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(CASE REPORT)

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Management of Impacted and Dilacerated Maxillary Central Incisors: A Case Report

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Abstract

A 9-year-old female patient with an impacted upper left central incisor was referred to the Paediatric Dentistry Clinic. The patient's medical history indicated that her maxillary primary left central incisor was extracted previously due to avulsion trauma at the age of 2. A periapical radiograph and cone beam computed tomography (CBCT) were performed, resulting in a diagnosis of an impacted upper left central incisor requiring dental intervention and treatment. The patient visited the paediatric dentistry clinic for the first time seeking dental treatment, specifically restoration and pulpotomy of a primary molar, as well as fissure sealant application on permanent molars. The patient's parents consented to the treatment approach, and a comprehensive treatment plan was elucidated. The patient exhibited good tolerance to the treatment and experienced no complications. Consent forms for the treatment plans were executed prior to the acceptance of dental treatment. After six months, the tooth had completely erupted and was secured with a fixed retainer. The patient and guardian expressed satisfaction with the final orthodontic outcome for the permanently retained palatal appliance.

Keywords: Unerupted upper central incisor; Dilacerated Maxillary; Orthodontic and pediatric dentistry clinics; Surgical exposure and traction

1. Introduction

1.1. Background and Etiology of Impacted and Dilacerated Maxillary Central Incisors

Impacted teeth can be caused by various factors, including congenital and acquired factors, early deciduous tooth loss, ectopic tooth position, cystic or benign lesions, or iatrogenic reasons [1-2]. Another etiological factor is the dilaceration of teeth, which is an angulation between the crown and root that develops after the crown's formation [3-4]. This can be identified in the incisors as disturbances on the labial or palatal bone, a buccal or palatal cortical plate, or abnormal anatomy in panoramic radiographs [5-6]. The most severe situation is when the crown and root are dilacerated. This case report describes the management of an unerupted dilacerated left maxillary central incisor that was displaced to the palatal and higher side of the right upper incisor [7-8]. Labial inversely impacted central incisors have a higher median time of exposure compared to palatal inversely impacted central incisors [9-10]. Factors affecting treatment duration include impaction degree, position of impacted central incisors, and soft tissue severity [11-12]. Prompt diagnosis and timely management can improve successful exposure and eruption of impacted central incisors [11-12].

2. Case presentation/clinical examination and diagnosis

A 9-year-old girl with dilacerated and impacted maxillary left central incisor was evaluated for her orthodontic state. Identifying the left central incisor as impacted showed labial inverse dilaceration. The patient's face is assessed for

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facial symmetry, lips, nasolabial folds, zygomatic and condylar prominence, and mandibular opening in relation to maxilla during an extraoral examination. The clinical evaluation of the mandible-maxilla relationship has six main records. The relationship between the mandible, maxilla, skull, and soft tissue profile is evaluated by means of cephalometric analysis of radiographs; cone beam technology helps to identify the position of permanent structures. The ANB measurement, a conventional measure showing the relationship between the chin-mandible and the cranial base-nasion-mandible, defines cephalometric analysis. Figure 1-4 thoroughly depicts the specifics of our case.

Figure 1 Cone beam before traction shows the position of impacted dilecerated upper left central incisor, it is palatel and higher position related to the adjacent tooth,with dileceration of the apical part of the root distally

Figure 2 regaining space of impacted central by 2*4 appliance

Figure 3 surgical exposure under GA, mucoperiosteal flap was done, gold chain was placed for traction

Figure 4 periapical x ray shows the central with dilacerated root after 6 months of traction, it is fully erupted and occlusion is returned

Figure 5 Post operative picture after 6 months of traction, permanent retainer is indicated for retention

3. Treatment Planning and Management Strategies

A dental anomaly called dilaceration is characterized by a rapid change in root orientation, usually calling for surgical treatment and orthodontic correction. Common in regular orthodontic treatment, this usually results from a history of avulsion trauma and intrusion, mostly linked with permanent damaged teeth. Treating affected dilacerated maxillary central incisors is even more difficult and strange [15-16]. More often seen in the maxilla, dilacerated incisors can happen at any height. Managing this condition is uncommon; there is little study available on it [17–18]. A case of an impacted dilacerated maxillary central incisor and its orthodontic-surgical management was recently shown. Prompt identification and early management of impacted teeth with root dilaceration were underlined by the successful eruption of the affected tooth made possible by the timely application of an interceptive approach and a correct treatment plan.

4. Outcome and follow-up

A 9-year-old girl was diagnosed with dislocation between the crowns of the impacted maxillary central incisors. The diagnosis was validated, and the effects and dilaceration were addressed surgically. The long-term outcomes and prognosis were favorable. The prompt identification and prompt management of impacted teeth are essential, as delayed diagnosis may result in complications including dental displacement, root resorption, and cyst formation, potentially hindering an individual's normal growth and development. The case involved affected central incisor and root dilaceration. The case underwent additional assessment via preoperative and postoperative retrospective analysis, and concurrent intelligence sampling images of the intended procedure were obtained. At the two-year follow-up, both teeth remained intact and asymptomatic, exhibiting no significant clinical or radiographic complications. Radiography indicated that the dilacerated maxillary central incisor-maintained root apex integrity, lamina dura delineation, and continuity, with favorable long-term outcomes and prognosis.

5. Discussion

In paediatric dentistry and orthodontics, treating impacted and dilacerated maxillary central incisors is a major problem that calls for a multidisciplinary approach to guarantee the best possible functional and cosmetic results. The effective treatment of an impacted upper left central incisor in a 9-year-old girl who had experienced a primary tooth avulsion at age 2 is highlighted in this case study. After a comprehensive treatment of pediatric, orthodontic, and surgical procedures, the patient's teeth erupted well and were stabilised with a fixed retainer. With an emphasis on aetiology, diagnostic techniques, treatment methods, and long-term results, the conversation will assess the case's salient features in light of the body of available research. With a reported frequency of 0.06–0.2% in the general population, maxillary central incisor impaction is a rather rare condition. [19].

Developmental abnormalities include dilaceration, odontomas, cysts, damage to primary ancestors, and extra teeth are the main causes. [20] Since severe damage to primary teeth may disturb the developing permanent tooth bud, resulting in deformity or ectopic eruption, the patient's history of avulsion of the main left central incisor at age 2 most certainly contributed to the impaction in this instance. [21] According to research by Andreasen et al. [22], primary incisor intrusive or avulsive traumas increase the likelihood of impaction, root dilcetation, and enamel hypoplasia in their successors. Eruption is made more difficult by dilaceration, which is defined by an abrupt angulation in the root or

crown. [23] Although there was not much dilatation in this instance, the impaction required careful radiographic evaluation and treatment. The importance of early identification by modern imaging, such as cone-beam computed tomography (CBCT), in identifying the precise location of the impacted tooth and organising suitable traction was highlighted by similar instances described by Topouzelis et al. [24].

The limited two-dimensional information provided by conventional periapical radiography is often inadequate for accurately localising impacted teeth. [25] In this instance, the precise location of the impacted incisor, the growth of the roots, and its closeness to other structures were evaluated using CBCT imaging. This is in line with suggestions made by Alqerban et al., [26], who showed that CBCT lowers surgical risks and increases diagnostic accuracy in situations with impacted teeth. Studies have shown different preferences for different imaging modalities. According to Wriedt et al. [27], impacted incisors may be successfully managed using only panoramic and periapical radiographs, suggesting that CBCT isn't always required in simple situations. CBCT is still the gold standard in cases of significant displacements or complicated dilceration. [28] The current instance demonstrates how useful CBCT is for improving treatment planning, especially when taking orthodontic traction mechanics into account. In order to treat impacted incisors, orthodontic traction is usually used after surgical exposure. [29] Given the favourable end placement, a closed eruption approach was probably used in this patient. The literature has generally endorsed this technique, which includes guided eruption, attachment bonding, and flap elevation. [30] In research comparing open and closed eruption procedures, Chaushu et al. [31] found that closed eruption produces improved periodontal health and gingival aesthetics.

Careful force application is necessary for orthodontic traction in order to prevent ankylosis or root resorption. [32] Light, continuous pressures (20–30g) are ideal for tooth movement without causing negative consequences, according to studies by Smailiene et al. [33]. Six months later, the current instance showed effective eruption, which is in line with research by Becker et al. [34], who found that impacted incisors typically took five to eight months to erupt after receiving the right traction. In contrast, some research supports the early excision of badly misaligned or non-viable teeth and the replacement of them with prosthetics. [35] In several instances, auto-transplantation of premolars was chosen over extended orthodontic therapy, as reported by McNamara et al. [36]. However, orthodontic traction was judged to be the most conservative and physiologically sound course of action in this instance due to the patient's age and favorable root growth.

After receiving orthodontic treatment, retention is essential to avoiding recurrence. [37] The incisor's position was maintained in this instance by the implantation of a fixed retainer, a procedure that was endorsed by Salehi et al. [38], who discovered that bonded retainers considerably decrease post-treatment displacement. There is conflicting data on how long retention lasts. While Littlewood et al. [39] highlighted the advantage of fixed retainers in terms of long-term stability, Renkema et al. [40] proposed that detachable retainers are equally beneficial. The patient's happiness with the palatal appliance is consistent with Zachrisson's results [41], which showed that patients in aesthetic zones were highly accepting of permanent retainers.

Similar positive results have been reported in a number of case studies. A similar instance of effectively aligning an impacted incisor with CBCT-guided traction was reported in research by Lin et al. [42]. On the other hand, Skaff et al. [43] documented an eruption failure brought on by ankylosis that was not identified, emphasising the need of a comprehensive radiographic evaluation. Instances where spontaneous eruption was permitted by the interceptive extraction of additional teeth show contrasting methods. [44] However, active intervention is often required in trauma-induced impacts such as this one. [45]. The effective multidisciplinary treatment of an impacted maxillary central incisor is shown in this case, highlighting the significance of precise diagnosis, the use of CBCT, and controlled orthodontic traction. While noting differences in retention techniques, the results are consistent with the body of research that supports surgical-orthodontic approaches. Long-term periodontal health and cosmetic results in comparable situations should be investigated in future research.

5.1. learning points

Impacted and dilacerated maxillary central incisors are dental anomaly, with the long axis pointing to the labial or palatal side of the dental arch. This dental anomaly can be treated with surgical-orthodontic combined therapy, with CT technology providing valuable information for surgery, orthodontics, or combined treatment. The thicker the palatal bone covering an unerupted tooth, the longer the surgery treatment will take. Orthodontic traction allows the tooth to move to a normal position, while tunnel approach surgery accelerates recovery. Preoperative axial plane CT reformation is helpful for achieving better orthodontic bone base overlay when pulling a dilacerated tooth. Traditional treatment involves operating the tooth from the crown, creating a composite restoration, crown, and overdenture, which is treated without complications like root resorption and missing tooth vitality. Impaction affects 2-7% of all permanent teeth, with maxillary canines being most frequently involved Impacted maxillary incisors are rare, with a prevalence of 0.08%.

The position of the maxillary central incisor in occlusion significantly affects the esthetics of a denture, with everted tooth sides exerting severe stress on the alveolar bone and potentially causing alveolar bone destruction [46-47].

6. Conclusion

Impacted and dilacerated maxillary central incisors are rare dental issues that can affect their function and appearance. Combining surgery and orthodontic treatment with CT images for accurate treatment planning can move these teeth. Orthodontics uses traction to move teeth back into place, and tunnel methods speed healing. CT scans before surgery improve orthodontic results and determine surgery length based on palate bone thickness. When root loss is a concern, crowns and overdentures are still good options. The maxillary central incisors are crucial to tooth alignment and appearance, so they must be fixed immediately and with a long-term plan.

Compliance with ethical standards

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Disclosure of conflict of interest

There is no conflict of interest in this manuscript.

Statement of ethical approval

There is no animal subject involvement in this manuscript. This study received approval from the institutional review board during the committee meeting on Feburary,2 2025 and was assigned the registration number 25_2/2025. The second and final approval for publication was obtained from our institutional directorate of technical and development at 8 May 2025. Due to the retrospective design of this study, the informed consent form from paediatric parents was waived, and the study was strictly adhered to the standards established in the Helsinki ethical research protocols.

Statement of informed consent

Consent forms for the treatment plans were executed prior to the acceptance of dental treatment.

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