-posterior discrepancy with normal mandibular plane angle. Maxillary incisors were slightly retroclined, the upper incisor to NA was 3 mm and 21°. Mandibular incisors were tipped lingually, lower incisor to NB was 3 mm and 18° (Figure 4; Table 1).

Figure 1. The pre-treatment extraoral photographs.
Figure 2. The Pre-treatment intraoral photographs and study models.

Figure 3. The Pre-treatment panoramic radiograph.
Table 1. The pre-treatment and post-treatment cephalometric measurements.

<table>
<thead>
<tr>
<th>Skeletal Analysis</th>
<th>Mean</th>
<th>Pre-TX</th>
<th>Post-Tx</th>
</tr>
</thead>
<tbody>
<tr>
<td>SNA (%)</td>
<td>83°</td>
<td>78°</td>
<td>78°</td>
</tr>
<tr>
<td>SNB (%)</td>
<td>80°</td>
<td>76°</td>
<td>76°</td>
</tr>
<tr>
<td>ANB (%)</td>
<td>4°</td>
<td>2°</td>
<td>2°</td>
</tr>
<tr>
<td>SND (%)</td>
<td>76 ~ 77°</td>
<td>74°</td>
<td>73.5°</td>
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<tr>
<td>SN-GoGn (%)</td>
<td>32°</td>
<td>34°</td>
<td>38°</td>
</tr>
<tr>
<td>Nv-A (mm)</td>
<td>0.4 mm</td>
<td>-4 mm</td>
<td>-4 mm</td>
</tr>
<tr>
<td>Nv-Pog (mm)</td>
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<td>-9.5 mm</td>
<td>-10.5 mm</td>
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<table>
<thead>
<tr>
<th>Dental Analysis</th>
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</tr>
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<tbody>
<tr>
<td>Upper 1 to NA (mm)</td>
<td>4 mm</td>
<td>3 mm</td>
<td>4 mm</td>
</tr>
<tr>
<td>Upper 1 to NA (%)</td>
<td>22°</td>
<td>21°</td>
<td>30°</td>
</tr>
<tr>
<td>Upper 1 to Pp (%)</td>
<td>108.7°</td>
<td>113°</td>
<td>118°</td>
</tr>
<tr>
<td>Lower 1 to NB (mm)</td>
<td>4 mm</td>
<td>3 mm</td>
<td>6.5 mm</td>
</tr>
<tr>
<td>Lower 1 to NB (%)</td>
<td>25°</td>
<td>18°</td>
<td>30°</td>
</tr>
<tr>
<td>Lower 1 to MP (Go-Me) (%)</td>
<td>25°</td>
<td>85°</td>
<td>96°</td>
</tr>
<tr>
<td>Upper 1 to Lower 1 (%)</td>
<td>130°</td>
<td>137°</td>
<td>116°</td>
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<table>
<thead>
<tr>
<th>Facial Analysis</th>
<th>Mean</th>
<th>Pre-TX</th>
<th>Post-Tx</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper lip - E-line (mm)</td>
<td>-1 mm</td>
<td>-1 mm</td>
<td></td>
</tr>
<tr>
<td>Lower lip - E-line (mm)</td>
<td>-0.5 mm</td>
<td>-0.5 mm</td>
<td></td>
</tr>
</tbody>
</table>

Figure 4. The pre-treatment cephalometric radiograph.
TREATMENT OBJECTIVES AND TREATMENT PLAN

The primary objectives in treating this malocclusion were: 1) to provide lower lip support and maintain satisfactory facial harmony; 2) to create space for two missing lower incisors, the bilateral lower lateral incisors would be moved mesially to replace the central incisors and facilitate future prosthetic restoration; 3) to maintain Class I molar and achieve Class I canine relationship with good dental alignment, ideal overjet and overbite relationships would be achieved to establish immediate anterior guidance.

TREATMENT PROGRESS

The lower primary incisor was removed. The 0.014-inch nickel-titanium archwires were placed for initial level and alignment. The 0.016x0.022-inch nickel titanium wires and 0.016x0.022-inch stainless steel arch wires were used subsequently. Since the lower dental space need to be increased to 2 incisors width, to maintain the proper overjet during the space regain, 2 mini-screws (Dentos, Absoanchor, SH 2018-10) were inserted at bilateral mandibular buccal shelves for lower dentition distalization. During canine retraction phase, the open coil springs were placed between bilateral lower lateral incisors and canines to get space for further restoration. Continuous 0.017x0.025-inch β III Nickel archwire with second order band was placed at upper arch. Class II interarch elastics from lower first molars to the short power hooks between upper lateral incisors and canines were used for two months to retract upper arch.

After moving bilateral lower lateral incisors toward midline, a mandibular cone beam computed tomography (CBCT) was taken for consulting prosthodontist for restoration management. Because the lower edentulous ridge was not wide enough for implantation, prosthodontist suggested an autogenous bone block transfer (ABBT) before implantation or a Maryland bridge or removable partial denture as other options. Patient finally chose removable partial denture to avoid the side effects of graft surgery or implant surgery. When the orthodontic appliances were removed, a maxillary Essix retainer and a mandibular Essix retainer with resin teeth on the 2 edentulous sites were delivered. The treatment duration was 1 year and 11 months.

TREATMENT RESULTS

The patient’s facial profile and proportion was maintained (Figure 5). The teeth were well aligned and levelled over the basal bone. Class I molar were established with ideal overbite and overjet. The maxillary

Figure 5. The post-treatment extraoral photographs.
dental midline was coincident with the facial midline and the centre of the remaining mandibular incisors (Figure 6). Excellent root parallelism was achieved, and the root resorption was minimal (Figure 7). New bone formation was noticed at mandibular CBCT, but the width of edentulous ridge was not enough for implantation. The overall cephalometric superimposition revealed late growth in the mandible. Upper incisors were slightly proclined, and upper molar were extruded 1 mm. Lower incisors were proclined and extruded due to protraction of lateral incisors to replace the central incisors. Lower molars were extruded due to Class II elastic. (Figure 8 and 9; Table 1) Patient was suggested to consult the periodontist for gingivoplasty to achieve a better gum line. Lower removable partial denture was delivered by prosthodontist as a temporary prosthesis.

Figure 6. The post-treatment intraoral photographs and study models.
Figure 7. The post-treatment panoramic radiograph.

Figure 8. The post-treatment cephalometric radiograph.

Figure 9. The cephalometric superimposition of the treatment effects. Left, overall superimposition; right, regional superimposition of maxilla and mandible; black line, before treatment; red line, after treatment.
DISCUSSION

Treatment strategies used in treating missing mandibular incisors involve various restorative and orthodontic procedures with the collaboration of various specialists like prosthodontist, orthodontist, and oral and maxillofacial surgeons to achieve the esthetic and functional outcome.

Space regain for one or two incisors must be aware of the tooth-size discrepancy and occlusal result. When analyze the Bolton’s discrepancy between ideal lower anterior arch length and present lower anterior arch length, there was 10.1 mm discrepancy. However, the average width of lower central incisor in Japanese female was 5.07±0.22 mm, that’s the reason to replace 2 incisors for this case.

After consultation with prosthodontist, dental implants will be the first choice to restore the missing teeth. Proper alveolar dimensions are required for implant placement. Numerous reconstruction procedures for alveolar ridge augmentation have been proposed to increase the alveolar bone volume, including guided bone regeneration, bone grafts, distraction osteogenesis, alveolar split osteotomy, and combination of the above procedures. A variety of graft materials has been used in these procedures either with or without barrier membranes or fixed materials. Bone graft transfers are associated with high complication rates, especially when vertical component is included. Bleeding is the most frequent post-surgery complication, followed by the hematoma, flap dehiscence and infection; future free gingiva graft might be needed.10

Orthodontic tooth movement is an alternative to bone grafting. Natural remodeling of new bone formation is achieved while tooth moves through the alveolar bone.11 There will be some side effects, such as root resorption, pulp necrosis; and the perforation of sinus membrane can cause additional complications.12,13 After discuss with patient and her family, moving bilateral lower lateral incisors to replace central incisors to get new bone for further implantation was chosen. However, the regained alveolar bone underwent resorption and became a feather type ridge, which cannot be implanted unless proper bone graft was done.

Communication among different related specialists and feedback from patients’ concern is essential for treatment planning formation. In this case, by considerations of patient’s facial profile, age and late growth stage of CVM 4, regain the space for the missing lower incisors and replace with a fixed bridge or removable partial denture would be the ideal treatment plan in the present timing.

CONCLUSION

Agenesis of mandibular incisors can lead to compromised dental and facial aesthetics and therefore require appropriate treatment.14,15 The present case showed the regained alveolar bone underwent resorption and became a feather type ridge. It could not be inserted with dental implant without other surgical procedures. It might happen in a well collaborative orthodontic and prosthodontic treatment plan that resulted in an unpredictable outcome. Further studies are required to offer more information regarding the tooth movement and bone regeneration/resorption for proper management of the similar cases.

REFERENCE

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