

Orthodontic Treatment of an Impacted Maxillary Central Incisor with Dentigerous Cyst in Male Patient – A Case Report

I Gusti Aju Wahyu Ardani¹, Ari Triwardhani¹, Alida¹, Indra Mulyawan², Iyanda Vemala¹,
Nina Agustin Chrystinasari¹, Dyshafilia Charindra¹

1. Departement of Orthodontics, Faculty of Dental Medicine Faculty, Airlangga University, Surabaya, Indonesia.

2. Departement of Oral and Maxillofacial Surgery, Faculty of Dental Medicine Faculty, Airlangga University, Surabaya, Indonesia.

Abstract

Impaction of the maxillary central incisor is very rare compared to impaction of third molars and canine. It impacts to the facial aesthetic and psychological of individuals. One of the etiologies is cystic formation that inhibits the eruption of the tooth. Dentigerous cysts are the most common type of odontogenic cysts. A multidisciplinary approach of surgical exposure and orthodontic force expected impacted maxillary central incisor down to proper position.

This paper presents a case of an impacted maxillary incisor with a dentigerous cyst that was managed by combined orthodontic and minor surgical techniques. Case(s): A 19-year-old male patient complained about the absence of an upper left permanent central incisor since he was 14 years old. Objective examination showed an edentulous area of tooth 21 with narrowing space but without midline shift.

The impacted tooth was performed by minor surgical exposure and the cyst was performed by marsupialization. A gold chain was bonded to the labial surface of the impacted tooth. The orthodontic treatment used the pre-adjusted technique with bonded MBT 0.022 brackets. NiTi open coil springs were placed to create space for the traction of impacted tooth 21. Finishing and detailing using SS 0.016 x 0.022. Hawley retainer was used as a retain

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Introduction

The anterior maxillary teeth are essential to facial esthetics since they are the prominent teeth during speech and smiling.¹ The normal eruption, position, and morphology of these teeth are crucial to craniofacial development, facial esthetics, and phonetics.² The primary maxillary incisors erupt approximately between six to nine months, and the permanent incisors erupt in six to eight years.³ As missing upper incisors are considered unattractive, this may impact self-esteem and social interaction. Hence, detecting and managing the problem as early as possible is crucial.⁴ The most frequently impacted teeth among the unerupted permanent incisors were

maxillary central incisors (70.6%), maxillary lateral incisors (22.5%), mandibular lateral incisors (4.1%), and mandibular central incisors were the least frequently impacted teeth (2.8%). The etiological factors of eruption disturbance of permanent maxillary incisors were mainly categorized as hereditary factors, including cleft lip and palate, supernumerary teeth, abnormal tooth or tissue ratio, and odontoma, and environmental factors, including cystic formation, trauma, retained primary teeth and early extraction or loss of primary teeth (with or without space loss).⁵

Cysts are pathological cavities enclosed by the epithelium, which may contain liquid, solid, or semi-solid material. Cysts are chronic, asymptomatic, slow-growing lesions and usually can only be detected by radiographic examination.⁶ A dentigerous cyst is a benign odontogenic developmental cyst that encloses the crown of an unerupted tooth or impacted tooth by an expansion of the follicle attached to its neck caused by a fluid accumulation between

*Corresponding author:

Prof. Dr. I Gusti Aju Wahyu Ardani, drg., M.Kes., Sp.Ort(K)
Department of Orthodontics, Faculty of Dental Medicine,
Universitas Airlangga, Surabaya, Indonesia.
E-mail: wahju_ardani@fkg.unair.ac.id

the enamel organ and the underlying dental crown.⁷ The dentigerous cyst is the most common odontogenic developmental cyst and represents about 20% of all cysts surrounded by epithelium that affects the maxillary bones.^{6,7} Dentigerous cysts are generally treated by surgical means. The most common surgical modalities used are total enucleation, marsupialization, and cyst decompression via fenestration.⁸

Impacted teeth can be appropriately positioned with orthodontic traction. The biomechanics knowledge is required to choose an ideal system of forces for each intended movement and traction of the impacted teeth.^{9,10} The successful management of the unerupted central incisor is a genuine clinical challenge for orthodontists because of the many opportunities for failure due to ankylosis, loss of attachment, and root resorption after orthodontic treatment.¹¹ This case study describes an impacted upper left central incisor associated with a dentigerous cyst aligned into the proper position after orthodontic treatment combined with surgical exposure.

Case(S)

A 19-year-old male patient had a chief complaint about the absence of the upper left anterior teeth after he extracted his deciduous teeth at 14 years old. A panoramic radiograph was required by his general dentist to identify the cause of the unerupted upper tooth. The patient found his permanent tooth in an asymptomatic lesion. He denied any trauma or infection that occurred in this area. He was referred to Airlangga University Dental Hospital to be treated in Orthodontic Department. He was in good general health, had no history of significant systemic disease, and had no family with a related condition.

Diagnosis

The initial panoramic radiograph showed that the upper left central incisor was impacted in a vertical position, with a radiolucent area, 17 mm in diameter, round in shape, and with a well-demarcated margin surrounding the crown of 21. All teeth, including the developing third molars, were present. The lateral cephalometric evaluation and the measured values revealed a Class I skeletal pattern (\angle SNA 87°, \angle SNB 85°, and \angle ANB 2°) (Figure 1). The cephalometric analysis shows that the ANB value is 2° and he

has Class I skeletal malocclusion. The upper and lower incisors were vertically tipped (interincisal angle = 141°). (Table 1).

Variable	Normal	Patient
FH-NPog	84,8°	87°
SNA	84,3°	87°
SNB	81,4°	85°
ANB	3°	2°
Interincisal	118,8°	141°

Table 1. Measurement of lateral cephalogram.



Figure 1. Initial panoramic and cephalometric radiograph.

Extraoral examination showed a straight facial profile with competent lips at rest, a symmetric face, and good facial balance in all proportions (Figure 2). From a dental perspective, the patient has been classified as Angle Class 1 malocclusion, although his upper and lower left canines relations were end-to-end. The upper left central incisor was absent in the arch. The largest width of the crown of erupted upper right central incisor was 9 mm, while the space available for the unerupted upper left central incisor was 8 mm. The overjet between 11 and 41 was 1 mm, and the overbite was 4 mm.

There is no contact between 21 and 31. Moderate crowding was also observed in the upper and lower anterior regions. The upper midline coincided with the facial midline, and the lower midline shifted to the left by about 1.0 mm.

The maxillary and mandibular arch were parabola-shaped (Figure 2). The arch length discrepancies in the study model show -4,5 mm in the maxillary arch and -3,5 mm in the mandibular arch, as calculated by Moyers' prediction tables. His dental history showed good oral hygiene, no bad habits, and no orthodontic treatment before.

Masticatory muscles and temporomandibular joints were asymptomatic to palpation, with no clicking, crepitations, or movement constraints.



Figure 2. Initial extra-oral and intraoral photograph.

Case Management(S)

MBT 0.022-in orthodontic brackets were placed except for tooth 12 (labioversion). The initial wire was NiTi 0.012-in with a stopper (resin composite) between teeth 11 and 22. One day after the brackets have placed, the patient was transferred to the oral surgeon for surgical exposure to the impacted maxillary central incisor (Figure 3A). A gold chain was bonded directly to the labial surface of the impacted tooth during surgical exposure (Figure 3C). A gold chain was tied passively to the wire using ligature wire. A part of the cystic lining was removed for histopathological evaluation (Figure 3B).

The histopathological examination revealed that the lesion is a calcifying odontogenic cyst, which is a benign lesion. Leveling and alignment were performed using a wire sequence with NiTi 0.012, 0.014, and 0.016-in archwires every 30 days. A month after surgical exposure, a bracket was placed for tooth 12 when NiTi 0.014-in archwires were used. A radiological and clinical was evaluated by the oral surgeon after three months of surgical exposure and it showed a disappearance of the lesion completely, and the impacted central incisor erupted spontaneously (Figure 3D).



Figure 3. (A) Surgical exposure 21, (B) A cystic lesion, (C) Bonded gold chain. (D) Periapical radiograph of 21, three months after surgical exposure.

NiTi open coil springs were placed between teeth 11 and 22 when using NiTi 0.016-in archwires to do space opening for the maxillary central incisor. After obtaining adequate space for alignment of the impacted incisor in the maxillary arch, an open coil spring was kept passively. After three months of surgical exposure, orthodontic traction of the impacted tooth 21 was started. The gold chain was activated by a force of approximately 50 g applied to an elastic module thread, and the chain was cut every 30 days.

NiTi 0.016 x 0.016-in archwires were used for traction of the impacted tooth 21 for two months, and stainless steel 0.016 x 0.016-in archwires for three months. An open coil spring was removed. Then the traction continued with rectangular stainless steel 0.016 x 0.022-in archwires for seven months. After 15 months of orthodontic treatment, upper and lower left canines were corrected into Class 1 relationship, and 21 erupted completely. After that, correcting inclination tooth 21 using torque spring with TMA 0.017 x 0.025-in archwires and finishing and detailing with rectangular stainless steel 0.016 x 0.022-in archwires for three months and in the end, using Hawley retainer for retention.

In the facial aspect, the profile improved by increasing of convexity profile angle and nasolabial angle. The lower lip is shortening, and the dentigerous cyst was healing with a good occlusion (Figures 4). From the post-treatment panoramic photograph, it is clearly seen that the left central maxillary incisor has been well-aligned and no significant root resorption occurred (Figure 5).



Figure 4. Post-treatment extra-oral and intra-oral photograph.



Figure 5. Post-treatment panoramic and lateral cephalometric radiograph.

Discussion

Studies have shown that several teeth which failed to erupt and passed their normal eruption time need to be surgically exposed and orthodontically aligned into their normal physiologic position in the dental arch.¹² The following factors are used to determine whether the successful alignment of an impacted tooth: (1) the position and direction of the impacted tooth, (2) the degree of root completion, (3) the degree of dilacerations, and (4) the presence of space for the impacted tooth.^{9,13} Delays in tooth eruption may be related to local or systemic changes. Local changes are a lack of space in the arch, the presence of supernumerary teeth, cysts, and tumours. The systemic changes are associated with craniofacial syndromes, hereditary factors, and endocrine disorders.⁷ According to this case report, tooth 21 was delayed in eruption because of engaging in a dentigerous cyst.

Clinically, patients with dentigerous cysts are generally asymptomatic. They are often described as incidental radiographic findings to determine why a tooth has failed to erupt or when an acute inflammation or infective exacerbation occurs. The common radiographic feature is characterized by a symmetric, well-defined, usually unilocular radiolucent lesion surrounding the crown of an unerupted tooth.⁸ The aim of treatment for dentigerous cysts is the complete elimination of pathology and maintenance of dentition. Criteria for selecting the cyst treatment modality refer to the cyst size and location, patient age, dentition involved, root development stage, the involved tooth's position in the jaw and its relation to the adjacent teeth, and involvement of adjacent vital structures.¹⁴

In general, marsupialization and orthodontic traction are considered the best option for patients with a dentigerous cyst,

including an unerupted tooth.¹⁵ Marsupialization is a procedure that involves the creation of a surgical window in the wall of the cyst. The cyst remains open for several months allowing the cavity to be filled with new bone. The involved teeth are then allowed to spontaneously erupt or brought into their proper position with orthodontic traction.¹⁶ Some studies have been conducted to determine the optimal timing of orthodontic traction to allow the unerupted tooth to erupt from the cyst. The findings were that spontaneous eruption of the cyst-associated tooth is predictable and may occur three months after marsupialization.¹⁷ Nowadays, CBCT has been commonly used by dentists, especially orthodontists and oral and maxillofacial surgeons, to identify the precise location of the impacted tooth and determine the bone density.^{18,19} Accurate visualization, excellent resolution, and detailed anatomy structures of the impacted tooth were provided by CBCT.^{15,20,21} In this case, CBCT was not used since, from the initial panoramic radiograph, the position of the maxillary central impacted tooth was seen as vertically positioned and well angulated.

The impacted tooth could be tracted to its proper position by fixed orthodontic treatment and surgical exposure.²² Patient's age, impacted tooth space, impacted tooth inclination, and the shape of impacted tooth apex are the specific considerations of surgical exposure to be properly continued by orthodontic treatment.²³ Properly aligned impacted tooth to its correct position, well-maintained surrounding tooth, and normal functional occlusal were the goals of successful orthodontic treatment of the impacted tooth.²⁴ The available space for tooth alignment was sufficient, and the etiologic for the maxillary central impacted tooth has been eliminated so the tooth 21 could be tracted to the correct anatomical position in the dental arch.

Conclusions

The dentigerous cyst lesion completely disappeared in 3 months, and the orthodontic treatment was finished in 19 months. The impacted maxillary central incisor was successfully positioned to its proper arch by surgical exposure removing the cyst lesion, and orthodontic traction was performed. The final appearance of the teeth was esthetically pleasing, with normal gingival margins. Tooth 21

showed no abnormalities in the crown shapes. The successful management of impacted central incisors is a clinical challenge. The clinician must have knowledge of the classification, etiology, and treatment modalities available for eruption disturbances of the maxillary incisors because it is essential to obtain an accurate diagnosis related to the treatment plan. If orthodontic traction fails, a multidisciplinary approach involving prosthetic treatment may be necessary.

Declaration of Interest

The authors report no conflict of interest.

References

1. Godhi BS, Shanbhog R, Chanchala HP. Interceptive management of ectopically erupting central incisor - A case report. *J Indian Soc Pedod Prev Dent*. 2019;37:409-13.
2. Suresh KS, Uma HL, Nagarathna J, Kumar P. Management of Ectopically Erupting Maxillary Incisors: A Case Series. *Int J Clin Pediatr Dent*. 2015;8(3):227-33.
3. Huber KL, Suri L, Taneja P. Eruption Disturbances of the Maxillary Incisors: A Literature Review. *J Clin Pediatr Dent*. 2008;32(3):221-230.
4. Tanki JZ, Naqash TA, Gupta A, Singh R, Jamwal A. Impacted maxillary incisors: Causes, Diagnosis and Management. *IOSR Journal of Dental and Medical Sciences*. 2013;5(2):41-5.
5. Kannan PK, Palanisamy SK, Kumar TS. A case of impacted maxillary central incisor and its management. *J Pharm Bioallied Sci*. 2012;4(Suppl 2):S174-S176.
6. Moraes LS, Bravo RP, Duda JG, Losso EM, Araujo MR. Impacted tooth associated with dentigerous cyst and compound odontoma—case report. *RSBO*. 2016;13(2):145-51.
7. Shear M, Speight P. Cysts of the oral and maxillofacial regions. 4th ed. Oxford: Wiley-Blackwell pub. 2007:59-75.
8. Mohapatra PK, Joshi N. Conservative Management of a Dentigerous Cyst Associated with an Impacted Mandibular Second Premolar in Mixed Dentition: A Case Report. *J Dent Res Dent Clin Dent Prospect*. 2009;3(3):98-102.
9. Uematsu S, Uematsu T, Furusawa K, Deguchi T, Kurihara S. Orthodontic Treatment of an Impacted Dilacerated Maxillary Central Incisor Combined with Surgical Exposure and Apicoectomy. *Angle Orthodontist*. 2004;74(1):132-6.
10. Nakandakari C, Gonçalves JB, Cassan DS. Orthodontic Traction of Impacted Canine Using Cantilever: A Case Report. Hindawi Publishing Corporation, Case Report in Dentistry. 2016, Article ID 4386464, 1-6.
11. Abu-Mostafa N, Abbasi A. Marsupialization of a large dentigerous cyst in the mandible with orthodontic extrusion of three impacted teeth. A case reports. *J Clin Exp Dent*. 2017;9(9): p. 1162-6.
12. Subbiah Kannan PK, Palanisamy SK, Kumar TS. A case of impacted maxillary central incisor and its management. *J Pharm Bioall Sci*. 2012;4:174-6.
13. Tanaka E, Watanabe M, Nagaoka K, Yamaguchi K, Tanne K. Orthodontic traction of an impacted maxillary central incisor. *J Clin Orthod*. 2001;35:375-378.
14. Motamedi M, Talesh KT. Management of extensive dentigerous cyst. *Br Dent J*. 2005; 198: 203-6.
15. Chrystinasari NA, Narmada IB, Triwardhani A. Position of unilateral / bilateral permanent canine impaction on the prognosis of treatment with KPG index: 3D cone beam computed tomography analysis. *J Int Dent Med Res*. 2021; 14(4): 1523-30.
16. Aoki N, Ise K, Inoue A, et al. Multidisciplinary approach for treatment of a dentigerous cyst – marsupialization, orthodontic treatment, and implant placement: a case report. *Journal of Medical Case Reports*. 2018;12:305.
17. Jena AK, Duggal R, Roychoudhury A, Parkash H. Orthodontic assisted tooth eruption in a dentigerous cyst: a case report. *J Clin Pediatr Dent*. 2004; 29(1):33-5.
18. Adiwinarno B, Narmada IB, Hamid TA. Comparison of trabecular Bone in Impacted and Normal Erupted Unilateral Maxillary Canine Teeth Using Cone-Beam Computed Tomography in Patients Scheduled for Orthodontic Treatment at the Universitas Airlangga Dental and Oral Hospital. *Acta Med Philipp*. 2023.
19. Narmada IB, Putri AR. The Effect of Maxilla Impacted Canine Positions on Root Resorption of Adjacent Teeth Using Cone-Beam Computed Tomography Imaging. *Acta Med Philipp*. 2023.
20. Tallo FR, Narmada IB, Ardani IGAW. Maxillary anterior root resorption in Class II/I malocclusion patients post fixed orthodontic treatment. *Dent. J*. 2020;53(4):201-5.
21. Gunardi OJ, Danudiningrat CP, Rizqian A, Mulyawan I, Amir MS, et al. Decision-Making Criteria of Odontectomy or Surgical Exposure in Impacted Maxillary Canine Based on Treatment Difficulty Index Modification. *Eur J Dent*. 2022;16(4):796-802.
22. Handayani FT, Evangelina IA. Successful traction of a mesially 90° dilacerated root of impacted maxillary canine: A case report. *Dent. J*. 2022;55(4):240-5.
23. Wijaya SB, Utomo RB. The management of impacted permanent canine with surgical exposure. *Dent. J*. 2014;47(3):158-63.
24. Melati BF, Wibowo TB, Rizki B. Surgical exposure and orthodontic treatment on labially impacted maxillary central incisor. *Dent. J*. 2014;47(2):77-81.