



Case report

Surgical resection after orthodontic eruption: A case report of compound odontoma-induced impacted maxillary right central incisor

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ABSTRACT

Herein, we described the multidisciplinary treatment of a mixed dentition patient with impacted maxillary right central incisor and adjacent compound odontoma. In contrast to conventional treatment procedures, orthodontic traction was first performed for the affected tooth in this case, followed by resection of the odontoma. The odontoma did not shift after eruption of the incisor and was safely removed after alignment of the impacted tooth. No root resorption, gingival recession or bone defect occurred in this case. These results demonstrated that the orthodontic force can break the connection between the impacted tooth and the odontoma. The increased distance between the impacted tooth and odontoma may facilitate removal of the odontoma. Adhesion between the soft tissue capsule of odontoma and the dental follicle, rather than blocking the tooth, may play a role in tooth impaction.

1. Introduction

Odontomas are a common type of odontogenic tumors. Based on the 2017 World Health Organization classification, odontomas are divided into compound and complex odontomas according to the different compositions of tumor mass [1]. Odontomas are typically accompanied by delayed eruption of permanent teeth, retained deciduous teeth, local swelling and pain as well as occasional infection [1, 2, 3]. Compound odontomas, which are relatively smaller in size, commonly occur in the anterior maxillary region and are usually located between the permanent tooth and alveolar crest, which hinders the eruption of permanent teeth [4, 5]. The management of odontoma with impacted teeth commonly involves removal of the lesion, followed by creating a path for eruption of the impacted permanent tooth [3, 5, 6, 7, 8, 9, 10, 11]. In some studies, the treatment of choice was surgical removal of the odontoma, immediately followed by orthodontic traction to facilitate eruption of the impacted tooth [6, 7, 8, 9, 10, 11]. In other studies [4, 5, 12, 13, 14, 15], after removing the lesion, clinical and radiological follow-up was required due to incomplete root apex closure of the impacted tooth. Fenestration followed by orthodontic traction was indicated only when spontaneous eruption did not occur. Extraction of the impacted tooth was recommended if the patient showed a combination of cystic lesions,

ectopic growth, morphological changes, or a lack of space [5, 16, 17, 18]. However, to the best of our knowledge, the initiation of orthodontic traction of the impacted tooth before surgical removal of the adjacent odontoma has not been reported to date.

This case report describes a mixed dentition patient with impacted maxillary right central incisor and adjacent compound odontoma. The fenestration and immediate traction of the impacted incisor were initially performed. Surgical enucleation of odontoma was performed after the impacted incisor shifted to the normal eruptive position.

2. Case report

An 11-year-old girl presented to our department with the chief complaint of aesthetically unpleasant appearance because of delayed permanent tooth eruption in the right maxillary anterior region (Figure 1). Her permanent tooth had not emerged even after four years of deciduous tooth loss. She was physically healthy and had no family medical history or dental trauma history.

Intraoral examination revealed the absence of maxillary right central incisor. The panoramic radiograph revealed multiple overlapping tooth-like radiopaque structures adjacent to one-third of the impacted central incisor (Figure 1). Therefore, the patient was diagnosed with impacted

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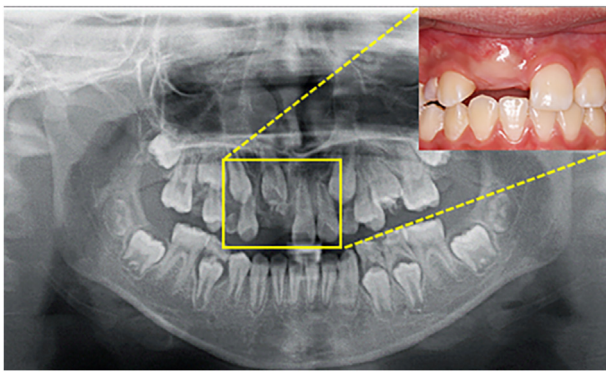


Figure 1. Pretreatment panoramic radiograph and intraoral photograph.

maxillary right central incisor with adjacent compound odontoma. The CBCT examination was not performed because the submucosal incisal edge of the impacted incisor could be clearly distinguished by visual examination, indicating a palatal location of the odontoma.

The routine treatment procedures involve removal of the odontoma, followed by different treatment options, as needed [3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15]. In the present case, we anticipated spontaneous exposure of the impacted incisor, which was very close to the alveolar ridge, with thin osseous covering and not directly blocked by the odontoma. Thus, the best option for this case was surgical removal of the odontoma followed by the targeted orthodontic process. However, initial surgical treatment was refused by the patient and her parents due to major fear of invasive surgery, and the expectation of beginning with a relatively mild treatment procedure. Therefore, we initiated orthodontic traction of the impacted incisor, and performed regular radiographic examination of the odontoma, as needed. The patient and her parents were clearly explained the possible failure of traction without removing the adjacent odontoma. Written consent was obtained from the parents for publication of this case report.

All the erupted permanent teeth of the maxillary arch were bonded with an 0.022 × 0.028-in slot straight-wire appliance. A minimal mucosal resection was performed to expose the labial surface of the impacted incisor for the lingual button bonding. The elastic chain was used to smoothly move the impacted incisor down, and there was no apparent hindrance from the odontoma (Figures 2A-2C).

During the traction of the impacted incisor, serial follow-up periapical radiographs showed no intraosseous position changes of the odontoma. The relative position shifted toward the root from the original crown area, and the odontoma front reached to the vicinity of the apical area and presented gradually larger tooth-like radiopaque structures within

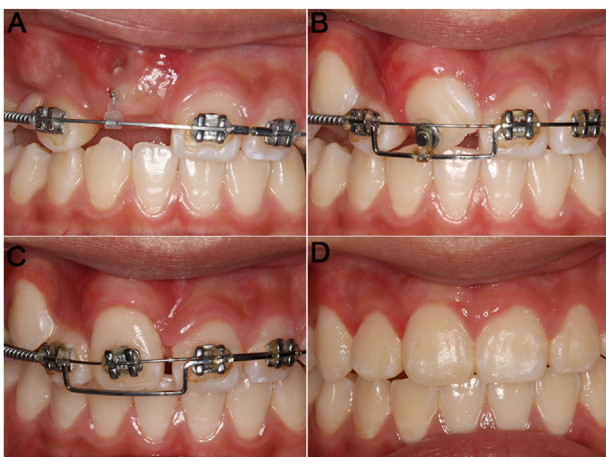


Figure 2. Intraoral photographs during treatment.

13 months (Figures 3A-3C). Given the odontoma growth and the possible root damage resulting from the odontoma during further mesial upright of the root of the erupted maxillary right central incisor, surgical resection was suggested again to the patient and her parents, who promptly agreed. The odontoma was successfully resected under local anesthesia, without any complications. Five tooth-like structures with variable size and fibrous capsule were removed (Figure 4), supporting the diagnosis of compound odontoma. One week after the surgery, the periapical radiograph confirmed safe and complete resection of the odontoma (Figure 3D). The remaining orthodontic work was performed according to the conventional procedure.

After 28 months of active treatment, a satisfactory treatment effect was achieved. The impacted maxillary right central incisor was in the normal position, with adequate gingival attachment and no recession (Figure 2D). The periapical radiograph revealed substantial bone formation in the surgical area, and no root injuries of the impacted incisor and the adjacent tooth (Figure 3E).

The patient did not visit our department until 32 months after debonding because of academic stress, and reported that she only used the clear retainer for the first four months. No obvious relapses occurred and no clinical or radiographic evidence of related complications was found (Figure 5).

3. Discussion and conclusions

There is no consensus on the treatment of odontomas with impacted teeth. The general approach involves surgical removal of the odontoma and simultaneous orthodontic traction of the impacted tooth [6, 7, 8, 9, 10, 11]. Some studies [4, 5, 12, 13, 14, 15] reported removal of the lesion and monitoring of spontaneous eruption of the impacted tooth. If the affected tooth did not erupt into the oral cavity, a second fenestration operation was performed [4]. Simultaneous removal of the impacted tooth along with the odontoma was also reported in some studies [16, 17, 18]. However, orthodontic traction of the impacted tooth before removal of the odontoma, which is not in the eruption path of the impacted tooth, has been rarely reported.

The treatment plan in this case provided a valuable opportunity for us to observe whether the orthodontic force could separate the impacted tooth from the odontoma. If this does not happen, tumor resection should be performed first. If the impacted tooth erupted successfully, it is important to check whether the odontoma also moved along with the tooth exposed into the oral cavity. In contrast, if the odontoma remained in its original location, the potential benefit of safer surgical resection for the patient could be analyzed because of the increased distance between the tumor and the erupted impacted incisor.

Odontomas are often associated with impacted adjacent teeth. They are not always located over the tooth crown, but sometimes between the roots [1, 19]. A retrospective study of 45 odontomas concluded that 35 (77.8%) odontomas were in proximity to at least one tooth, while 15 (33.3%) had direct contact with the tooth [3]. This means that physical obstruction may not be the main reason for impaction, especially in early stage odontomas that resemble developing tooth germ, with very small size and no calcification. Histologically, odontomas are often surrounded by thin connective tissue, consistent with the dental follicle [1]. This soft tissue capsule is close to or partially integrated with adjacent dental follicle, as has been frequently noted in radiological examinations, particularly in the widely used cone beam computer tomography [20, 21, 22]. Thus, we assumed that epithelial cross-linking between the soft tissue capsule of odontoma and the adjacent normal dental follicle may delay or prevent spontaneous tooth eruption. In the present case, the impacted tooth finally erupted into its position, which demonstrated that the conventional orthodontic force can break the epithelial cross-linking between the impacted tooth and the odontoma.

Odontomas are rarely exposed into the oral cavity because of the absence of the periodontal ligament and tooth root [23]. The odontoma in this case remained in its original position rather than shifting with the

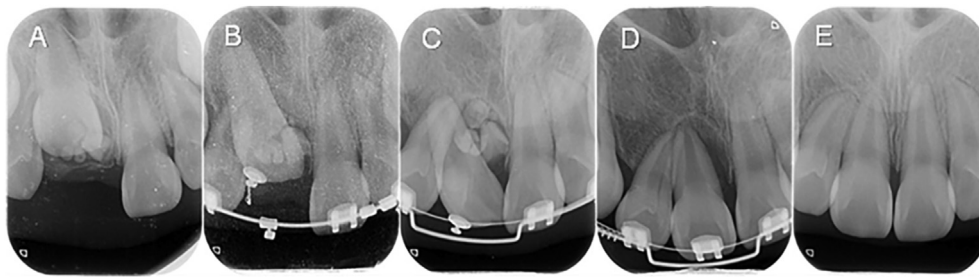


Figure 3. Serial follow-up periapical radiographs during treatment. A, Pretreatment periapical radiograph; B and C, At 9 and 13 months, the odontoma was found to gradually increase in size; D, At one week post-surgery for odontoma; E, Substantial bone formation was observed and no root damage occurred at 28 months.

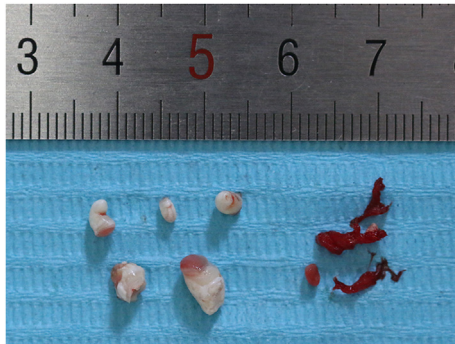


Figure 4. Denticles of varying size and fibrous capsule.

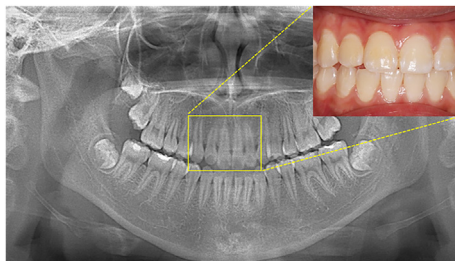


Figure 5. Panoramic radiograph and intraoral photograph at the 32-month follow-up.

erupting impacted incisor, which might be because the binding force between the odontoma and the surrounding bone was stronger than the orthodontic force.

Odontomas can be radiologically classified into initial (radiolucent), intermediate (partial calcification) and final (radiopaque and surrounded by narrow radiolucency) stages during the tumor growth [24, 25]. The odontoma in the present case was diagnosed as the intermediate stage, with predictable growth potential. The odontoma had clearly increased in size, as seen in the serial periapical radiographs (Figures 3A-3C). Although the orthodontically exposed impacted incisor and the intraosseous odontoma increased the distance between them, which potentially reduced the risk of tooth injury during surgical removal of the odontoma, the gradual growth of the odontoma had to be considered, which might shorten the distance between the tooth and odontoma. Thus, we recommend early resection of the odontoma after fully exposing the impacted tooth to avoid possible injury to the adjacent tooth.

In summary, tooth traction followed by odontoma resection can be considered an alternative treatment plan if the lesion does not completely block the impacted tooth. The intraosseous odontoma will not shift with the erupting impacted tooth, which offers a potential benefit for safe tumor surgery due to increased distance between the lesion and the tooth. The odontoma should be removed as soon as possible after the

impacted tooth moves into position, especially for a growing odontoma. Adhesion between the soft tissue capsule of the odontoma and the dental follicle, rather than blocking the tooth, may be involved in the occurrence of tooth impaction.

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Author contribution statement

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Additional information

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