รายงานผู้ป่วย
Case Report

Treatment of Unilateral Severe Horizontally Embedded Maxillary Central Incisor with Odontoma: A Case Report

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Abstract

One of the most difficult orthodontic conditions is severe horizontally embedded maxillary central incisor. A well-managed combination of orthodontic treatment and surgery results in a satisfactory outcome. This case report describes the correction of a severe horizontally embedded left maxillary central incisor with odontoma in a 13-year-old Thai boy. The treatment included surgical removal of the obstructive odontoma and surgical crown exposure combined with orthodontic traction of the embedded incisor. The target tooth was successfully moved into its proper position. The patient completed the treatment with a normal and stable occlusion.

Keywords: Embedded tooth, Horizontal position, Maxillary central incisor, Odontoma, Supernumerary tooth

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Introduction

The maxillary central incisors are the most prominent teeth in the mouth. They significantly affect a child's facial appearance related to esthetics, pronunciation, mastication, and mental wellness.[1] Unerupted maxillary central incisors are uncommon. The incidence of unerupted permanent maxillary incisor was variously reported. Previous studies showed an occurrence of unerupted maxillary incisors of 0.02-1.41%.[2-4]

Failure or delayed eruption of maxillary incisors are related to several factors including local and systemic factors.[5] Common local factors are pathological or physical obstructions such as supernumerary teeth, odontomas, and cysts that develop in the eruptive path of the incisor.[5, 6] Systemic factors are extremes of nutrient deprivation, endocrine abnormalities, and impairment of growth.[5] Other possible causes are ectopic position of the tooth bud, non-vital or ankylosed primary teeth, early extraction or loss of primary teeth, and mucosal barriers in the path of eruption that act as physical obstacles to eruption.[6]

Treatments of a severe horizontally embedded maxillary central incisor are challenging because of the unfavorable position,[7] i.e. height, depth, and angulation, unfavorable root malformation,[7] and its importance to facial esthetics.[8] Treatment options for this condition include surgical removal of the embedded tooth followed by space opening and prosthesis placement or space closure by tooth substitution. Another option is surgical exposure and orthodontic traction of the embedded tooth into its proper position.[7, 9-11] However, each plan has different advantages and limitations. Therefore, treatment planning must be considered on a case-by-case basis that includes treatment time, compliance of the patient and parents, cost, expected treatment results, and adverse effects. Moreover, treatment planning requires consultation between the patient, parents, orthodontist, and oral surgeon.

Cases of an embedded maxillary central incisor are not frequently reported.[8] However, this case report presents a 13-year-old Thai boy who underwent correction of a severe horizontally embedded left maxillary left central incisor with odontoma through surgical removal of the obstructive odontoma followed by crown exposure and orthodontic traction.

Case report

A 13-year-old Thai male had a chief complaint of an unerupted left maxillary central incisor and crowding of the four mandibular incisors. The patient was in good health and had no systemic disease; however, he was allergic to erythromycin. The parents could not recall any history of dental trauma.

Clinical examination revealed that the patient had a mesofacial type face in the frontal view and a convex facial profile in the lateral view. Although the lips were slightly protruded, his facial appearance was acceptable. Intraoral examination reported molar Class I and canine Class II relationship on both sides with unerupted maxillary left central incisor. The maxillary and mandibular anterior teeth were crowded. The maxillary dental midline had shifted 3 mm to the left (Figure 1).

The cephalometric analysis revealed skeletal Class II normodivergent pattern with orthognathic maxilla and mandible, normally inclined and positioned upper and lower incisors, normal interincisal angle, protruding upper and lower lips, and normal nasolabial angle (Figure 2, Table 1).

The radiographs and cone beam computed tomography (CBCT) showed a permanent dentition stage with odontoma and two supernumerary teeth that were related to the horizontally embedded maxillary left central incisor. The embedded tooth was in a high position near the floor of the nose. The position of the odontoma was between the middle root of the maxillary right central incisor and the maxillary left lateral incisor. Furthermore, one of the two supernumerary teeth was located between the maxillary right central and lateral incisors, whereas

the other was at the apical region of the embedded tooth (Figures 3-5).

The diagnosis of this case according to the skeletal, dental, and soft tissue parameters was (i) skeletal Class II normodivergent pattern with orthognathic maxilla and mandible, (ii) dental Class II malocclusion with embedded maxillary left central incisor with odontoma, supernumerary teeth between the maxillary right and left central incisors and at the maxillary left central incisor, ectopic eruption of the maxillary left canine, maxillary and mandibular anterior teeth crowding, normally inclined and positioned maxillary and mandibular incisors, maxillary dental midline shift to the left of 3 mm, and (iii) convex facial profile and protruded upper and lower lips.

According to the patient's medical status and no history of head and neck trauma, the etiology of the embedded maxillary left central incisor was the odontoma and supernumerary teeth that obstructed the path of eruption. Moreover, the abnormal tooth bud position of the maxillary left central incisor might have caused an angle between the tooth axis and facial axis to be approximately 90 degrees in the horizontal position.

Figure 1 Pre-treatment extra- and intra-oral photographs.

Figure 2 Pre-treatment lateral cephalometric radiograph

Figure 3 Pre-treatment panoramic radiograph

Figure 4 Pre-treatment periapical radiograph

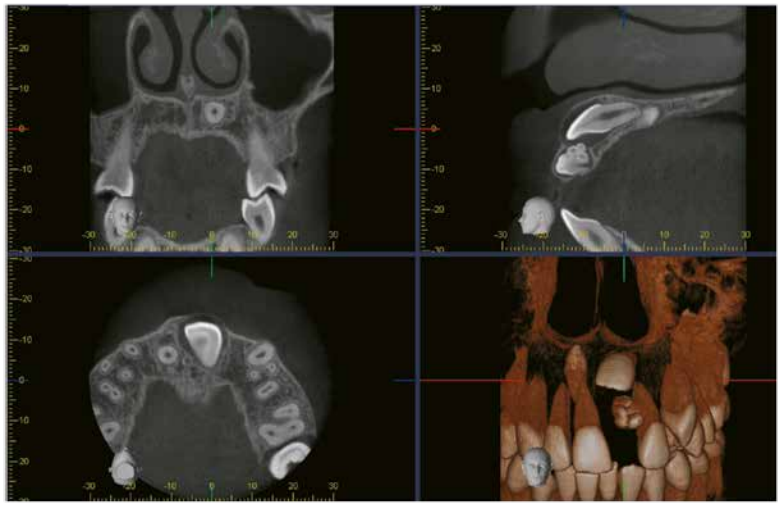

Figure 5 Pre-treatment CBCT

Table 1 Pre-treatment cephalometric analysis (Thai norm[12-14])

Area		Measurement	Norm Mean±SD	Pre-treatment	Interpretation
Reference line		FH-SN (degree)	6±3	6	Normal SN plane
Skeletal	Maxilla to cranial base	SNA (degree)	84±4	86	Orthognathic maxilla
		SN-PP (degree)	9±3	9	Normal inclination of maxilla
	Mandible to cranial base	SNB (degree)	81±4	80	Orthognathic mandible
		SN-MP (degree)	29±6	39	Hyperdivergent pattern
		SN-Pg (degree)	82±3	80	Orthognathic mandible
		NS-Gn (degree)	68±3	69	Normodivergent pattern
	Maxillo-mandibular	ANB (degree)	3±2	6	Skeletal Class II
		Wits (mm.)	-3±2	0	Skeletal Class II
		MP-PP (degree)	21±5	29	Hyperdivergent pattern
		FMA (degree)	23±5	33	Hyperdivergent pattern
Dental	Maxillary dentition	UI to NA (degree)	22±6	19	Normally inclined upper incisor
		UI to NA (mm)	5±2	3	Normally position upper incisor
		UI to SN (degree)	108±6	109	Normally inclined upper incisor
	Mandibular dentition	LI to NB (degree)	30±6	36	Normally inclined lower incisor
		LI to NB (mm)	7±2	8	Normally position lower incisor
		LI to MP (degree)	99±5	96	Normally inclined lower incisor
	Maxillo-mandibular	UI to LI (degree)	125±8	120	Normal interincisal angle
Soft tissue	Soft tissue	E line U. lip (mm)	-1±2	5	Protruded upper lip
		E line L. lip (mm)	2±2	5	Protruded lower lip
		Nasolabial angle (degree)	91±8	94	Normal nasolabial angle
		H-angle (degree)	14±4	24	Protruded upper lip

The possible treatment options explained to the patient and his parents were as follows:

1. An orthodontic space opening for the maxillary left central incisor would be performed. The embedded crown would be exposed during the surgical removal of both the odontoma and supernumerary teeth followed by orthodontic traction to bring the maxillary left central incisor into its proper alignment.
2. Surgical removal of the maxillary left central incisor, odontoma, along with the supernumerary teeth would be performed followed by orthodontic space opening when his growth had stabilized. A 3-unit bridge or a single implant would be proposed.

The vertical position of the embedded tooth was high since it was at the apical level between the maxillary right central incisor and the maxillary left lateral incisor, and it was near the nasal floor. Such severe horizontal angulation is typically challenging. Although there was little chance of successfully bringing the tooth into alignment, the patient and parents wanted to try this treatment option. They were given the information that in case of a failure of assisted eruption, removal of the embedded tooth and a prosthetic tooth would be required. Therefore, the treatment plan consisted of orthodontic space opening, surgical exposure of the embedded tooth, surgical removal of both the odontoma and supernumerary teeth, and traction of the embedded tooth into the proper position.

Treatment progress

In the pre-orthodontic phase, the patient was referred for scaling, filling, and surgical removal of the odontoma and supernumerary teeth followed by surgical exposure of the embedded tooth (Figure 6). A button with a ligature was bonded on the uncovered tooth (Figure 7).

During the orthodontic phase, bi-dimensional preadjusted edgewise appliances (slot 0.018-inch at the incisors and slot 0.022-inch at all remaining teeth) were bonded and the leveling phase was started with 0.012-, 0.016-inch nickel-titanium (NiTi) wires and 0.018-inch stainless steel (SS) wire on both arches. A space was prepared by interproximal reduction on the maxillary posterior teeth. An open NiTi coil spring was used between the maxillary right central incisor and maxillary left lateral incisor to open space for the embedded tooth and to center the maxillary dental midline to the right. An intermaxillary Class II elastic was used on both sides to correct the Class II canine relationship.

When there was an appropriate space for the maxillary left central incisor, the elastic thread was tied from the main arch wire (0.016 x 0.016-inch SS wire) to the ligature of the maxillary left central incisor button. The button was replaced by a bracket when the maxillary left central incisor became sufficiently exposed. A 0.012-inch NiTi overlay wire was used to

Figure 6 Odontoma and supernumerary teeth

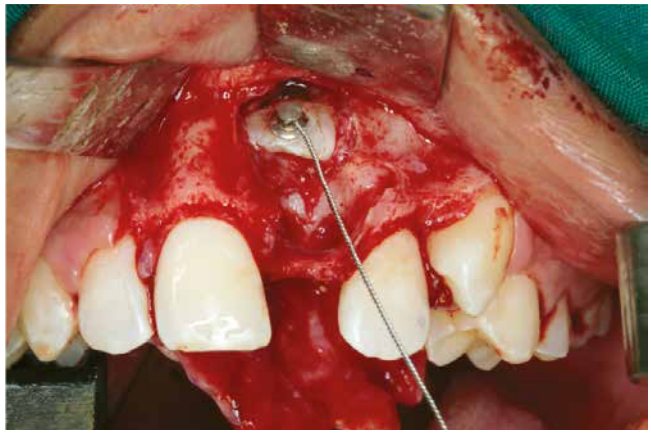

Figure 7 Surgical exposure of the embedded tooth

bring the maxillary left central incisor into the normal position. The finishing arch wire was a 0.016 x 0.022-inch SS wire with torque and artistic bends. The total active treatment time was 29 months. Wrap-around retainers were made and used full-time for one year followed by night-time only.

At the completion of all treatment steps, the extraoral examination indicated a convex facial profile but the lower facial height increased. The upper and lower lip positions were maintained (Figure 8). The intraoral examination and dental casts showed that the maxillary left central incisor was not only successfully aligned in a proper position but also remained vital. The tooth presented mild gingival recession and a little darker color (Figures 8 and 9). A radiograph revealed that the root length of the newly positioned maxillary left central incisor was shorter than the root length of the maxillary right central incisor (Figure 10). From a post-treatment lateral cephalometric radiograph and lateral cephalometric superimposition (Figures 11, 12 and table 2), no changes were observed in the skeletal or soft tissue structures. The dental part showed normally inclined and positioned upper and lower incisors and normal interincisal angle.

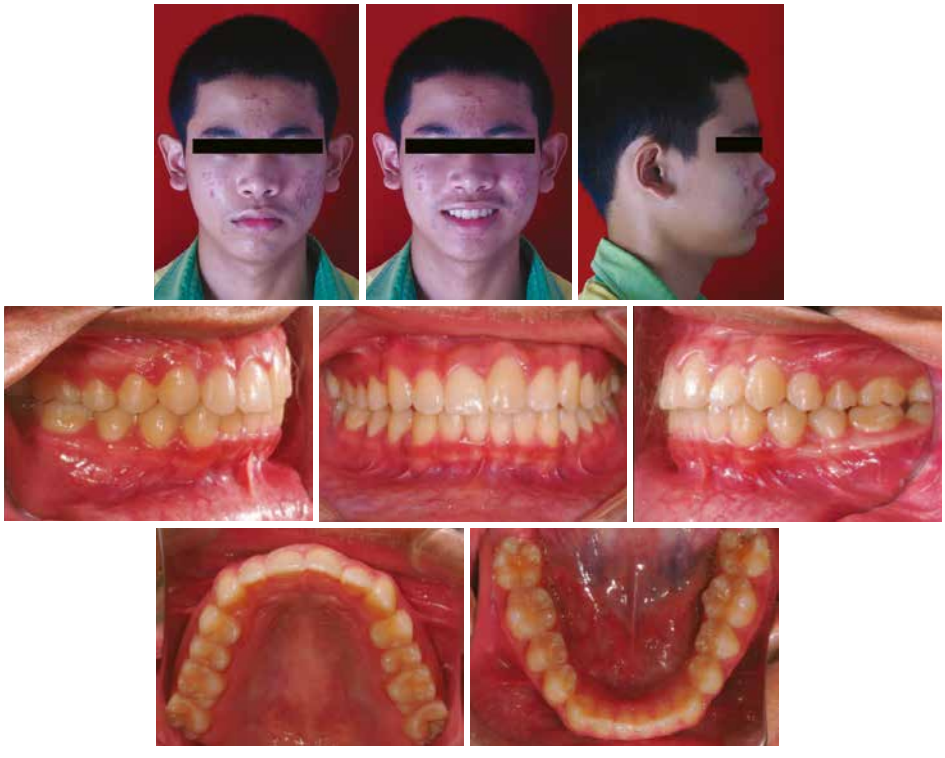

Figure 8 Post-treatment extra- and intra-oral photographs

Figure 9 Post-treatment dental cast photographs

Figure 10 Post-treatment panoramic radiograph

Figure 11 Post-treatment lateral cephalometric radiograph

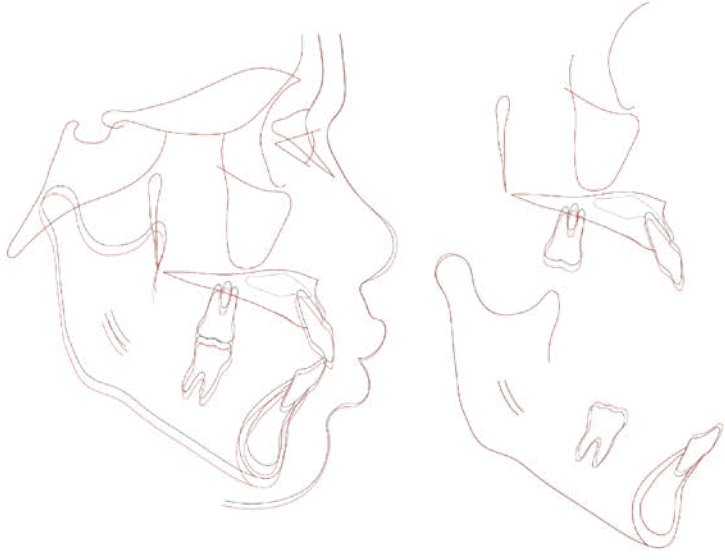

Figure 12 Lateral cephalometric superimposition

Discussion

An embedded tooth is one of many terms used in the literature to describe disorders of tooth eruption.[5] In this case, the clear etiology of the embedded tooth was the odontoma and supernumerary teeth. The abnormal proliferation of cells of enamel organ may result in an odontogenic hamartoma, commonly referred to as an odontoma. There are two types of odontomas: compound and complex. A compound odontoma represents multiple tooth-like structures and a complex odontoma has irregularly shaped masses of enamel with no anatomic resemblance to a tooth.[15] Odontomas are reported to be the most common of the odontogenic lesions associated with delayed tooth eruption.[5] In this case from the CBCT, it was a compound type because the lesion had only tooth-like structure. The recurrence rate of odontoma is very low. The latest research reported that recurrence was observed in 4 cases out of 127 patients.[16]

From the literature, removal of an obstruction from the path of an eruption is the suggested treatment for an embedded tooth in permanent dentition.[5,15] Alternative recommended treatments are either immediate surgical exposure followed by orthodontic traction[17] or monitoring for a spontaneous eruption.[5, 18, 19]

Table 2 Comparison of pre- and post-treatment cephalometric analysis (Thai norm[12-14])

Area		Measurement	Norm Mean±SD	Pre-treatment 23-9-2017	Post-treatment 23-7-2020	Difference
Reference line		FH-SN (degree)	6±3	6	6	0
Skeletal	Maxilla to cranial base	SNA (degree)	84±4	86	86	0
		SN-PP (degree)	9±3	9	9	0
	Mandible to cranial base	SNB (degree)	81±4	80	80	0
		SN-MP (degree)	29±6	39	39	0
		SN-Pg (degree)	82±3	80.5	80.5	0
		NS-Gn (degree)	68±3	69	69	0
	Maxillo-mandibular	ANB (degree)	3±2	6	6	0
		Wits (mm)	-3±2	0	0	0
		MP-PP (degree)	21±5	29	29	0
		FMA (degree)	23±5	33	33	0
Dental	Maxillary dentition	UI to NA (degree)	22±6	19	21	+2
		UI to NA (mm)	5±2	3	4	+1
		UI to SN (degree)	108±6	109	111	+2
	Mandibular dentition	LI to NB (degree)	30±6	36	38	+2
		LI to NB (mm)	7±2	8	9	+1
		LI to MP (degree)	99±5	96	98	+2
	Maxillo-mandibular	UI to LI (degree)	125±8	120	123	+3
Soft tissue	Soft tissue	E line U. lip (mm)	-1±2	5	5	0
		E line L. lip (mm)	2±2	5	5	0
		Nasolabial angle (degree)	91±8	94	94	0
		H-angle (degree)	14±4	24	24	0

Odontoma removal may or may not result in a spontaneous eruption depending on patient age, lesion size, and the stage of embedded tooth development.[20] Spontaneous eruption had a very low possibility in this case based on the patient's age, near complete root formation, high position of the embedded tooth, and severe horizontal angulation. It was possible, however, to pull the embedded tooth immediately during space preparation, which would save treatment time. Consequently, surgical exposure and orthodontic traction were done at the time of odontoma removal.

The prognosis of orthodontic treatment of an embedded tooth depends on many factors. First, it depends on the anatomy of the tooth.[5, 21] Orthodontic traction is more difficult if the root is dilacerated. Before starting traction of the embedded tooth, the root should be formed at least half of the length.[5] Second, consideration must be taken in regard to the distance from the embedded tooth to the space, angulation of the tooth,[21] alveolar bone, and the attached gingiva in the area of tooth exposure in the oral cavity. These factors impact the direction and mechanics of the orthodontic traction. Other factors consist of the available space for eruption,[21] the ability to prepare the space, compliance of the patient and parents, and the mechanics of orthodontic traction. In this case,

the prognosis of the maxillary left central incisor was fair due to the very deep horizontal position and the large distance from the embedded tooth to the space. However, the anatomy was normal and there was favorable angulation and sufficient alveolar housing at the final position.

A light force was used to bring the maxillary left central incisor into alignment[22] and to reduce the chance of future bone loss and root resorption. When the maxillary left central incisor was close to the occlusal plane, piggy-back mechanics aligned the target tooth by inserting a highly flexible NiTi wire. The main arch wire was sufficiently stiff to maintain the other teeth and served as an anchor for the orthodontic traction. This method had no side effects on the other teeth.[23] Case selection is very important to the success of orthodontic traction. In this case, no obstacle was present in the path of traction after removal of the odontoma and supernumerary teeth, and angulation of the embedded tooth was favorable for traction of the tooth.

Side effects might have occurred due to orthodontic intervention. For example, root resorption, pulp inflammation, gingival recession, inflammatory reaction, and enamel white spot lesions.[24] In this case, the maxillary left central incisor presented mild gingival recession but adequate attached gingiva was present. The patient's smile did not show the gingival margin of the maxillary teeth; therefore, it did not affect the patient's esthetic appearance. In addition, the size of the maxillary left central incisor was smaller than the right but there was normal overjet and Class I canine relationship at both sides. In consequence, the patient would not need to correct the unequal size problem. Moreover, a post-treatment panoramic radiograph disclosed that the root length of the maxillary left central incisor was shorter than the maxillary right central incisor. Even though the root was short, the crown to root ratio was 1:1. However, periodic follow-up was indicated.

The patient had good treatment results. The chief complaint of his embedded maxillary left central incisor was successfully corrected. The maxillary and mandibular teeth were well-aligned with a normal interincisal angle, normal Class I canine and molar relationship, maximum intercuspation, and normal overjet and overbite.

Conclusion

The compound odontoma and supernumerary teeth in this case were the obstacles to the eruption pathway of the maxillary left central incisor. The patient underwent successful treatment of the unilateral severe horizontally embedded maxillary central incisor by surgical exposure and orthodontic traction at the time of odontoma removal. The treatment resulted in normal and stable occlusion. Moreover, the patient and parents were satisfied with the esthetic outcome.

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