Journal of Orthodontic and Periodontal Biomaterials Research

2024, Volume 4, Issue 1, Page No: 67-78

Available online at: https://galaxypub.co/

Galaxy Publication

Combined Surgical and Orthodontic Management of Complex Odontomas in Pediatric Patients: Two Case Reports

Sung Wang[1]*, Raluca R. Dumitru[2]

[1]Department of Orthodontics, Faculty of Dentistry, University of Tokyo, Tokyo, China.
[2]Department of Preventive and Community Dentistry, Faculty of Health Sciences, University of Bucharest, Bucharest, Bulgaria.

***E-mail** ✉ sung.wang@outlook.com

Received: 14 February 2024; **Revised:** 08 May 2024; **Accepted:** 15 May 2024

ABSTRACT

Odontomas, the most prevalent mixed odontogenic tumors, can obstruct the eruption of adjacent teeth and cause functional difficulties in mastication. Management of tooth impaction associated with odontomas depends on the stage of root development and the tumor's location within the alveolar bone. This case report aims to illustrate the outcomes of combined surgical and orthodontic management in growing patients with odontomas. Two pediatric patients—a 8-year-old boy and a 17-year-old girl—presented with sizable odontomas in the posterior maxilla. Radiographic examination revealed that the first molars on the affected sides were impacted due to the tumors. Treatment involved surgical excision of the odontomas. In the younger patient, the impacted developing molar erupted naturally into the oral cavity 14 months post-surgery, whereas the older patient required orthodontic traction to successfully guide the impacted molar into position. Large posterior odontomas can cause displacement, impaction, and root malformations of neighboring molars. Early detection and removal, prior to root completion, may allow for spontaneous eruption; otherwise, orthodontic intervention is necessary. Collaborative, interdisciplinary planning is crucial for optimal management of young patients with odontomas.

Keywords: Self-eruption, Odontoma, Hamartoma, Odontogenic tumor, Orthodontic traction, Impacted tooth

How to Cite This Article: Wang S, Dumitru RR. Combined Surgical and Orthodontic Management of Complex Odontomas in Pediatric Patients: Two Case Reports. J Orthod Periodontal Biomater Res. 2024;4(1):67-78. https://doi.org/10.51847/zgY2GBPjem

Introduction

Odontomas are mixed lesions arising from both epithelial and mesenchymal dental tissues, encompassing dental hard and soft tissue components. Because they exhibit slow, limited growth and contain well-differentiated tissues resembling normal teeth, odontomas are generally classified as hamartomas rather than true neoplasms [1-5]. Based on their internal structure, they are categorized as complex odontomas (OCxs), which consist of irregular conglomerates of dentin, enamel, and cementum, or compound odontomas (OCps), which mimic miniature teeth ("odontoids") and include pulp tissue. These components appear in various stages of histodifferentiation and morphodifferentiation and are enclosed by a connective tissue capsule [1-8]. Their benign behavior and low recurrence rate further support their classification as hamartomas.

According to the 2017 fourth edition of the World Health Organization (WHO) Classification of Head and Neck Tumors, odontomas represent the most frequently occurring benign odontogenic lesions [5]. However, depending on the population studied, they may rank either as the most common or second most common odontogenic tumor after ameloblastomas [9]. For instance, Buchner *et al.* reported that, among 826 cases in the American population, both compound and complex odontomas accounted for 75.9% of all odontogenic tumors [3-5,10-12]. Conversely,

a study by Soluk-Tekkesin *et al.* in Turkey identified odontomas as the second most common odontogenic tumor (27.2%, n = 335) following ameloblastomas (29.7%, n = 366) [13-15]. Such discrepancies across populations may be related to the asymptomatic nature of odontomas and their incidental detection on radiographs [9, 15].

Anatomically, compound odontomas are most frequently found in the anterior maxilla (74.6%), whereas complex odontomas are more common in the posterior mandible (68.2%). These lesions are usually asymptomatic, detected during routine radiographic assessments in the second decade of life, rarely occur in deciduous dentition, and show no gender predilection [2, 5, 9, 13, 16]. Clinically, odontomas often obstruct the eruption of permanent teeth, leading to impaction, malposition, or root malformation, which can cause malocclusion or esthetic concerns, particularly in the anterior maxilla. Delayed eruption of adjacent teeth is the most common presentation, with maxillary incisors and canines being most frequently affected, while mandibular permanent molars are less commonly involved. Less frequent signs include dental or facial asymmetry, tooth agenesis, pain, or localized inflammation [2, 3, 13, 17].

Radiographically, compound odontomas are recognized by their tooth-like radiopaque structures with well-defined borders, while the appearance of complex odontomas can vary depending on the stage of hard tissue mineralization, sometimes mimicking other odontogenic tumors [13, 18]. Odontomas can also be associated with calcifying odontogenic cysts (COCs), with approximately 20% of COCs containing odontoma components [19]. Therefore, definitive diagnosis requires histopathological confirmation [9, 18, 20, 21].

The exact etiology of odontomas remains unclear. Various factors have been implicated, including local inflammation, hereditary conditions such as Gardner's syndrome [5, 22], gene mutations affecting tooth development, or odontoblastic hyperactivity [7, 16, 23-26]. Additionally, trauma to primary teeth has been suggested as a potential contributing factor [11,17, 27].

Management of odontomas involves complete surgical excision, including the surrounding fibrous capsule. Orthodontic intervention may be necessary for impacted teeth associated with the lesion. The timing and location of the odontoma can influence adjacent tooth development; early removal often allows spontaneous eruption and completion of root formation. When the lesion is in close proximity to adjacent teeth and cannot be removed atraumatically, extraction may be required [28, 29].

This case report aims to demonstrate the outcomes of combined surgical and orthodontic treatment in growing patients with odontomas.

Case Reports

Case Report 1

An 8-year-old boy, approaching 9 years of age, was referred to the Department of Oral Surgery at the Medical University in Warsaw in November 2019 due to a mandibular left first permanent molar that had not erupted. He was otherwise healthy, with no previous orthodontic treatment or history of dental trauma.

Facial assessment showed balanced symmetry with a proportionate profile and a slightly retruded chin. His lips were naturally closed, and there were no observed oral parafunctions or dysfunctions. Intraoral examination revealed he was in the early mixed dentition stage: all incisors and first permanent molars had erupted, except for the mandibular left first molar, while all primary canines and molars were still present. Oral hygiene was poor, and several deciduous molars contained large restorations. Dental evaluation noted a Class II molar relationship, mild crowding in the upper front teeth, and increased overjet and overbite. A small portion of the crown of the impacted mandibular molar was visible through the gingiva **(Figure 1a)**.

Orthodontic records were collected, including photographs, study models, and a cephalometric radiograph. During the extraoral exam, a non-tender, enlarged lymph node was observed, distinguishable from the underlying bony lesion. Intraorally, there were multiple restorations, active caries, and pathological wear on several teeth, but no inflammation of the soft tissues; the alveolar ridge appeared normal in size.

Panoramic imaging **(Figure 1b)** revealed a calcified lesion approximately 3 cm in diameter in the distal region of the mandibular first molar, surrounded by a radiolucent margin and cortical bone. For detailed assessment, a CBCT scan was performed. It showed a densely calcified mass with radiodensity similar to dental hard tissues, enclosed by a narrow radiolucent zone in the left mandibular molar region. The lesion measured 25 × 20 × 17 mm and extended to the lower border of the mandible. The adjacent first permanent molar had been displaced downward and toward the midline, with roots only partially developed (about two-thirds of final length). The

upper portion of the lesion, measuring 20 × 6 mm, was exposed and not covered by alveolar bone. These features were consistent with a complex odontoma.

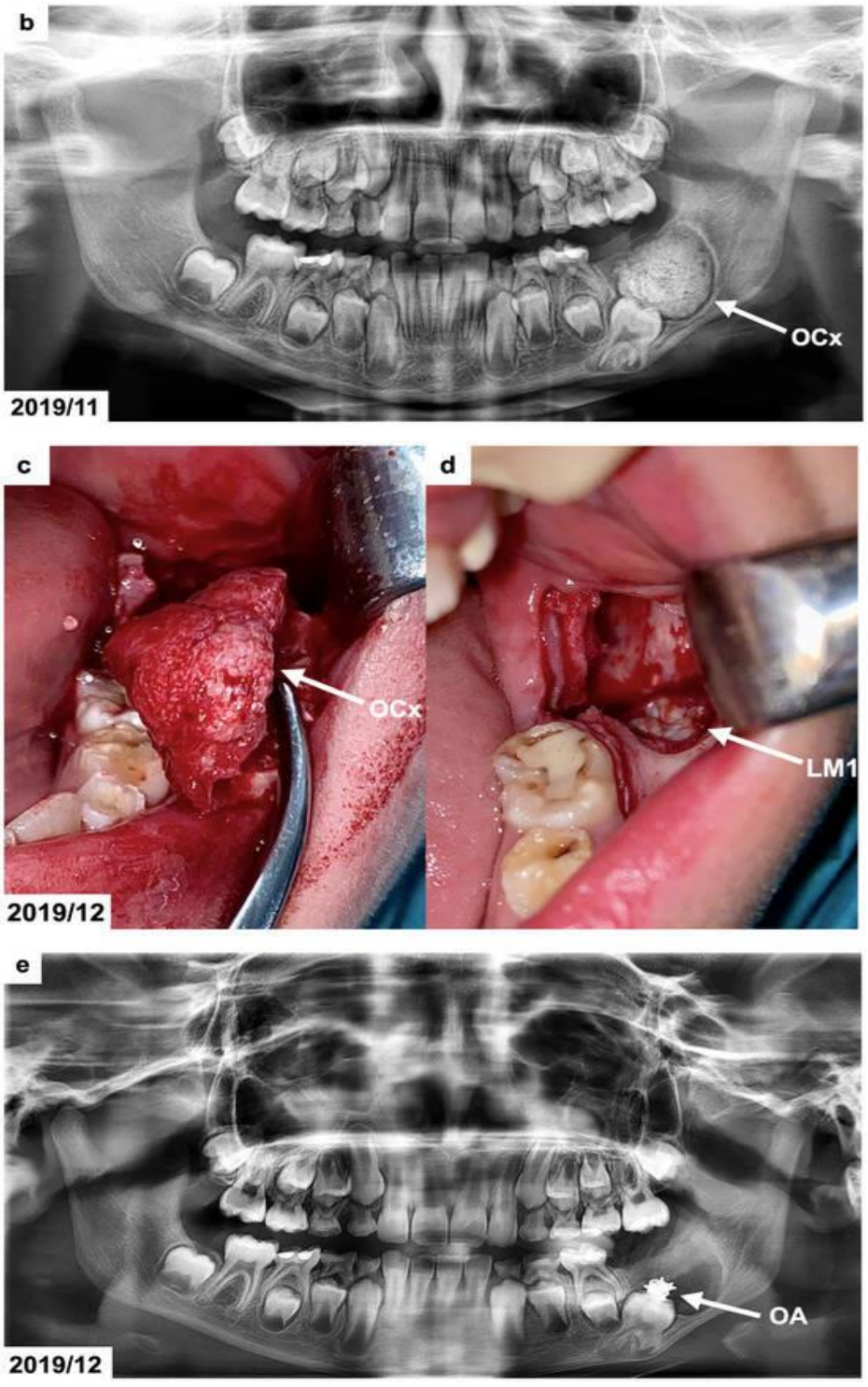
The treatment strategy included surgical removal of the odontoma and bonding an orthodontic attachment to enable extrusion of the impacted molar. A removable mandibular appliance was selected for orthodontic traction, due to the limited biomechanical options in this region for a young patient and because its cost is covered under the Polish National Health System.

The patient underwent surgery under local anesthesia with 2% lignocaine combined with noradrenaline. In the mandibular retromolar region, a triangular flap was raised to expose both the surface of the tumor and the adjacent bone. A thin bony layer overlying the lesion on the buccal and superior sides was carefully removed using a round surgical bur with continuous saline irrigation. Once the odontoma was fully exposed, it was delicately separated and entirely removed, ensuring the unerupted first permanent molar remained intact **(Figure 1c, d)**. The cavity was thoroughly rinsed with a Metronidazole solution, and an orthodontic attachment was bonded to the tooth's occlusal surface **(Figure 1e)**. The flap was repositioned, sutured, and the excised tissue was sent for histopathological analysis. Postoperative care included a 7-day course of amoxicillin 500 mg with clavulanic acid 125 mg administered every 12 hours. At the 7-day follow-up, healing was uneventful, sutures were removed, and no complications were noted.

Microscopic examination of decalcified sections stained with H&E revealed irregularly arranged dentin with uneven borders, confirming the lesion as a complex odontoma.

A lower removable appliance designed to apply elastic traction to the bonded button on the exposed molar was fabricated in March 2020. However, due to COVID-19 restrictions, the appliance could not be delivered, as the clinic was limiting care to emergencies. The patient returned one year later, in February 2021, reporting that the impacted molar had partially erupted on its own. Clinical examination confirmed visibility of the tooth's occlusal surface with the bonded button intact, and panoramic imaging **(Figure 1f)** showed progressive occlusal movement and normal postoperative healing. By December 2021, the mandibular left first molar had fully emerged into the oral cavity **(Figure 1g)**, with radiographs showing only a distal root angulation.

Subsequently, the patient was fitted with an activator containing an expansion screw to address Class II molar relationships and maxillary crowding. By August 2023, the molar had fully erupted into functional occlusion, and root formation was complete **(Figure 1h, i)**. A pronounced distal root dilaceration was evident, attributed to the tumor's proximity during early tooth development. The long-term outlook for the molar is favorable if oral hygiene is maintained. Complete regeneration of the alveolar bone defect was observed, and no additional permanent molars were detected on the affected side. Orthodontic treatment with the removable appliance continues.


b
OCx
2019/11
c
OCx
d
LM1
2019/12
e
OA
2019/12

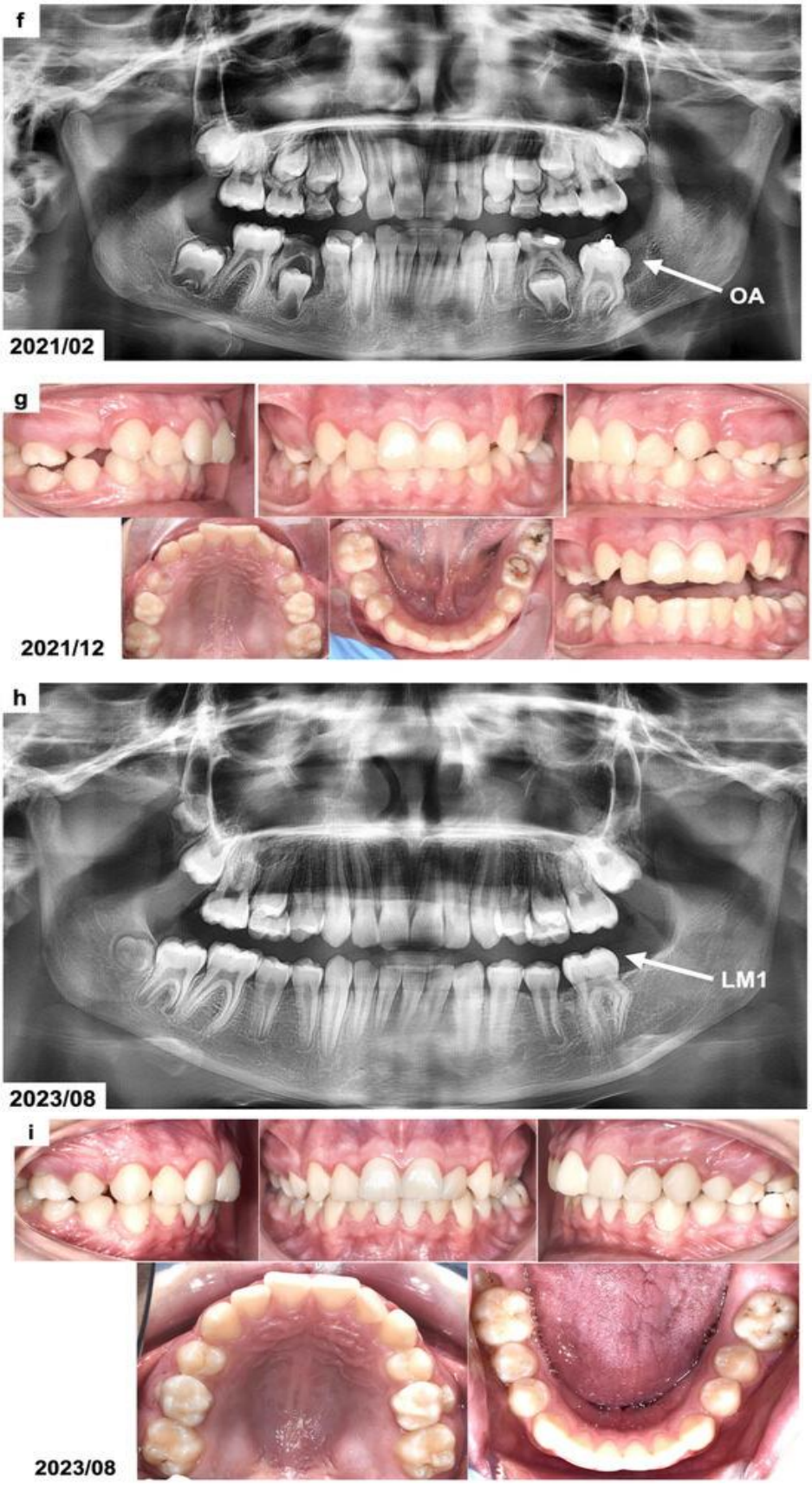


Figure 1. (a) Preoperative intraoral images of the patient at eight years and ten months, before any surgical or orthodontic intervention. (b) Panoramic radiograph obtained prior to treatment, revealing a complex

odontoma (OCx) in the left mandibular molar region; patient age was eight years and ten months. (c,d) Photographs taken during surgical excision of the lesion, showing the exposed occlusal surface of the lower left first permanent molar (LM1) adjacent to the complex odontoma (OCx); patient age was eight years and eleven months. (e) Postoperative panoramic radiograph following tumor removal and bonding of the orthodontic attachment (OA) to the affected molar; patient age was eight years and eleven months. (f) Panoramic radiograph taken one year after surgery, showing the orthodontic attachment still in place on the occlusal surface of the lower left first molar (OA); patient was ten years and one month old. (g) Intraoral images showing the spontaneous eruption of the lower left first permanent molar after removal of the orthodontic attachment; patient age was ten years and eleven months. (h) Panoramic radiograph captured four years post-treatment, showing the fully erupted lower left first permanent molar (LM1); patient age was twelve years and seven months. (i) Intraoral photographs taken four years after surgery and orthodontic treatment, demonstrating the proper position of the erupted lower left first molar within the dental arch; patient was twelve years and seven months old

Case Report 2

In May 2015, a 15-year-and-10-month-old girl was referred to the Department of Oral Surgery at the Medical University in Warsaw by her family dentist due to the failure of eruption of the right maxillary molars and the detection of a lesion within the posterior maxilla. The abnormality had initially been identified on a panoramic radiograph taken by the referring dentist.

The patient was otherwise healthy and had no prior orthodontic interventions or history of dental trauma. She did not experience facial discomfort or pain, and no temporomandibular joint symptoms were present. She reported satisfaction with her facial appearance and had no esthetic concerns about her teeth, expressing no desire for comprehensive orthodontic treatment.

Extraoral assessment revealed a well-proportioned, symmetrical face with a straight profile. Intraoral evaluation showed that the maxillary molars on the right side were absent. Lymph nodes were not palpable. Oral hygiene was good, with no active carious lesions or large restorations. The alveolar ridge in the posterior right maxilla was slightly expanded but asymptomatic and free of soft tissue inflammation.

The patient exhibited Class I molar and canine relationships, and both dental arches had sufficient space. Overbite and overjet were within normal limits. A mild posterior crossbite was observed on the right side, accompanied by a 1-mm deviation of the lower dental midline to the left; the maxillary midline was aligned with the facial midline. No abnormalities were noted in the teeth or surrounding periodontal tissues.

Panoramic imaging provided by the patient revealed a radiopaque mass with a thin radiolucent border located in the posterior right maxilla, likely responsible for the impaction of the right maxillary first permanent molar **(Figure 2a)**. To better characterize the lesion, a cone-beam computed tomography (CBCT) scan was performed. CBCT images revealed a roughly spherical radiopaque mass, resembling irregularly formed dentin and enamel, surrounded by a narrow radiolucent margin in the right maxillary molar region **(Figure 2b)**. The lesion measured 16 × 18 × 20 mm. The first permanent molar had fully formed roots and was impacted in a distoangular position, with the crown in contact with the lesion. The second and third right maxillary molars were absent. These findings suggested the lesion was a complex odontoma.

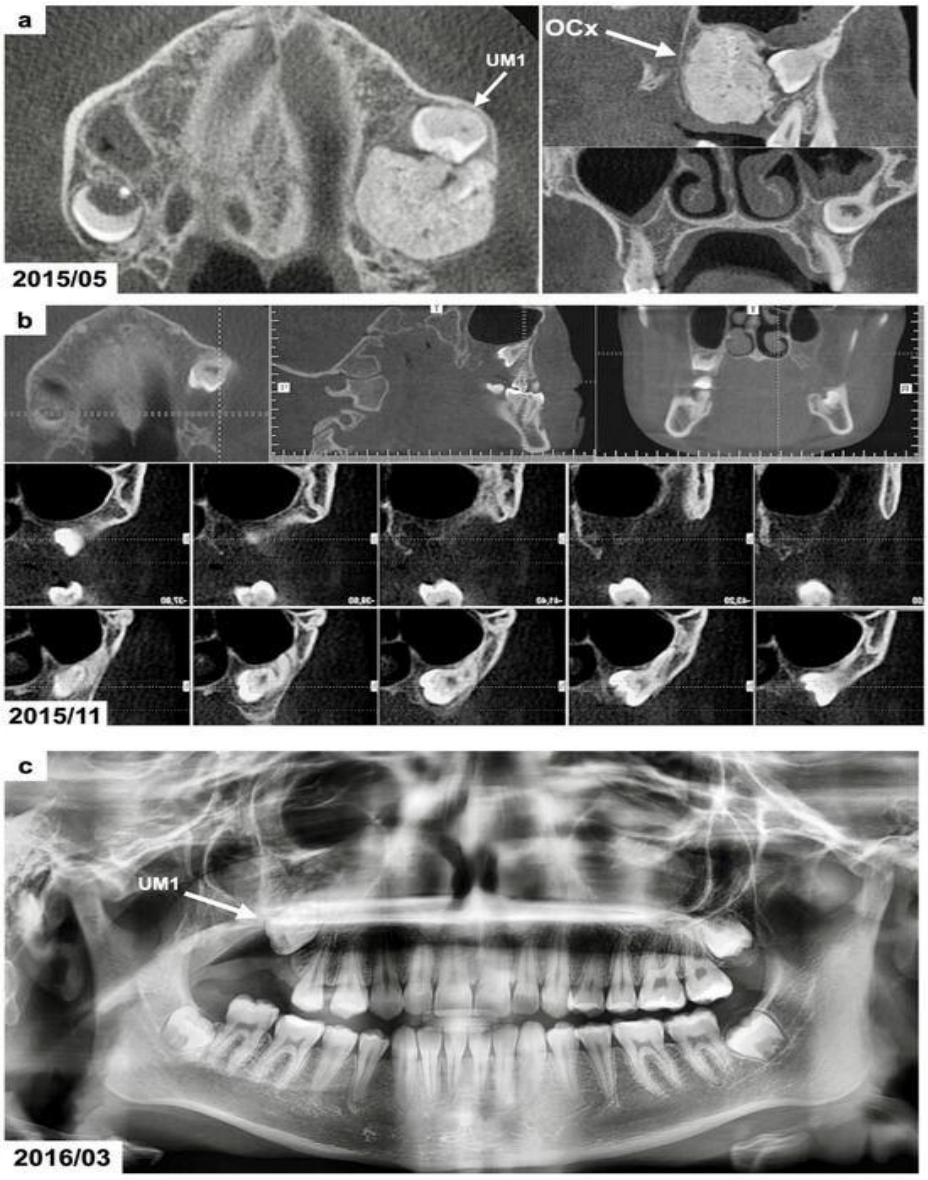
The treatment approach involved surgical removal of the lesion, combined with orthodontic extrusion of the impacted molar. During surgery, an orthodontic button with a soft ligature was planned for bonding to enable traction. Because the patient declined comprehensive orthodontic treatment for the posterior crossbite, a segmented fixed appliance was planned for the right maxillary posterior segment, including the canine and both premolars. Orthodontic traction would be initiated only if the impacted molar did not erupt spontaneously following tumor removal. The patient also refused the use of temporary skeletal anchorage devices (TADs) for the procedure.

Surgery was performed under local anesthesia with 2% lignocaine combined with noradrenaline. A trapezoidal flap was raised in the posterior right maxilla to access the lesion. The overlying buccal cortical bone was carefully removed with a round bur under continuous saline irrigation, exposing the tumor. The odontoma was then fully excised without injuring the underlying first permanent molar. The surgical site was thoroughly curetted and irrigated with Metronidazole solution. An orthodontic button was bonded to the crown of the impacted molar, connected via a metal ligature to the second premolar. The flap was repositioned, sutured, and the excised tissue

submitted for histopathological evaluation. Postoperative management included a seven-day course of amoxicillin with clavulanic acid (0.625 g) every 12 hours. Healing was uneventful, and sutures were removed after one week. Histology of H&E-stained decalcified sections revealed mature tubular dentin with small remnants of enamel matrix or immature enamel; the mature enamel had been lost during decalcification. Combining these findings with clinical and radiographic evidence confirmed a diagnosis of complex odontoma.

The impacted first molar was initially observed, but no eruption occurred over a period of 10 months **(Figure 2c–e)**. Consequently, a segmented fixed appliance (0.022-inch slot, American Orthodontics Mini Master series) was used to initiate orthodontic traction. Brackets were bonded to the maxillary canine and premolars on the right side. After three months of alignment, a 0.017 × 0.022-inch stainless steel rectangular wire was placed, and the impacted molar was attached to the appliance using an elastomeric Powerchain linked to the metal ligature, with adjustments planned every 5–6 weeks. Despite missed appointments, the molar was successfully brought into the oral cavity after 16 months **(Figure 2f)**.

The patient declined further orthodontic intervention for the posterior crossbite after the molar eruption. The appliance was removed without retention. Five years later, the patient returned for follow-up. The maxillary right first molar remained fully erupted and healthy **(Figure 2g, h)**. CBCT imaging showed residual alveolar bone deficiency at the previous tumor site, and bone grafting was advised before considering future implant placement **(Figure 2i)**.



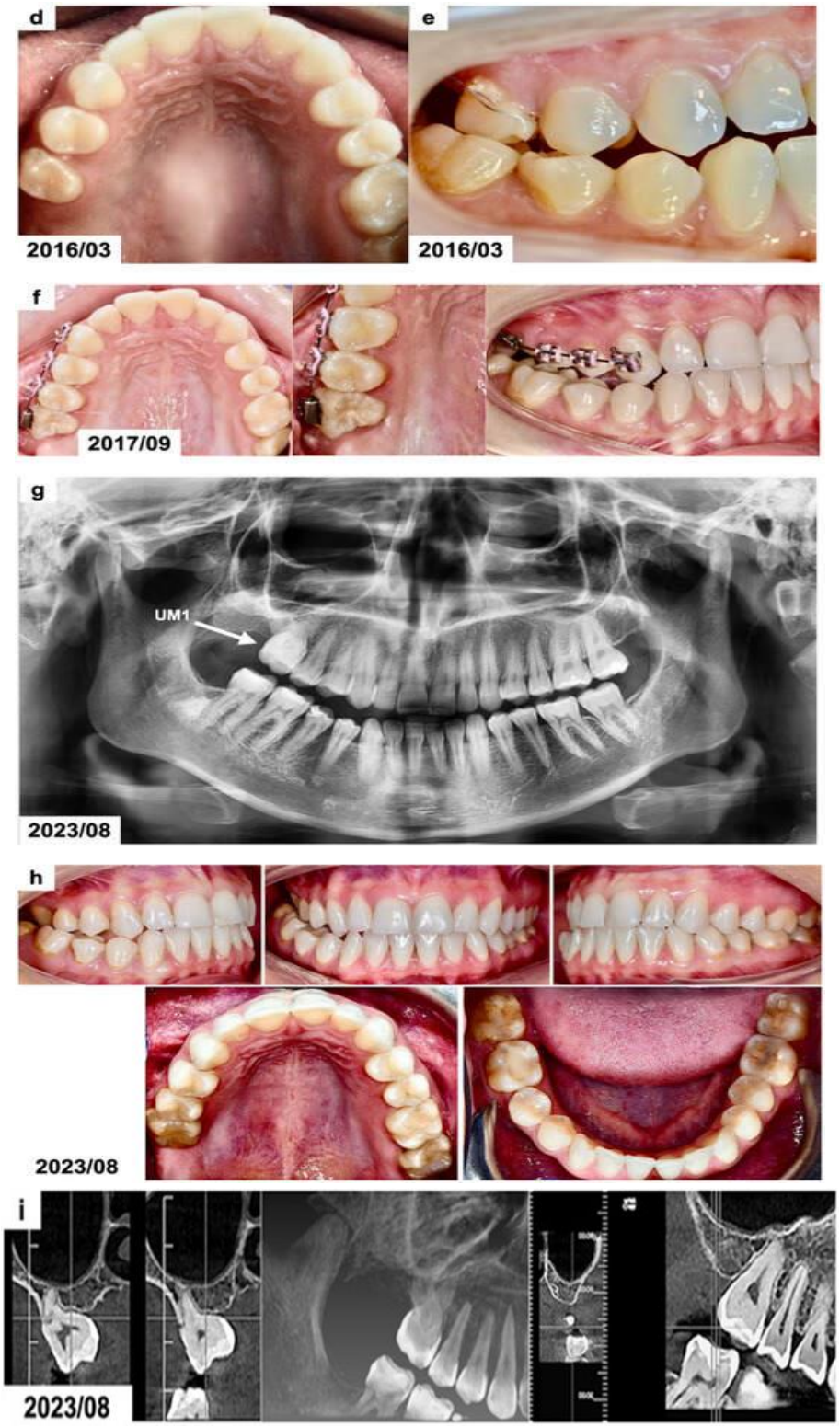


Figure 2. (a) Preoperative CBCT images showing the odontogenic lesion in the right maxillary molar region; patient age was fifteen years and ten months. (b) CBCT scans following tumor excision, illustrating the altered position of the impacted upper right first permanent molar; patient was sixteen years and 4 months old. (c) Panoramic radiograph obtained after surgery, depicting the impacted maxillary first molar; patient age was sixteen years and seven months. (d,e) Intraoral images captured 10 months post-surgery, prior to initiating orthodontic traction with a segmented fixed appliance; patient age was sixteen years and seven months. (f) Intraoral photographs showing the upper right first molar after 16 months of orthodontic traction; patient age was seventeen years and 10 months. (g) Panoramic radiograph obtained six years after surgical

and orthodontic treatment; patient age was twenty four years and one month. (h) Intraoral images six years post-treatment showing the fully erupted upper right first molar in proper alignment within the dental arch; patient age was twenty four years and one month. (i) CBCT scans six years after treatment demonstrating the erupted upper right first molar and the absence of alveolar bone at the site of previous tumor removal; patient age was twenty four years and one month

Discussion

Odontomas are the most frequently encountered intraosseous odontogenic lesions, typically identified during childhood or adolescence. These lesions can disrupt the normal eruption path of adjacent teeth, potentially causing impaction, delayed eruption, or malocclusion [18, 28, 30]. In the cases presented here, the odontomas were located in the posterior maxilla and mandible and were responsible for missing or impacted permanent molars. Since both patients were still growing, the absence of a single posterior tooth was subtle and not readily noticed by the patients or their guardians. In Case 2, however, it is likely that an earlier diagnosis could have been achieved during routine dental examinations. Both lesions were largely asymptomatic, producing only minor localized swelling of the alveolar ridge. In Case 1, the tumor was discovered incidentally on a panoramic radiograph taken for orthodontic assessment, whereas in Case 2, clinical evaluation revealed the missing right maxillary first molar. Panoramic imaging subsequently confirmed the presence of odontomas obstructing the eruption of neighboring teeth. Surgical removal was performed in both cases, followed by orthodontic treatment to assist eruption of the impacted molars. These cases highlight the importance of a coordinated interdisciplinary approach, in which pediatric dentists often play a key role in early detection and orthodontists contribute to post-surgical treatment planning.

It is critical to distinguish complex odontomas from other odontogenic lesions such as ossifying fibromas (OFs), osteomas, cemento-osseous dysplasias (CODs), ameloblastic fibromas (AFs), ameloblastic fibro-odontomas (AFOs), ameloblastic fibro-dentinomas (AFDs), and calcifying odontogenic cysts (COCs). This differentiation relies on both imaging and histopathology to establish a definitive diagnosis [7, 16, 18, 21]. Lesions formerly classified as AFOs or AFDs contain both a calcified dental matrix resembling an odontoma and a soft tissue component resembling an ameloblastic fibroma, placing them between AFs and odontomas in their features. Currently, these are considered developing odontomas, even though some cases show BRAF p.V600E mutations typical of AFs, which are absent in complex odontomas. Certain AFO/AFD lesions also exhibit locally aggressive behavior, suggesting a neoplastic rather than hamartomatous character. Further molecular research is required to clarify whether these lesions should be regarded as distinct entities or as combinations of developing odontomas and ameloblastic fibromas [5,9,14]. In the present cases, histological evaluation of both excised lesions confirmed the diagnosis of complex odontoma.

The cause of odontoma formation remains uncertain, though multiple factors have been proposed, including genetic predisposition, trauma, or inflammatory events. In these cases, no obvious causative factor, such as prior dental trauma or pathology, could be identified, and family history was negative for tooth impaction. Both patients were asymptomatic and reported no functional problems related to the lesions. Additionally, the absence of second and third permanent molars in the regions affected by the tumors likely reflects the inhibitory effect of the odontomas on normal tooth development [25, 31]. For example, Liu *et al.* described a 12-year-old boy with mandibular first molar impaction due to an odontoma, who also lacked the mandibular second and third molars, suggesting that odontomas can interfere with the development of adjacent teeth [31].

The literature indicates that the preferred management of odontomas involves surgical excision of the lesion while preserving the impacted tooth, which is usually separated from the tumor by a bony septum [2, 24, 32]. The primary goal is to allow spontaneous eruption of the affected tooth, particularly when the procedure is performed before root development is complete. Several factors should be taken into account when planning post-surgical management, including the position of the impacted tooth within the alveolar bone, its morphology, the stage of root formation, and the available space [11, 17, 28, 30, 32]. Treatment of tooth impaction associated with odontomas typically involves lesion removal, surgical exposure of the impacted tooth, and often the bonding of an orthodontic attachment to facilitate extrusion. A critical consideration is the root development stage of the impacted tooth, as teeth with incomplete roots are more likely to erupt spontaneously following surgery, emphasizing the importance of early detection. In the cases presented, family dentists identified eruption

disturbances both clinically and radiographically and referred the patients to oral surgery specialists for definitive treatment. Since odontomas are generally separated from adjacent teeth by a bony septum, extraction should only be considered when tumor removal cannot be accomplished without damaging neighboring teeth [24, 25, 32].

In Case 1, the odontoma was detected early during the mixed dentition period, while the impacted molar's root was still forming. In such situations, surgical excision of the tumor allowed the permanent tooth to erupt naturally, without requiring orthodontic traction, although continued orthodontic monitoring is recommended until the tooth reaches full occlusion [3, 4, 8, 11, 13, 29, 30]. Hidalgo-Sánchez *et al.* analyzed 77 cases of odontoma management and reported that all lesions were surgically removed, with only seven cases necessitating subsequent orthodontic intervention [2]. Conversely, Isola *et al.* found that, in their study, only four teeth erupted spontaneously after surgery, whereas 29 required combined orthodontic–surgical treatment over a 15-year follow-up period [13]. The likelihood of spontaneous eruption following odontoma removal is influenced by factors such as root development stage, the tooth's position in the alveolar bone, and its relationship with adjacent teeth [3,16-18, 24, 28-33].

In Case 2, the odontoma was identified after the patient had reached full permanent dentition and the roots of the first molar were fully formed. Because of this, the impacted tooth did not erupt naturally, necessitating orthodontic traction using a fixed appliance to align it properly within the dental arch. This highlights the importance of early detection, as timely removal of such tumors can reduce or even eliminate the need for orthodontic intervention. The use of orthodontic devices carries potential risks, including enamel demineralization, root resorption, and other iatrogenic effects such as soft tissue irritation or allergic reactions. Additionally, extruding a terminal molar presents challenges in anchorage control, which can compromise outcomes. In the case described, the impacted tooth was successfully aligned without requiring additional anchorage aids, such as temporary skeletal anchorage devices (TADs). Placement of TADs after removing a large tumor in the alveolar bone may be difficult, and alternative locations—like the palate—may need to be considered.

Odontomas have a very low recurrence rate and an excellent long-term prognosis [5, 7, 8, 10]. Hisatomi *et al.* reported that odontomas not associated with impacted teeth could be monitored over several years without changes in size, position, or radiographic appearance. Due to their limited growth, lack of cellular proliferation, and benign nature, the risk of recurrence is minimal. Standard management involves surgical excision with histopathological confirmation, followed by orthodontic traction if the impacted tooth requires guidance into the arch [5, 25, 28-30, 34-37]. In both cases presented, no recurrence was observed during follow-up.

Conclusion

Large odontomas in posterior regions can cause displacement and impaction of adjacent molars. If diagnosed and removed early—before root formation is complete—the affected tooth may erupt spontaneously. Surgical management should prioritize preserving neighboring teeth, although orthodontic extrusion is often required for proper alignment of impacted molars. Effective treatment relies on interdisciplinary collaboration to ensure accurate diagnosis and optimal planning in young patients with odontomas.

Acknowledgments: None

Conflict of interest: None

Financial support: None

Ethics statement: None

References

1. Neville BW, Damm DD, Allen CM, Chi AC, editors. Odontogenic cysts and tumors. In: Neville BW, Damm DD, Allen CM, Chi AC, editors. Oral and Maxillofacial Pathology. 4th ed. Ottawa: Saunders; 2016. p. 674–675.
2. Hidalgo-Sánchez O, Leco-Berrocal MI, Martínez-González JM. Metaanalysis of the epidemiology and clinical manifestations of odontomas. Med Oral Patol Oral Cir Bucal. 2008;13:E730–4.

3. Troeltzsch M, Liedtke J, Troeltzsch V, Frankenberger R, Steiner T, Troeltzsch M. Odontoma-associated tooth impaction: Accurate diagnosis with simple methods? Case report and literature review. J Oral Maxillofac Surg. 2012;70:e516–20.
4. Kämmerer PW, Schneider D, Schiegnitz E, Schneider S, Walter C, Frerich B, et al. Clinical parameter of odontoma with special emphasis on treatment of impacted teeth—a retrospective multicentre study and literature review. Clin Oral Investig. 2016;20:1827–35.
5. El-Naggar AK, Chan JKC, Randis JR, Takata T, Slootweg PJ, editors. WHO Classification of Head and Neck Tumours. 4th ed. Lyon: IACR; 2017. p. 224–226.
6. Thompson LDR. Odontoma. Ear Nose Throat J. 2021;100(Suppl 5):536S–7S.
7. Khalifa C, Omami M, Garma M, Slim A, Sioud S, Selmi J. Compound-complex odontoma: A rare case report. Clin Case Rep. 2022;10:e05658.
8. Boffano P, Zavattero E, Roccia F, Gallesio C. Complex and compound odontomas. J Craniofac Surg. 2012;23:685–8.
9. DeColibus KA, Rasner DS, Okhuaihesuyi O, Owosho AA. Clinicoradiopathologic analysis of odontomas: A retrospective study of 242 cases. Dent J. 2023;11:253.
10. Nelson BL, Thompson LD. Compound odontoma. Head Neck Pathol. 2010;4:290–1.
11. Küchler EC, da Silva Fidalgo TK, Farinhas JA, de Castro Costa M. Developmental dental alterations in permanent teeth after intrusion of the predecessors: Clinical and microscopic evaluation. Dent Traumatol. 2010;26:505–8.
12. Buchner A, Merrell PW, Carpenter WM. Relative frequency of central odontogenic tumors: A study of 1088 cases from Northern California and comparison to studies from other parts of the world. J Oral Maxillofac Surg. 2006;64:1343–52.
13. Isola G, Cicciù M, Fiorillo L, Matarese G. Association between odontoma and impacted teeth. J Craniofac Surg. 2017;28:755–8.
14. Vered M, Wright JM. Update from the 5th edition of the World Health Organization classification of head and neck tumors: Odontogenic and maxillofacial bone tumours. Head Neck Pathol. 2022;16:63–75.
15. Soluk-Tekkesin M, Cakarer S, Aksakalli N, Alatli C, Olgac V. New World Health Organization classification of odontogenic tumours: Impact on the prevalence of odontogenic tumours and analysis of 1231 cases from Turkey. Br J Oral Maxillofac Surg. 2020;58:1017–22.
16. Choudhary PJ, Gharote HP, Hegde K, Gangwal P. Compound odontoma associated with impacted teeth: A case report. IJSS Case Rep Rev. 2014;1:12–5.
17. Silva DR, Shahinian AL. Odontoma malformation and disturbances of eruption subsequent to traumatic dental injuries: A literature review and a case report. Dent Traumatol. 2022;38:98–104.
18. Astekar M, Manjunatha BS, Kaur P, Singh J. Histopathological insight of complex odontoma associated with a dentigerous cyst. BMJ Case Rep. 2014;2014:bcr2013200316.
19. Martinez A. Odontoma. PathologyOutlines.com. Available from: https://www.pathologyoutlines.com/topic/mandiblemaxillaodontoma.html. Accessed 20 Apr 2024.
20. Soliman N, Al-Khanati NM, Alkhen M. Rare giant complex composite odontoma of mandible in mixed dentition: Case report with 3-year follow-up and literature review. Ann Med Surg (Lond). 2022;74:103355.
21. Park JC, Yang JH, Jo SY, Kim BC, Lee J, Lee W. Giant complex odontoma in the posterior mandible: A case report and literature review. Imaging Sci Dent. 2018;48:289–93.
22. de Oliveira Ribas M, Martins WD, de Sousa MH, de Aguiar Koubik AC, Avila LF, Zanferrari FL, et al. Oral and maxillofacial manifestations of familial adenomatous polyposis (Gardner's syndrome): A report of two cases. J Contemp Dent Pract. 2009;10:82–90.
23. Shafer GW, Hine MK, Levy BM. A textbook of oral pathology. 4th ed. Rajendran R, editor. Philadelphia: WB Saunders; 1983. p. 308–11.
24. Abdul M, Pragati K, Yusuf C. Compound composite odontoma and its management. Case Rep Dent. 2014;2014:107089.
25. Satish V, Prabhadevi MC, Sharma R. Odontome: A brief overview. Int J Clin Pediatr Dent. 2011;4:177–85.
26. Fujii S, Nagata K, Matsumoto S, Kohashi KI, Kikuchi A, Oda Y, et al. Wnt/β-catenin signaling, which is activated in odontomas, reduces Sema3A expression to regulate odontogenic epithelial cell proliferation and tooth germ development. Sci Rep. 2019;9:4257.

27. Wang XP, O'Connell DJ, Lund JJ, Saadi I, Kuraguchi M, Turbe-Doan A, et al. Apc inhibition of Wnt signaling regulates supernumerary tooth formation during embryogenesis and throughout adulthood. Development. 2009;136:1939–49.
28. Hisatomi M, Asaumi JI, Konouchi H, Honda Y, Wakasa T, Kishi K. A case of complex odontoma associated with an impacted lower deciduous second molar and analysis of the 107 odontomas. Oral Dis. 2002;8:100–5.
29. Delbem AC, Cunha RF, Bianco KG, Afonso RL, Gonçalves TC. Odontomas in pediatric dentistry: Report of two cases. J Clin Pediatr Dent. 2005;30:157–60.
30. de Oliveira BH, Campos V, Marçal S. Compound odontoma—diagnosis and treatment: Three case reports. Pediatr Dent. 2001;23:151–7.
31. Liu JK, Hsiao CK, Chen HA, Tsai MY. Orthodontic correction of a mandibular first molar deeply impacted by an odontoma: A case report. Quintessence Int. 1997;28:381–5.
32. Jain A, Karuna YM, Baliga M, Suprabha BS, Natarajan S. Surgical management of complex odontoma associated with agenesis of a molar. Contemp Clin Dent. 2018;9(Suppl 2):S388–90.
33. Tuczyńska A, Bartosik D, Abu-Fillat Y, Sołtysik A, Matthews-Brzozowska T. Compound odontoma in the mandible—case study and literature review. Dev Period Med. 2015;19:484–9.
34. Vengal M, Arora H, Ghosh S, Pai KM. Large erupting complex odontoma: A case report. J Can Dent Assoc. 2007;73:169–73.
35. Pacifici A, Carbone D, Marini R, Pacifici L. Surgical management of compound odontoma associated with unerupted tooth. Case Rep Dent. 2015;2015:902618.
36. Barros LD, Pedron IG, Utumi ER, Zambon CE, Rocha AC. Complex odontoma: Report of a five-year follow-up case. J Dent Child. 2010;77:183–6.
37. de Vasconcellos Machado C, Knop LAH, da Rocha MCBS, da Silva Telles PD. Impacted permanent incisors associated with compound odontoma. BMJ Case Rep. 2015;2015:bcr2014208201.