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Complex odontoma in the lower left mandible of a 4-year-old child: Surgical management and histomorphological insights

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Abstract
Odontomas are the most common odontogenic tumors, typically asymptomatic and often identified incidentally on radiographic examination. They are broadly classified into compound odontomas, which exhibit tooth-like structures, and complex odontomas, which consist of a disorganized mass of dental tissues lacking morphological resemblance to teeth. Although complex odontomas predominantly occur in the posterior mandible, their presentation in the anterior mandibular region is exceedingly rare. This article reports a case of a 4-year-old child presenting with swelling in the anterior mandibular canine region. Clinical and radiographic findings suggested a complex odontoma in the lower left mandible, which was surgically excised and confirmed histopathologically.

Keywords: Odontoma, primary tooth, eruption disturbance, surgical removal, radiograph, histopathology

Introduction
The term "odontoma," introduced by Paul Broca in 1867, refers to a tumor formed by the overgrowth or transitory development of complete dental tissues. Odontomas are the most prevalent type of odontogenic tumors of the jaws, classified as hamartomatous developmental abnormalities of odontogenic origin [1]. According to the World Health Organization (WHO), odontomas are defined as non-aggressive hamartomatous developmental abnormalities comprising enamel, dentin, cementum, and pulpal tissue [2].

In 1992, the WHO recognized two primary subtypes of odontomas: compound and complex.

Compound odontomas are characterized by well-organized structures resembling miniature teeth, termed denticles, representing all dental tissue types. On the other hand, complex odontomas consist of a disorganized conglomeration of dental tissues, including enamel, dentin, cementum, and pulp, with no structural resemblance to normal tooth morphology [3]. Occasionally, mixed odontomas present features of both subtypes [4].

The exact etiology of odontomas remains unclear, though local trauma or infection has been proposed as potential contributing factors. Odontomas are the most common odontogenic tumors observed in children, with compound odontomas being more prevalent than complex ones [5]. Compound odontomas are frequently located in the anterior maxilla near the incisors and canines, whereas complex odontomas are more commonly associated with the posterior mandible, especially near the second and third molars [6].

Epidemiological studies suggest a slight male predilection, with the mean age of occurrence around 14 years and the highest prevalence during the second decade of life [7]. Odontomas exhibit a greater predilection for the maxilla compared to the mandible, with a maxilla-to-mandible ratio of 3:1 [8].

Clinically, the growth of both sub-types is typically slow and painless, often associated to alterations in the permanent or deciduous dentition. These lesions are usually discovered on the occasion of routine radiological examinations (panoramic and/or intraoral X-rays) to evaluate the cause of delayed tooth eruption. Radiographically, odontomas appear as unilocular lesions, exhibiting multiple radiopaque denticles or a dense radiopaque mass surrounded by a radiolucent rim. Diagnosis is confirmed through histological examination, which reveals varying combinations of dental tissues [9].

Case description

A 4-year-old Female child presented to the Department of Pedodontics and Preventive Dentistry with a chief complaint of swelling in the anterior mandibular region. According to the parent, the swelling initially appeared small but had gradually increased in size over time. The child reported no associated pain or discomfort.

Clinical examination revealed a well-defined, circumscribed swelling in the right buccal region, along with the absence of the deciduous canine (73) (Fig. 1). The swelling was non-tender, hard in consistency, and accompanied by cortical plate expansion. No discharge was observed.

Radiographic investigations, including intraoral periapical, occlusal, and panoramic radiographs, were advised. Radiographs showed multiple dense radiopaque structures contained within a radiolucent cavity surrounded by a corticated border (Fig. 2). Additionally, mesial to the lesion, a radiopaque structure corresponding to the unerupted 73 was noted, with 33 observed apically to the same region (Fig. 3). The occlusal radiograph confirmed cortical plate expansion.

Based on clinical and radiographic findings, a provisional diagnosis of odontoma was made. The differential diagnoses considered included Complex odontoma, compound odontoma, ameloblastic fibroma, ameloblastic fibro-odontoma, odontoameloblastoma and cementoblastoma in its osteoblastic stage.

Management

The treatment of choice for the lesion was complete enucleation of the odontoma along with the associated soft tissue. Preoperative investigations were completed, and the surgical procedure was initiated under adequate local anesthesia. A crevicular incision with vertical releasing incisions was made, and a full-thickness mucoperiosteal flap was raised to expose the lesion.

Upon selective bone removal, multiple white denticle-like structures were revealed. The odontoma and associated structures were carefully removed (Fig.4). The mucoperiosteal flap was repositioned and sutured using interrupted sutures (Meril Filasilk #3-0 Black Braided Silk Suture).

Post-operative treatment

Pharmacological treatment comprised administration of Syp AMOXIL 250mg -3.5 ml twice daily for 5 days and Syp Ibugesic Plus 3.5 ml Twice Daily. The patient was instructed to use Salt water Gargle, for 5 minutes twice daily for as long as the sutures remained in place.

Histo-pathological findings

The surgical specimen was decalcified using 7% nitric acid for 15 days, with the acid replaced every 3 days. The specimen was then fixed in 10% buffered formalin, embedded in paraffin wax, sectioned into thin slices (4 µm), and stained with hematoxylin and eosin (H&E) for histopathological evaluation.

Histopathological examination of the decalcified hard tissue mass revealed an ill-organized conglomerate comprising dentin, cementum, and pulp tissue. Dentin and cementum were present in relatively larger quantities, forming the bulk of the specimen, while the enamel matrix and pulp tissue were found in smaller amounts (Fig.5). Spherical basophilic masses, representing cementum, were scattered throughout the decalcified section (Fig.6). Surrounding fibrous soft tissue with numerous blood vessels and extravasated RBCs were also appreciable. The overall disorganized arrangement of the dental tissues confirmed the lesion as a complex odontoma.

The case was treated using conventional surgical methods. At the 3-month follow-up, no complications or evidence of recurrence were observed. Postoperative monitoring was conducted with orthopantomography taken two weeks post-surgery, which revealed normal eruption of the deciduous canine into occlusion. It is anticipated that an acceptable occlusal relationship will be achieved within one year following g the surgery.

Discussion

Odontomas are common benign hamartomatous malformations, typically asymptomatic, and are frequently diagnosed incidentally during routine radiological evaluations [10]. While many odontomas remain clinically undetectable, they may occasionally present with signs such as delayed tooth eruption, pain, or infection, including suppuration [11]. Approximately 70% of odontoma cases are associated with other dental conditions, including tooth impaction, malposition, and resorption or devitalization of adjacent teeth. Odontomas are categorized into compound and complex types, with a reported ratio of 2:1, respectively [9]. Compound odontomas are most commonly found in the anterior maxilla, near the crowns of unerupted teeth or between the roots of erupted teeth. Conversely, complex odontomas are usually located in the posterior mandible, frequently associated with impacted teeth, and can grow to significant sizes [12]. Although odontomas are most often diagnosed during the second and third decades of life, the occurrence in patients in the first decade, as seen in this case, is rare [13].

Clinically, complex odontomas tend to remain asymptomatic, with only minimal signs of delayed eruption or swelling in a few cases. This case is particularly noteworthy as the odontoma presented in the anterior mandibular region, hindering the eruption of the primary canine. Literature reports few instances of complex odontomas in the anterior mandible, with studies noting their presence in the molar region more commonly. Radiographically, complex odontomas are seen as irregular radiopaque masses, initially appearing radiolucent due to incomplete calcification, progressing to a mixed lesion during partial calcification, and finally becoming a radiopaque mass surrounded by a radiolucent halo [14]. Histopathological examination is crucial for confirming the diagnosis, with findings of a heterogeneous mass of dental tissues such as immature dentin, enamel matrix, cementum, and pulp tissue, often encased by a connective tissue capsule resembling the dental follicle [15].

Traditionally, odontomas were considered odontogenic tumors and treated with radical resection. However, with a shift in understanding, odontomas are now considered hamartomatous malformations, prompting a more conservative approach [16]. The preferred treatment now involves selective removal of the odontoma and surrounding tissue, with special consideration given to the management of impacted teeth. While some studies report that impacted teeth may erupt following the removal of an odontoma, others advocate for extracting both the impacted tooth and odontoma to avoid future complications. Careful evaluation of each case is necessary, taking into account factors such as the lesion's size, location, and the condition of the associated teeth [17].

The patient in this case was treated with conventional surgical methods, which remain the gold standard for odontoma management. The procedure involved enucleation of the odontoma and associated soft tissues, followed by closure

with a mucoperiosteal flap. The patient's healing was uneventful, and at the 3-month follow-up, there were no signs of complications or recurrence. Postoperative radiographs revealed the normal eruption of the deciduous canine, with expectations for acceptable occlusion within one year of surgery. However, at the six-month follow-up, as the canine continued to erupt toward the occlusal plane, the patient presented with a complaint of localized pain. Clinical examination revealed a spicule-like prominence on the buccal surface of the erupting retained canine. This structure was suspected to represent a residual attachment site of the previously excised complex odontoma, causing irritation to the adjacent buccal mucosa and resulting in discomfort (Fig.7). The condition was managed conservatively through enameloplasty, leading to immediate resolution of pain following the procedure. This case highlights the importance of conventional surgical methods in ensuring favorable outcomes for odontoma management.

While laser surgery, particularly the Er: YAG laser, has been explored as an alternative treatment option, conventional surgery remains the preferred approach. The Er: YAG laser, with its wavelength of 2,940 nm, is absorbed by water and effectively ablates hard tissues. It is known for its minimal thermal effects on surrounding tissues when used with proper cooling systems and in a pulsed emission mode [18]. Despite these advantages, conventional surgery continues to be the treatment of choice due to its long-standing success and established clinical outcomes. The current case underscores the efficacy of conventional surgical techniques in achieving successful results, including smooth healing and minimal risk of recurrence, which remains a key consideration in odontoma management.

To summarise, odontomas present unique clinical challenges, particularly when they occur in atypical locations like the anterior mandible. Proper diagnosis, based on clinical, radiological, and histopathological findings, is critical to determining the most appropriate treatment. Conventional surgery remains the mainstay of treatment for odontomas, providing excellent outcomes when performed correctly, with a low risk of recurrence. While newer methods, such as laser surgery, hold promise, further research is needed to directly compare their efficacy to traditional surgical techniques.

Fig 1: Swelling on the labial gingiva of 73 region

Fig 2: IOPA showing radiopaque masses in the 73 regions

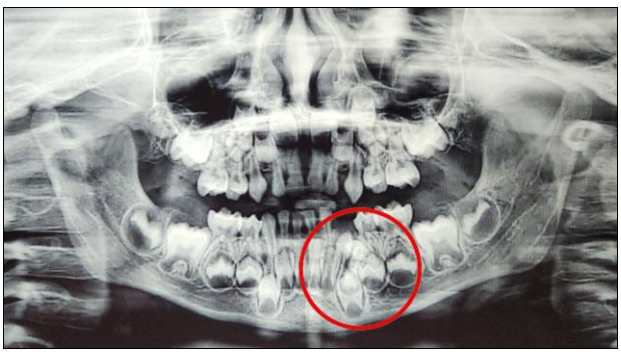

Fig 3: OPG

Fig 4: Removed odontomes

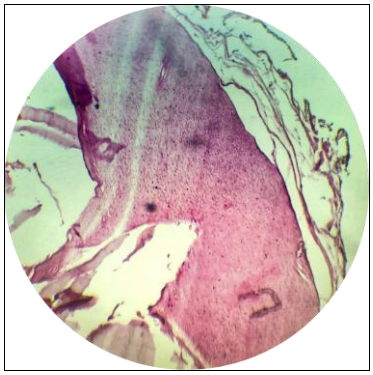

Fig 5: Microscopic image demonstrates a disorganized mass of dentin, cementum, and pulp tissue with minimal enamel matrix deposition (H&E, ×40)

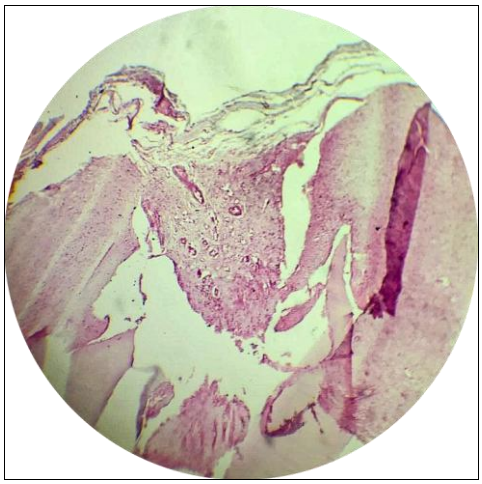

Fig 6: Light microscopy reveals spherical basophilic cementum-like masses scattered throughout a disorganized mass of dental tissues

Fig 7: Clinical view showing a spicule-like prominence on the buccal surface of the erupting retained canine

Conclusion

This case report highlights the clinical, radiographic, and histopathological findings, and the necessary investigations to reach an accurate diagnosis. The treatment provided, supported by histopathological analysis, confirms that following established protocols is the best approach. While variations in tooth eruption can occur, significant changes should prompt further investigation into the patient's health and development. Based on clinical experience, any child with delayed tooth eruption, retained deciduous teeth, or tooth displacement should undergo a detailed radiographic examination, with or without a history of trauma. Early diagnosis allows for a simpler and more effective treatment, leading to a better prognosis.

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Conflicts of interest

There are no conflicts of interest.

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