

Orthodontic Treatment after Autotransplantation of a Mature Tooth

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บทคัดย่อ: การรักษาทางทันตกรรมจัดฟันภายหลังการปลูกถ่ายฟัน

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การปลูกถ่ายฟันให้ตนเองเป็นทางเลือกหนึ่งในการทดแทนฟันที่หายไป รายงานผู้ป่วยฉบับนี้ เป็นกรณีศึกษาการรักษาทางทันตกรรมจัดฟันในหญิงไทย อายุ 26 ปี ที่มีการกีดขวางการสบฟัน ของฟันกรามบนซ้ายซี่ที่หนึ่งและฟันกรามล่างซ้ายซี่ที่หนึ่ง ผู้ป่วยได้รับการปลูกถ่ายฟันให้ตนเองจากฟันกรามบนขวาซี่ที่สามไปยังฟันกรามล่างซ้ายซี่ที่หนึ่ง ภายหลังการรักษาไม่พบการอักเสบ ไม่มีการละลายตัวของรากฟัน ไม่พบการยึดติดของกระดูกเข้าฟันและฟัน ไม่พบว่ามีอาการโยกของฟัน การเรียงตัวของฟันและการสบฟันดีขึ้นภายหลังการรักษา ผู้ป่วยพอใจกับผลการรักษาและสามารถใช้งานได้เป็นปกติ

คำสำคัญ: การรักษาทางทันตกรรมจัดฟัน การปลูกถ่ายฟัน

Abstract:

Autotransplantation is an alternative method to replace a missing tooth. This case report describes the orthodontic treatment of a 26-year old Thai female who had occlusal interference between 26, 36. Autotransplantation of the 18 into the 36 socket was performed. No signs of inflammation, root resorption, ankylosis, or mobility were found. The teeth alignment and occlusion were improved. The patient was satisfied with the treatment outcome and could function normally.

Keyword: Autotransplantation, Orthodontic treatment

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Introduction

Tooth autotransplantation is defined as the surgical movement in one individual of a vital or endodontically treated tooth from its original location in the mouth to another site¹. It is important to select patients with favorable prognostic factors for success². While there are many indications for autotransplanting teeth, tooth loss as a result of dental caries is the most common indication, especially when mandibular first molars are involved. First molars erupt early and are often heavily restored. Autotransplantation in this situation involves the removal of a third molar which may then be transferred to the site of an unrestorable first molar. Other conditions in which transplantation can be considered includes tooth agenesis (especially mandibular second premolars), traumatic tooth loss, atopic eruption, juvenile periodontitis^{1, 3}. Successful transplantation depends on various patient factors, the donor tooth, and the recipient site. The patients must be in good health, able to follow post-operative instruction, and reliable for follow-up. They should also demonstrate an acceptable level of oral hygiene and be amenable to regular dental care. As for the recipient site, it must have sufficient alveolar bone

support in all dimensions with adequate attached keratinized tissue to allow for stabilization of the transplanted tooth. In addition, the recipient site should be free from acute infection and chronic inflammation¹. The donor tooth should be positioned such that extraction will be as atraumatic as possible. Teeth with either open or closed apices may be donors; however, the most predictable results are obtained with teeth having between one-half to two-thirds completed root development¹. In recent years, application of autotransplantation to orthodontic treatment has been reported mainly in Scandinavian countries⁴⁻⁶. Autotransplantation has become one of the standard treatments offered with a validity similar to that of dental implants^{2, 6-7}. Several studies have suggested autotransplantation of immature teeth. This case report demonstrates successful autotransplantation of the maxillary right third molar to the area of a missing the mandibular left first molar. Teeth alignment and occlusion improved after completion of the active orthodontic treatment. The patient was satisfied with the treatment outcome and could function normally.

Diagnosis and etiology



Fig 1. Pretreatment photograph

The patient was a 26-year-old Thai female with the chief complaint of occlusal interference between 26, 36. She had completed autotransplantation of 18 into the space of the 36; 11 months ago. She had no serious medical history or previous orthodontic treatment. The patient had a symmetrical and slightly convex profile. Her frontal facial photograph showed incompetent lips. Her left and right eye openings were not equal. She had Class I canine and Class II molar classification

at her left teeth with an overjet of 2 mm. and overbite of 10%. There was mild crowding at the premolar segment of the maxillary arch with cross-bites of 12, 15, 25 and 26. The mandibular arch had mild crowding at left molar segment with 36 buccoversion and first mobility degree, and a mild curve of Spee. The space condition discrepancy was -5.0 mm. in the maxillary arch and -1.5 mm. in the mandibular arch. (Fig 1.)



Fig 2. Lateral cephalometric

	Measurement	Thai		Before tx
		Norm	±S.D.	
SKELETAL (SAGITTAL)	NS-FH	7	2.58	5
	NS-Ba	128	5.09	121
	SNA	84	3.58	86
	SNB	81	3.59	84
	ANB	3	2.50	2
	AF-BF (mm.)	3	3.72	4.5
	AO-BO (mm.)	-2	3.49	-4
	SNPg	82	3.09	84
	Pg-NB (mm.)	1	1.54	0
	Co-A (mm.)	93	4.95	91
	Co-Gn (mm.)	121	6.69	124
	Mand-Max difference	28	4.14	33
SKELETAL (VERTICAL)	NS-MP	30	5.61	29
	NS-PP	9	3.03	5
	MP-PP	21	5.25	24
	FH-FO	9	4.38	12
	NS-Gn	68	3.29	67.5
	Mand. angle	118	6.13	114
	PFH/AFH	65	2.88	68.05
	Facial index	81	6.54	77.33
DENTAL (ANT-POST)	U1-NA	22	5.94	18.5
	U1-NA (mm.)	5	2.13	6
	U1-SN	108	6.13	106
	L1-NB	30	5.61	36
	L1-NB (mm.)	7	2.22	9
	L1-MP	97	5.97	103.5
	Inter-incisal angle	125	8.03	122
	Overjet (mm.)	3		2
DENTAL (VERTICAL)	Overbite (mm.)	2	1.06	1
	Ant.max.alv.ht (mm.)	28	2.64	33
	Post.max.alv.ht (mm.)	22	2.13	26
SOFT TISSUE	Naso-labial angle	91	7.98	98
	H-angle	14	3.83	14
	Lower lip to E-plane	2	2.03	1

Table1. Cephalometric analysis⁽⁸⁻⁹⁾

** Additional cephalometric measurement (Appendix A)

Cephalometric analysis indicated a skeletal Class I relationship (SNA, 84; PP, 5;). The maxillary incisors showed normal inclination and position (U1-NA, 18.5, 6 mm.), and

the mandibular incisors showed slightly proclination and protrusion (L1-NB, 36, 9 mm.) (Fig 2; Table 1)



Fig 3. Pre-treatment panoramic radiograph

The panoramic radiograph shows generalized mild blunting of the alveolar crestal bone, mild vertical bone loss mesial of 18 transplanted at the location of 36 with periapical radiolucency. (Fig 3.)

Materials and Methods

The treatment objectives were to obtain normal overjet and overbite, establish Class I molar occlusion on the left, maintain Class I molar on the right and the Class I canine occlusion on both sides; eliminate crossbite, relieve crowding of both arches and level the curve of Spee. On the basis of the diagnostic records, the following treatment plan was developed: placement of fixed appliances¹, and establishment of a stable occlusion².

Treatment progress

All of the maxillary and mandibular teeth were bonded with a 0.022-inch slot self-ligating brackets. The 0.014", 0.016" stainless steel wire, 0.018" NiTi, 0.018" stainless steel wire and 0.016" x 0.022 NiTi were placed on both dental arches for alignment. After the leveling stage, 0.018" stainless steel loop

was placed at the mesial and distal aspect of 36, an open coil spring for space of 36 was placed on the mandibular arch for occlusal adjustment 26 and 36. During the finishing and detailing stages to obtain suitable interdigitation with ideal archwires: 0.017 x 0.025 stainless steel for the maxillary arch and mandibular arch. The crowding and the crossbite of the maxillary arch and mandibular arch were corrected.

Active treatment time took a total of 51 months. After its completion, the orthodontic retainers were to be worn all day for 1 year and therefore only at night.

Results

The overall treatment objectives were successfully achieved (Fig 4). The post-treatment facial photographs showed improved profile esthetics. Suitable intraoral interdigitation was also achieved with Class I canine relationship and Class I molar relationship on both sides, and the dental midline was centered with ideal overbite and overjet, and a flat curve of Spee.



Fig 4. Posttreatment

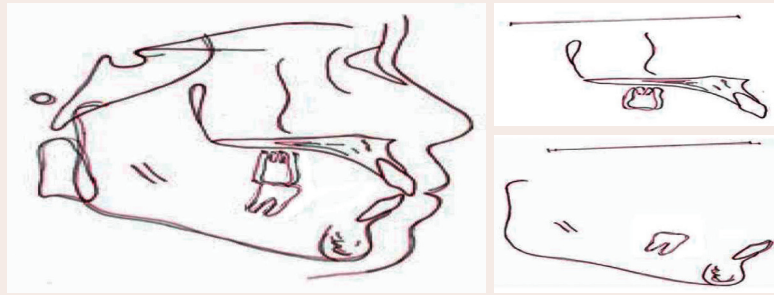


Fig 5. Superimposition

According to the cephalometric superimposition, the maxilla and mandible were stable, Class I skeletal relationships maintained with no rotation of maxilla, slight posterior rotation of mandible, and slight anterior rotation of the functional occlusal plane. Upper incisors were maintained in position but slightly proclined. Lower incisors were slightly proclined and positioned forward. Interincisal angle was slightly reduced. Nasolabial angle increased. Slight reduction of facial convexity was achieved. Lower lip position was slightly increased by 1.0 mm. related to E-plan. Upper first molars moved backward about 2 mm. with slight extrusion. Upper incisors were in the same position, no extrusion. Lower first molars were almost the same position and slightly uprighted. The radiographic findings showed generalized mild root resorption in the upper and lower arch, generalized blunting of the alveolar crestal bone and a radiolucent area surrounding the autotransplanted tooth (Dx: Pulp necrosis with asymptomatic apical periodontitis). The final endodontic treatment was applied to the autotransplanted tooth after removal of the fixed appliance.

Discussion

As the number of adult dental patients has increased, the number of patients with missing teeth due to periodontal disease or dental caries has also increased. A high success rate and good prognosis has been reported when dental implants were used to replace missing teeth. Implants can be applied to almost any patient with predictable results¹⁰⁻¹². However, it has been reported that the magnitude of adult growth change, assessed on a millimeter per year basis, was quite small; but the cumulative effect over decades was surprisingly large. Data also revealed that the rotation of both jaws continued into adult life¹³. We cannot deny that these changes may result in a lack of vertical occlusion or malposition of adjacent natural teeth relative to the implant. This patient was 26 years old, and changes in the jaws and teeth with aging and adult growth were predicted. Autotransplantation has been used to replace missing teeth and teeth of poor prognosis. However, autotransplantation currently still has many limitations as it is not yet a standard treatment, in contrast to dental implants. The success and prognosis after autotransplantation of a tooth with complete root formation is affected by the amount of

intact and viable periodontal ligament cells, the quality of root filling, pocket depth, donor tooth's extraoral time, distance between the recipient site tissue and the transplant root surface, and patient's age^{1, 14-18}. In this patient presenting with autotransplantation of the maxillary right third molar into the mandibular left first molar, the maxillary right third molar had occlusal interference with the maxillary left first molar, and the development of tooth root had occurred but shortening and dilacerations of the root was observed with periapical radiolucency.

Although the success rate of autotransplantation is reported to be fairly high, between 63.1% and 100%^{16, 19- 20} the most common complications mentioned in the literature are ankylosis of the transplant and replacement resorption after ankyloses^{14, 19}. For orthodontic treatment, tooth movement after transplantation is mandatory in most cases, the orthodontic force (jiggling force) employed to prepare for autotransplantation decreased the risk of damages to the periodontal membrane. Therefore, several postoperative procedures were considered to reduce the changes of ankylosis. Conventionally, orthodontic treatment begins 3 to 6 months after transplantation, but recently the application of stable biological loading just after the initial healing period has been reported to have positive effects in preventing ankyloses^{2, 4, 21}. In our patient, orthodontic treatment was started 11 months after transplantation. All of the maxillary and mandibular teeth were bonded with an edgewise appliance and minimal orthodontic force was exerted on the teeth. The panoramic radiograph showed a radiolucent area surrounding the donor tooth. In general, endodontic treatment of the transplant is recommended after autotransplantation but before tooth movement. The endodontic treatment was applied to the autotransplantation tooth after removal of the fixed appliance.

When there are missing teeth, autotransplantation in combination with orthodontics can increase the quality of treatment. Orthodontic treatment must begin after the healing of the periodontal ligament.

Conclusion

Autotransplantation is a viable option to avoid prosthetic rehabilitation or to achieve the reconstruction and stability of occlusion. Orthodontic treatment combined with tooth

transplantation contributed to successful for an adult patient with missing teeth.

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