Case Report

Orthognathic Treatment with Autotransplantation of Impacted Maxillary Third Molar

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ABSTRACT

This article presents orthognathic treatment in successful collaboration with autotransplantation of the maxillary third molar. The case report describes a 24-year-old man with severe mandibular protrusion and severe crowding in both dentitions. Overbite was 0 mm, overjet, -15 mm. Maxillary second molars and mandibular third molars were extracted, and presurgical multibracket treatment was begun. Maxillary third molars were impacted completely at 18 months in terms of presurgical tooth alignment. Autotransplantation of the teeth was achieved to substitute for extracted maxillary second molars. At 6 months after autotransplantation, the maxilla was advanced 4 mm on both sides through a Le Fort I procedure; left and right sides of the mandible were set back 15 and 18 mm, respectively, via sagittal split ramus osteotomy to improve mandibular protrusion. The total treatment period lasted 37 months. Autotransplantation treatment is an effective modality for tooth replacement when a donor tooth is available. Fully impacted maxillary third molars are potentially reliable candidates for autotransplantation. (*Angle Orthod.* 2009;79:401–406.)

KEY WORDS: Autotransplantation; Orthognathic surgery; Maxillary third molar

INTRODUCTION

In the case of a severe Class III malocclusion with mandibular prognathism and maxillary anterior-posterior (A-P) deficiency, extraction of second molars is an alternative approach that causes less retraction of the maxillary incisors. Chipman¹ suggested that this procedure is indicated when the second molars are severely carious, ectopically erupted, or severely rotated, and when mild to moderate arch length deficiencies exist. One option for moving maxillary first molars distally is the extraction of maxillary second molars to create space.² Maxillary third molars have been found to replace second molars are successfully after extraction.^{3,4}

Autotransplantation of teeth can lead to significantly

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Accepted: March 2008. Submitted: February 2008.

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shorter treatment time and an improved treatment result in certain cases of tooth loss.⁵ We corrected maxillary arch length deficiencies by extracting second molars and completing orthognathic treatment in collaboration with autotransplantation of impacted maxillary third molars.

The purpose of this article is to present a case of severe mandibular protrusion involving autotransplantation of the maxillary third molar combined with a Le Fort I and sagittal split ramus osteotomy (SSRO).

CASE SUMMARY

A 24-year-old man presented with the chief complaints of underbite and an inability to incise food. His profile was concave, and he had esthetic concerns about his large lower jaw (Figure 1). The patient presented for treatment with no history of trauma or serious illness. The patient's upper dental midline was deviated 1 mm to the right, and the lower dental midline 3 mm to the left. He had 12 mm of upper crowding and 8 mm of lower crowding. A severe bilateral posterior crossbite was noted, along with overbite of 0 mm and overjet of -15.0 mm (Figure 2).

Cephalometric analysis revealed SNA of 80.9 degrees, SNB of 90.5 degrees, and ANB of -9.6 degrees. The mandibular plane was 36.9 degrees, and the gonial angle was large, at 134.7 degrees. The upper incisors were labially inclined 111.0 degrees to the

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Figure 1. (A and B) Pretreatment extraoral facial and lateral photographs.

SN plane, and the lower incisors were considerably inclined lingually 61.5 degrees to the mandibular plane (Table 1). The maxillary second molars erupted ectopically and were restored. A panoramic radiograph confirmed that mandibular third molars had erupted and that maxillary third molars with complete root formation were impacted (Figure 3).

Diagnosis and Treatment Objective

From cephalometric findings, this case was diagnosed as a mandibular protrusion with skeletal open bite. The main treatment objectives were (1) to reduce mandibular protrusion, and (2) to correct crowding, anterior crossbite, open bite, and reversed jaw relationships through orthognathic treatment.

Treatment Plan

- Le Fort I advance surgery to correct sagittal coordination with the mandible.
- · SSRO setback to correct asymmetry, prognathism,

 Table 1. Cephalometric Measurements at Pretreatment and Posttreatment, degrees

Cephalometric Measure	Pretreatment	Posttreatment	Treatment Change
SNA	80.9	83.3	2.4
SNB	90.5	83.0	-7.5
ANB	-9.6	0.3	9.9
SNP	90.1	83.9	-6.2
Gonial angle	134.7	131.0	-3.7
SN-MP	36.9	42.3	5.4
U1-SN	111.0	101.1	-9.9
L1-MP	61.5	69.7	8.2
Interincisal	150.7	146.9	-3.8

sagittal maxillomandibular relation, and dental malocclusion.

- Extraction of maxillary second molars to resolve arch length deficiencies. Place the anterior teeth in an ideal position to enhance esthetics, function, and degree of skeletal correction with surgery.
- Alignment in the lower arch to resolve crowding and correct the lingual inclination caused by dental compensations.

Treatment Progress

After maxillary second molars and mandibular third molars were extracted, presurgical treatment was started. Teeth alignment was conducted for 18 months (Figure 4). Because maxillary third molars remained impacted completely (Figure 5), autotransplantation was chosen.

Surgical procedures were performed as follows:



Figure 2. (A through C, E, and F) Pretreatment intraoral photographs. (D) Pretreatment dental cast of maxillary dentition. The maxillary second molars erupted ectopically.



Figure 3. Pretreatment panoramic radiograph.

Maxillary right and left third molars were carefully extracted and were positioned in the recipient site, where the root socket was prepared with a round bur. After adequate adaptation of third molars, a semirigid fixation was achieved with a 0.9 mm nylon thread and composite resin to the adjacent teeth. Seven days after the surgical procedure was performed, the nylon threads were removed. Two weeks after autotransplantation, the composite resin was removed. Two months after autotransplantation, we started to improve considerable buccal position of the third molars using a lingual arch. Because an unfavorable inflammation was caused by extension of the infection to the infratemporal regions after an autotransplantation, a root canal treatment was carried out after the operation. A periapical radiograph taken 17 months after autotransplantation showed no root resorption and no periodontal bone loss (Figure 6).

White-coat hypertension was diagnosed at the time of whole body inspection after autotransplantation, and an operation was held over for 5 months. White-coat hypertension is a phenomenon in which patients ex-



Figure 5. Panoramic radiograph immediately before autotransplantation.

hibit elevated blood pressure in a clinical setting but not when they are recording by themselves at home.

The total period of presurgical orthodontic treatment lasted 29 months. Through a Le Fort I procedure, the maxilla was advanced 4 mm, and left and right sides of the mandible were set back 15 and 18 mm, respectively, by SSRO to improve mandibular protrusion. Maxillomandibular fixation was employed for 15 days. Eight months after surgery, all bands and brackets were removed (Figures 7 and 8). The total treatment period lasted 37 months. The overbite was improved to +1.5 mm, and the overjet to +1.5 mm. Removable-type retainers were placed in the upper and lower dentition. The plate retainer was maintained all day for 2 years and 6 months and was worn only during the night subsequently.

RESULTS

Posttreatment results showed that overall facial balance was improved, lower facial height was increased, and the anterior crossbite was corrected. Acceptable



Figure 4. (A through E) Intraoral photographs immediately before autotransplantation.

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Figure 6. Periapical radiograph 17 months after autotransplantation.



Figure 7. (A and B) Posttreatment extraoral facial and lateral photographs.

overjet and overbite was achieved. The maxillary dental midline almost coincided with the facial and mandibular midline. The SNB was improved to 83.0 degrees; as a result, the ANB was improved to 0.3 degrees (Table 1). The mandibular plane was significantly increased, and the mandible exhibited a backward and downward rotation (Figure 9). The maxillary incisor was inclined lingually and was elongated remarkably by the treatment; the lingual inclination of lower incisors remained after treatment.

Posttreatment panoramic radiography showed the autotransplanted third molar after 2 years 3 months (Figure 10). The autotransplanted molars showed no periodontal pathologic signs, and the patient was described as symptom free. The patient was satisfied with the results of treatment.

DISCUSSION

The presence of maxillary third molars influenced the transverse angulation of the posterior vertical cut of Le Fort I.⁶ Impacted maxillary third molars have been proposed as a factor in the increased incidence of intraoperative maxillary unfavorable fracture. It has been decided that third molars should be removed before orthognathic surgery at a minimum of 6 months



Figure 8. (A through E) Posttreatment intraoral photographs.



Figure 9. Superimposition of pretreatment (black) and posttreatment (dotted) cephalometric tracings.

before Le Fort I osteotomy, because it will take time for the maxillary bone to adequately heal. In this case, the upper second molars were revealed to be ectopically erupted, and we recognized that removal of second molars could be justified with the expectation of their satisfactory replacement by third molars.^{3,4}

Autotransplantation is one of the options available for the treatment of a missing tooth when a donor tooth is available.5 The recipient site may be an extraction socket or a surgically prepared site. Autotransplantation of a third molar for replacement of the missing teeth is sometimes a suitable alternative to prosthetic treatment.7,8 Fully developed third molars in this case are potential candidates in the absence of other suitable donor teeth. The success rate has been reported to be excellent if the donor teeth were transplanted before root formation was completed.9 Teeth with onethird to three-quarter root formation are most frequently transplanted clinically.^{10,11} On the other hand, it has been reported that autotransplantation is a reliable method with a good prognosis for donor teeth with both open and closed apices if teeth with closed apices are endodontically treated.12,13

The denuded root surface was expected to be subject to ankylosis or root resorption because of the lack of periodontal membrane. Andreasen¹⁴ concluded that the presence of an intact and viable periodontal ligament (PDL) on the root surface is the most important



Figure 10. Posttreatment panoramic radiograph.

factor in ensuring healing without resorption. In this case, no signs of ankylosis and resorption were evident after the transplantation. Essentially, root canal treatment was employed with calcium hydroxide medication because of its high pH, which provides an antimicrobial effect and stimulates the healing process.¹⁵

Pohl et al¹⁶ mentioned that adequate mobility reduced the probability of ankylosis, and that periodontal ligament cell activity and bone repair were stimulated when functional movements of the transplanted tooth were preserved. Tsukiboshi17 reported that optimal reattachment of PDL occurred within 2 weeks after autotransplantation between the PDL connective tissues of the root surface and the recipient socket wall. Orthodontic treatment, if necessary, can be initiated 1 month after autotransplantation with mature teeth.¹⁷ These transplants in this case were positioned at the buccal site immediately after autotransplantation, so we decided to start to traction them into the lingual site 2 months later. It has been reported that occlusal forces promote periodontal healing of transplanted teeth and can prevent dentoalveolar ankylosis.18,19 Because of unfavorable inflammation after autotransplantation and the patient's hypertension, a root canal treatment was carried over after the operation. Consequently, this treatment was completed during the 15 months after autotransplantation. However, few symptoms such as ankylosis, root resorption, and periodontal disease were noted.

CONCLUSIONS

 Autotransplantation treatment is an effective modality for the replacement of tooth when a donor tooth is available.

ACKNOWLEDGMENTS

The authors wish to thank the members of the Oral and Maxillofacial Surgery Department at Kyushu University Hospital for their valued assistance in the preparation of this case study.

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