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## Case Report

# Six-year Follow-up in Skeletal Class III Patient Aged over 40 Receiving Orthognathic Surgery and Autotransplantation: A Case Report

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## Abstract

This paper describes the post-operative course of care in a patient requiring orthognathic surgery for skeletal mandibular protrusion in whom autotransplantation of a third molar was performed. A lower third molar that had to be removed for sagittal split ramus osteotomy (SSRO) was transplanted to replace the missing right second molar during pre-surgical orthodontic treatment, contributing to post-treatment occlusal stability. A 44-year-old woman presented with mandibular protrusion. The upper left second molar was congenitally missing and the lower right second molar had been extracted. She was diagnosed as having skeletal mandibular protrusion with excess vertical growth of the mandible and anterior open bite. Correction of the skeletal problem required orthognathic surgery by SSRO and Le Fort I osteotomy without orthodontic tooth extraction. At month 5 during 18 months of pre-surgical orthodontic treatment, the lower left third molar was transplanted to the lower right second molar site. Active treatment was completed after 7 months of post-surgical orthodontic treatment. The patient wore upper and lower Begg-type removable retainers for approximately 2 years. She returned for a recall checkup at 6 years post-treatment. Although radiographic examination revealed root resorption and ankylosis of the autotransplanted tooth at 8 years after transplantation, occlusion has remained stable with no clinically significant complications. The autotransplanted tooth helped stabilize her occlusion and acted as a kind of temporary tooth prior to the final decision on treatment to be given such a dental implant.

Key words: Orthognathic surgery—Autotransplantation—Middle-aged patient—Long-term follow-up—Skeletal class III

## Introduction

Autotransplantation is an effective means of replacing a missing tooth if a suitable donor tooth is available and the anatomy of the recipient site permits it<sup>2,3,10</sup>. The literature contains many case reports on autotransplantation performed in conjunction with orthodontic treatment. Schwartz *et al.*<sup>15</sup> reported a 4-year follow-up of the upper right premolar transplanted to substitute for the upper left canine extracted 10 years previously in a 24-year-old woman. Harzer *et al.*<sup>8</sup> published 20-month follow-up results for the upper left first premolar transferred to the extraction socket of the upper right central incisor with incomplete root formation in a 10-year-old girl. Reports on autotransplantation to the molar area include a 27-month follow-up by Kitahara *et al.*<sup>12</sup> of third molars transplanted to the sockets of two upper second molars extracted during orthognathic surgery in a 24-year-old man; 4-year follow-ups by Fujita *et al.*<sup>7</sup> of transplantations of the upper left second premolar to the lower right first molar socket in a 27-year-old man, the upper left first premolar to the upper right second molar socket in a 32-year-old woman and a lower third molar to the upper first molar socket in a 23-year-old man; and a 22-month follow-up by Enacar *et al.*<sup>6</sup> of a third molar transplanted to a second molar position in a 24 old woman with skeletal asymmetry treated with orthognathic surgery. Nishimura *et al.*<sup>13</sup> also reported a 24-year-old woman in whom the lower second premolar was translated to the upper first molar and maintained for 10 years.

However, there appear to be no reports on longer-term follow-ups of autotransplantations in older patients. In light of an aging patient population, the purpose of this paper is to report the status of a molar transplanted 8 years ago in a female orthognathic surgery patient in her 40's at her 6-year recall checkup.

## Case

A 44-year-old woman presented with man-

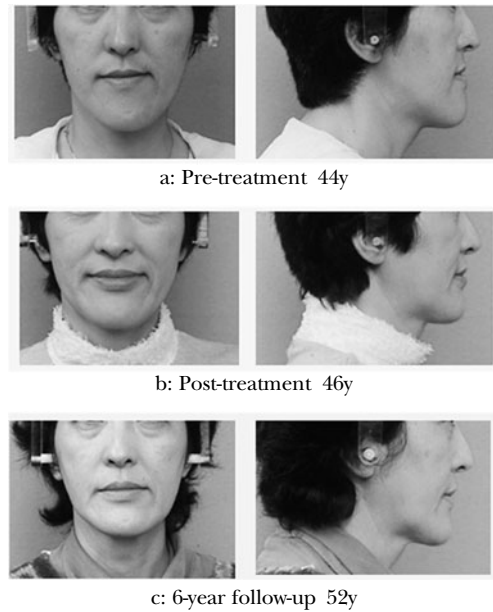


Fig. 1 Facial photograph

dibular protrusion (Figs. 1-a, 2-a). She had no history of orthodontic treatment or contributory medical condition, except mild anemia. Excessive vertical growth of the face with skeletal class III was noted (Fig. 4-a). The upper left second molar was congenitally missing and the lower right second molar had been extracted (Figs. 3-a, 5-a). Her molar relationship was class III with an overbite of  $-3$  mm and overjet of  $-1.5$  mm; minimal crowding was observed in both dental arches (Fig. 2-a). Cephalometric analysis indicated excessive vertical growth of the mandible with an SNA of  $78^\circ$ , an SNB of  $80^\circ$ , an ANB of  $-2^\circ$ , a mandibular plane angle of  $46^\circ$  and an occlusal plane angle of  $22^\circ$  (Fig. 4-a). The patient was, therefore, diagnosed as having skeletal mandibular protrusion with anterior open bite. To achieve improvement in both form and function, it was decided to correct the problem surgically by sagittal split ramus osteotomy (SSRO) and Le Fort I osteotomy using a non-extraction approach. Lower third molars usually have to be removed for SSRO during pre-surgical orthodontic treatment. Although the crown of the lower left third molar in this case

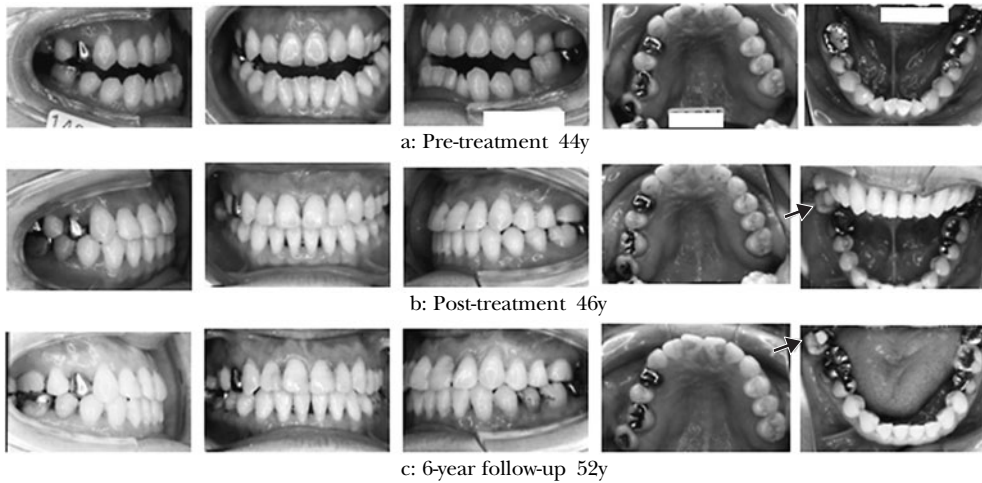


Fig. 2 Oral photograph  
The arrow head indicates recipient site.

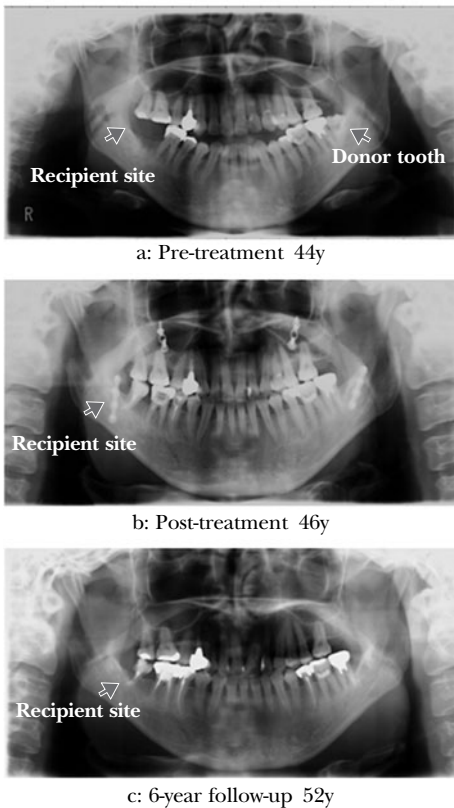
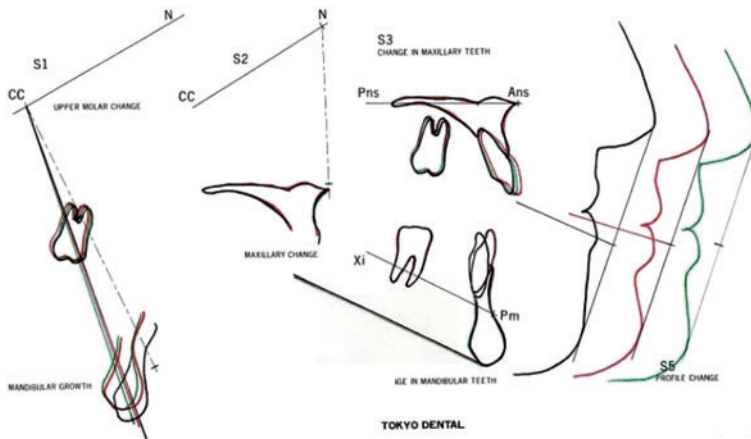
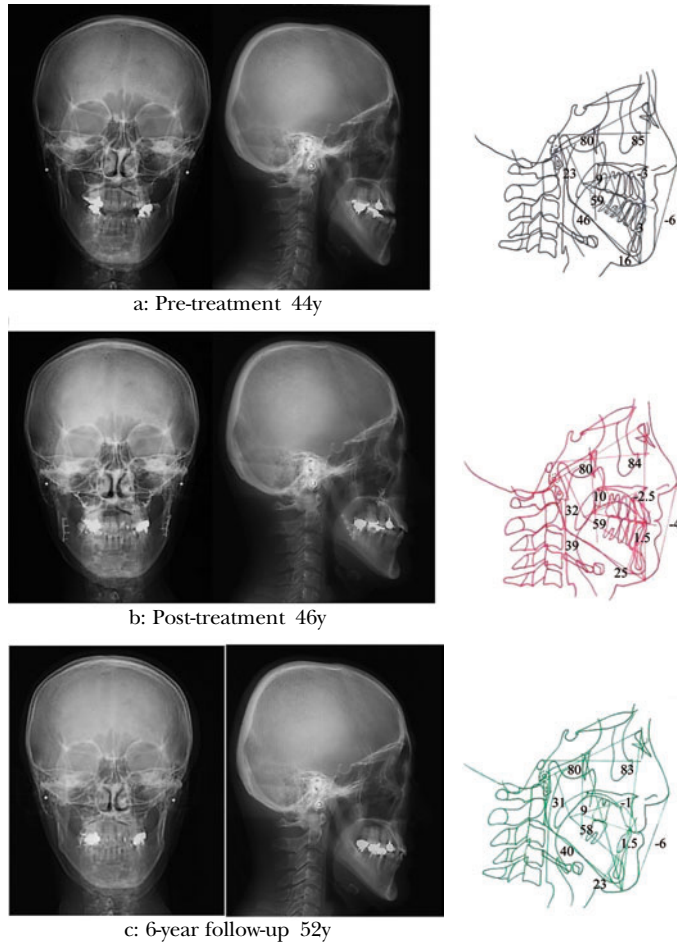


Fig. 3 Panoramic radiography

was tipped distally, it was still possible to extract it as a donor tooth. The alveolar bone on the recipient side showed no sign of resorption so the treatment plan also included autotransplantation of the lower left third molar to the lower right molar socket (Figs. 3-a, 5-a).

Autotransplantation was performed 5 months after the start of pre-surgical multi-bracket appliance therapy. The duration of pre-surgical orthodontic treatment was 18 months. Correction of the skeletal problem required orthognathic surgery by SSRO and Le Fort I osteotomy without orthodontic tooth extraction. Active treatment was finished after 7 months of post-surgical orthodontic treatment. The autotransplanted tooth was not moved orthodontically with an appliance during active treatment.

Her molar relationship was corrected class I with an overbite of 2.5 mm and overjet of 2.5 mm (Fig. 2-b). Cephalometric analysis indicated an SNA of 78°, an SNB of 78°, an ANB of 0°, a mandibular plane angle of 39° and an occlusal plane angle of 19°; an improvement was observed in her facial appearance (Figs. 1-b, 4-b). The autotransplanted tooth was stable and the environment healthy; inspection and observation of panoramic X-ray revealed that the right upper second



d: Superimposition of Pre-treatment, Post-treatment and 6-year follow-up

Fig. 4 Cephalogram, Tracing and Superimposition

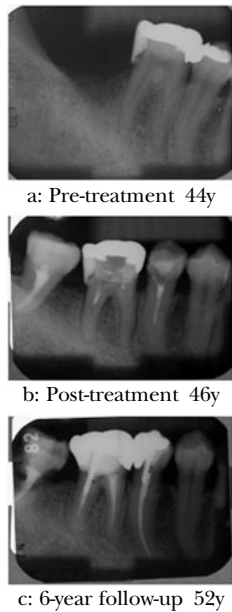


Fig. 5 Dental radiograph of recipient site

molar and the autotransplanted tooth were occluded (Figs. 2-b, 3-b). However, the crowns of the lower right first molar and the transplanted tooth were not in contact with each other and the dental X-ray film revealed no periodontal membrane space in the transplanted tooth (Figs. 3-b, 5-b); the transplanted tooth was suspected of replacement resorption, so-called ankylosis<sup>16)</sup>.

After removal of the fixed appliance, Begg-type retainers were prescribed for both dental arches. The patient came in for post-treatment checkups in the first year of retention, but did not return thereafter for 5 years (Figs. 1-c, 2-c). The patient wore retainers for approximately 2 years.

Cephalometric analysis indicated an SNA of 78°, an SNB of 78°, an ANB of 0°, a mandibular plane angle of 40.5° and an occlusal plane angle of 19° (Fig. 4-c). Her facial appearance was maintained favorably and her occlusion was stable (Fig. 4-d). The autotransplanted tooth showed signs of root resorption on the radiograph taken at 6-year recall (Figs. 3-c, 5-c). The patient stayed symptom-free in the meantime. She currently uses no retainer, and her occlusion remains stable.

## Discussion

Patient age at transplantation, donor health status and donor eruption stage are important factors in the success of autotransplantation and survival of transplanted teeth<sup>1)</sup>. Premolars and third molars are the tooth types most commonly used as donor teeth. Jonsson and Sigurdsson<sup>9)</sup> emphasized the importance of proper case selection in ensuring that the patient would benefit from the transplant, if successful, but that they would not be left any the worse in the event of failure than if no transplantation had been attempted. Their study included 40 transplanted teeth in 32 patients (19 men, 13 women) with a mean age of 13 years (10–15 years). Many of the transplants were removed from upper second premolar positions and transferred to sites of congenitally missing lower second premolars before orthodontic treatment<sup>4,5)</sup>. Of the 33 teeth (premolar) transplanted in the 28 patients (11.5 years in average age), 3 teeth were lost after 9, 10 and 29 years<sup>3)</sup>. Harzer *et al.*<sup>8)</sup> also reported successful results for premolar autotransplantation in 10-year-olds. These studies suggest that patient age at the time of transplantation is an important factor in the success rate of autotransplantation.

The literature also contains reports on autotransplantation of molars in slightly older patients. Akkocaoglu and Kasaboglu<sup>1)</sup> analyzed 49 molars transplanted in patients aged 18 to 24 years and reported a success rate of 84% (41/49) at 7 to 8 years of follow-up. Reich<sup>14)</sup> followed 44 molars autogenously transplanted in 32 patients aged 11 to 25 years for an average of 19 months and reported that 42 teeth remained asymptomatic and functional according to several predefined criteria.

None of these authors reporting high success rates saw any association between the success of autotransplantation and the degree of root maturity or the use of some form of fixation or splinting. The subjects enrolled in these studies were all relatively young at the time of transplantation.

Kallu *et al.*<sup>10)</sup> reported relatively low rates of root resorption (21%) and ankylosis (13%).

Their study also included young patients with a mean age of 18 years. Some transplanted teeth did not even call for endodontic treatment.

The age of the present patient was over 40 years at the time of transplantation and may not have been amenable to transplant success. However, there seems to be a growing need for autotransplantation as the number of unrestorable teeth requiring extraction or missing teeth increases with age.

The present patient showed no root resorption at appliance removal or 20 months after transplantation and has remained asymptomatic for 8 years. One contributing factor may have been the maintenance of occlusal stability, with the posterior teeth in more occlusal contact than they would have been without autotransplantation throughout active orthodontic treatment, despite drastic changes in the maxillomandibular relationship with orthognathic surgery. Without autotransplantation, the upper right second molar would have stood alone due to the lack of a corresponding tooth. The absence of subjective symptoms and favorable occlusal outcome may be explained by slow progression of root resorption. However, observation should be continued to ensure that functional occlusion is maintained.

Commonly used criteria for transplant failure include the presence of pulpal or periapical lesion, excessive tooth mobility, and progressive internal or external root resorption<sup>1)</sup>. Akkocaoglu and Kasaboglu<sup>1)</sup> judged success using the modified criteria of Chamberlin and Goerig<sup>4)</sup>: the tooth was fixed in its socket without discomfort; chewing was satisfactory; the tooth was not mobile; no pathological condition was seen on the radiograph; the lamina dura appeared normal on the radiograph; and the depth of the sulcus, gingival contour and gingival color were normal. The autotransplanted tooth of the present patient was fixed in its socket and it was not mobile. However, a more serious pathological condition, root resorption, was observed on the dental X-ray film (Fig. 5-c). Furthermore, although the lower right first molar and the second premolar were treated, treatment for the auto-

transplanted tooth was neglected after orthognathic treatment. According to Tsukiboshi<sup>16)</sup>, no matter how ankylosis may occur in an autotransplanted teeth, the tooth may still function long-term with proper maintenance in adults. Resorption was observed in half of the root, so a dental implant will eventually be needed as a final dental treatment for this patient. In one case report<sup>11)</sup>, an autotransplanted tooth extracted for implant treatment was found to be still healthy five years after initial insertion. More needs to be known not only with regard to the clinical condition but also the pathological conditions required for autotransplantation of teeth.

Autotransplantation is a technique-sensitive procedure that requires a careful surgical protocol for success. It is equally important to provide the patient with appropriate post-operative care through such measures as oral hygiene and dietary instructions in the first post-operative week; regular checkups on occlusal contact, ankylosis, tooth mobility, external and internal root resorption, necrosis and periodontal inflammation; and start of root canal treatment approximately 3 months after transplantation, when indicated<sup>8)</sup>. If these measures are carefully followed, the success rate of autotransplantation may increase in terms of both quality and duration of tooth survival, and autotransplantation may serve as a viable treatment option, even in older patients requiring replacements for missing or extracted teeth.

The autotransplanted tooth helped stabilize her occlusion and acted as a kind of temporary tooth prior to the final decision on treatment to be given such a dental implant.

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