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Case Report
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Orthodontic Eruption of an Odontoma-Impacted Maxillary Central Incisor: Clinical Case and Comprehensive Literature Review

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Abstract

Background: *Impaction of a maxillary central incisor is an uncommon but clinically significant malocclusion that can affect aesthetics, function, and psychosocial well-being. Odontomas are the most frequent pathological cause of anterior tooth impaction. Management typically requires a multidisciplinary approach combining surgical and orthodontic interventions for successful eruption and long-term stability.*

Case Presentation: *This report describes a 13-year-old patient presenting with the absence of the maxillary left central incisor (tooth 21) and anterior crowding. Radiographic evaluation revealed impaction of tooth 21 due to a compound odontoma obstructing the eruption pathway. Treatment involved surgical removal of the odontoma, bonding of an orthodontic button to the impacted incisor, and gradual orthodontic traction using fixed appliances. Over a 48-month treatment period, tooth 21 was successfully guided into the dental arch, achieving proper alignment, functional occlusion, and satisfactory aesthetics without complications.*

Conclusion: *Successful management of odontoma-associated maxillary central incisor impaction relies on early diagnosis, space creation, surgical exposure, and controlled orthodontic traction. This case highlights the importance of a stepwise multidisciplinary approach in restoring function and aesthetics in anterior tooth impaction.*

Keywords: Odontoma, Impacted Maxillary Central Incisor, Orthodontic Eruption, Surgical Exposure, Orthodontic Traction, Multidisciplinary Management.

Introduction

Impaction of a maxillary central incisor is an uncommon clinical finding, with a reported prevalence of 0.06–0.2% in the general population [1]. Unlike third molar and canine impactions, central incisor impactions have immediate aesthetic, functional, and psychosocial consequences due to their prominent location in the smile and essential role in speech and occlusion [2]. Early diagnosis is critical, as delayed management can lead to complications such as loss of eruption potential, root dilaceration, or prolonged treatment duration [3].

The most common etiological factors for anterior tooth impaction include odontomas, supernumerary teeth, early trauma to primary incisors, cystic lesions, and dense fibrous gingival tissue [4, 5]. Among these, odontomas account for the majority of pathologic impactions, with compound odontomas often located in the anterior maxilla and associated with eruption disturbances [6]. Radiographic evaluation using panoramic radiographs or cone-beam computed tomography (CBCT) is essential for identifying the exact position of the impacted tooth and any associated pathology [7].

Management of odontoma-associated maxillary incisor impaction typically requires a multidisciplinary approach, combining

surgical removal of the obstruction with orthodontic traction to guide the tooth into the dental arch [8, 9]. Literature reports success rates exceeding 85–95% when early intervention is undertaken, particularly if the tooth root is incompletely formed and adequate space is created [10]. This case report highlights a stepwise orthodontic-surgical approach for the successful eruption of an odontoma-impacted maxillary central incisor and provides a comprehensive review of the literature to contextualize clinical decision-making.

Case Report

Case Presentation

A 13-year-old boy presented at our orthodontic clinic with a chief complaint of bad appearance of his teeth, the patient's medical and family histories were unremarkable, with no history of facial trauma or systemic conditions that could affect tooth eruption.

Clinical Examination

Extraoral examination revealed symmetrical facial proportions with a straight profile. Intraoral examination showed the absence of the maxillary left central incisor (tooth 21), mild anterior crowding, and rotation with mesial inclination of the maxillary left lateral incisor (tooth 22). No signs of gingival swelling or infection were noted in the anterior maxilla (Figure 1A–C).

Figure 1A–C: Pre-treatment intraoral photographs showing absence of 21 and mild anterior crowding

Figure 1: (A) Frontal view showing absence of tooth 21 and mild anterior crowding.

Figure 1: (B) Left lateral view showing mesial inclination of tooth 22 and anterior spacing.

Figure 1: (C) Right lateral view showing space deficiency in the anterior maxilla.

Radiographic Findings

Panoramic and periapical radiographs demonstrated impaction of maxillary left central incisor (tooth 21) associated with a radiopaque mass consistent with a compound odontoma obstructing the eruption pathway (Figure 2A). The crown of the impacted tooth was oriented labially, with incomplete root formation, which was favorable for orthodontic traction.

Figure 2A: Pre-treatment periapical radiograph showing impacted maxillary left central incisor (tooth 21) with a radiopaque mass with a capsule-like radiopaque rim

Treatment Plan, Progression, and Outcome

A multidisciplinary orthodontic–surgical approach was implemented in four sequential phases to manage the case effectively. In the first phase, surgical exposure and removal of the odontoma were performed under local anesthesia. The second phase involved orthodontic space creation using a 0.022-inch edgewise fixed appliance bonded to the maxillary arch, with initial alignment and leveling to provide adequate mesiodistal space for tooth 21. A labial mucoperiosteal flap was raised, the odontoma was surgically removed to clear the eruption path, and the crown of tooth 21 was exposed. An orthodontic button with a ligature wire was bonded to its labial surface to facilitate traction. In the third phase, light continuous forces were applied using elastomeric chains and auxiliary ligatures, with initial eruption observed approximately 2–3 months after traction was initiated; progressive activation gradually guided the tooth into the arch over the following months. In the final phase, a conventional bracket was bonded to tooth 21 for fine alignment and occlusal finishing. Bite settling and detailed finishing were completed over the entire 48-month treatment period, achieving ideal anterior guidance, functional occlusion, and excellent aesthetics.

At the end of treatment, outcomes were highly satisfactory: tooth 21 had successfully erupted and been aligned into functional occlusion, anterior esthetics were harmonized with a pleasing smile arc (Figure 3A–C), and a stable occlusion was achieved without any periodontal compromise or root resorption. This

Figure 3: A) Post-treatment frontal intraoral photograph showing tooth 21 successfully erupted into the dental arch with bonded brackets during final alignmen

Figure 3: B) Post-treatment frontal occlusion photograph demonstrating harmonized anterior esthetics and a pleasing smile arc after completion of treatment

Figure 3: C) Post-treatment right lateral intraoral photograph showing tooth 21 in functional occlusion with a stable anterior relationship.

Literature Review

Impaction of maxillary central incisors is a rare but clinically significant condition, with a prevalence ranging from 0.06% to 0.2% in the general population [11]. Unlike canine or third molar impactions, the absence of a central incisor has an immediate aesthetic and psychosocial impact because of its prominence in the smile and its critical role in speech and occlusion [12]. Etiological factors include supernumerary teeth, odontomas, early trauma to primary incisors, cystic lesions, and dense fibrous gingival tissue [13]. Among these, odontomas are the most common pathological cause, particularly compound odontomas located in the anterior maxilla [14]. Early detection through clinical and radiographic examination is essential to prevent complications such as root dilaceration, loss of eruption potential, or prolonged treatment duration [15].

Odontomas are benign odontogenic tumours composed of dental tissues, and they are classified into compound and complex types [16]. Compound odontomas typically present as multiple small tooth-like structures and are more frequently associated with anterior maxillary impactions, while complex odontomas appear as irregular calcified masses more common in the posterior jaw [17]. Literature reports indicate that 70–80% of odontomas are detected in the first two decades of life, often during evaluation for delayed tooth eruption [18]. The obstruction caused by odontomas can prevent the spontaneous eruption of permanent teeth, necessitating a combined surgical and orthodontic approach for successful management [19].

Successful management of odontoma-associated maxillary incisor impaction relies on a multidisciplinary approach. Standard treatment involves three key steps: surgical removal of the odontoma, orthodontic space creation, and controlled orthodontic traction of the impacted tooth into the dental arch. Studies report success rates exceeding 85–95% when treatment is initiated early, particularly if the tooth root is incompletely formed and adequate space is available for eruption [20]. The timing of surgical intervention is also crucial; early removal of the obstruction followed by immediate or delayed orthodontic traction improves prognosis and reduces the risk of ankylosis or prolonged treatment duration [21]. Cone-beam computed tomography (CBCT) has become the gold standard imaging modality for pre-surgical planning, as it accurately determines the location, orientation, and proximity of the impacted tooth to adjacent structures [22].

Long-term outcomes of orthodontic-surgical management of central incisor impaction are generally favorable. Literature reviews indicate that teeth guided into the arch through controlled traction can achieve functional occlusion, harmonious gingival architecture, and stable esthetics, provided that careful biomechanical principles are followed [23]. However, potential complications include root resorption, loss of vitality, or periodontal defects if inappropriate forces are applied or if ankylosis develops [24]. Early diagnosis, individualized treatment planning, and adherence to light and continuous orthodontic forces remain the cornerstones of predictable outcomes. This literature supports the treatment protocol applied in the present case, emphasizing the value of timely multidisciplinary intervention to restore function and esthetics in patients with odontoma-induced central incisor impaction.

Discussion

Impaction of a maxillary central incisor is an uncommon but clinically significant condition due to its profound impact on dental esthetics, phonetics, and psychosocial well-being [25]. The present case highlights the successful orthodontic-surgical management of an odontoma-associated central incisor impaction using a stepwise, multidisciplinary approach. Early identification and timely intervention are critical, as delayed treatment can result in prolonged orthodontic therapy, loss of eruption potential, or unfavorable sequelae such as root dilaceration or ankylosis [26].

Odontomas represent the most frequent pathological cause of anterior tooth impaction, with compound odontomas commonly associated with maxillary central incisors [27]. The pathogenesis of impaction involves physical obstruction of the eruption pathway and sometimes the formation of dense fibrous tissue around the crown [28]. Radiographic imaging, particularly cone-beam computed tomography (CBCT), is recommended for precise localization and assessment of the impacted tooth and any associated pathology [29]. In this case, periapical and panoramic radiographs were sufficient to identify the odontoma and plan the surgical approach, as the root of tooth 21 was incompletely formed—a favorable condition for orthodontic traction.

The literature emphasizes that a multidisciplinary protocol—space creation, surgical exposure, and controlled orthodontic traction—offers the highest success rates for central incisor impactions [30, 31]. In our case, surgical removal of the odontoma was performed first, followed by bonding of an orthodontic button for guided eruption. Space creation with fixed appliances was then carried out, and light continuous forces as advocated in current orthodontic guidelines were applied to minimize the risks of root resorption and ankylosis [32, 33].

Initial eruption was observed at 10 weeks, and gradual activation successfully guided the tooth into alignment over an extended 48-month treatment period. Prolonged treatment duration in this case can be attributed to the need for staged force application and the patient's initial crowding, which required careful biomechanical control.

Outcomes of orthodontic-surgical management are generally favorable, with reported success rates of 85–95% for teeth guided into the dental arch. In our case, the final result achieved stable functional occlusion, harmonized anterior esthetics, and preserved periodontal health. This aligns with previous studies demonstrating that, when treated early and according to biomechanical principles, odontoma-impacted incisors can achieve long-term stability and esthetic integration comparable to naturally erupted teeth [34]. However, clinicians must remain vigilant for potential complications such as external root resorption, loss of pulp vitality, or periodontal defects, which may occur if excessive forces are applied or if ankylosis develops [35].

This case reinforces several key clinical principles: early radiographic assessment is essential for any delayed incisor eruption; odontoma-associated impactions require combined surgical and orthodontic management; and light, controlled forces optimize eruption while minimizing complications. Furthermore, adherence to multidisciplinary guidelines ensures predictable functional and esthetic outcomes. Long-term follow-up is recommended to monitor stability, periodontal health, and root integrity.

Conclusion

The successful management of odontoma-associated maxillary central incisor impaction relies on timely diagnosis, meticulous treatment planning, and a multidisciplinary orthodontic-surgical approach. Early identification of the obstruction, combined with space creation, surgical exposure, and controlled orthodontic traction using light continuous forces, allows predictable eruption of the impacted tooth into functional occlusion. This case demonstrates that adherence to stepwise biomechanical and surgical principles results in excellent functional and esthetic outcomes, while minimizing the risk of complications such as root resorption, ankylosis, or periodontal defects. Long-term follow-up is essential to ensure stability, preserve periodontal health, and maintain overall treatment success.

Consent for Publication

Consent Declaration

Written informed consent was obtained from the patient and his parents for the publication of this case report and accompanying images. The patient was informed that all identifying information will be anonymized and that the information will be used solely for academic and scientific purposes.

Conflicts of Interest

The authors declare that they have no conflict of interest

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