

Root Resorption of Maxillary Incisors caused by Bilaterally Impacted Canines: An Evaluation by Cone-Beam Computed Tomography

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ABSTRACT

When root resorption of incisors occurs due to impaction of maxillary canines, several factors interfere in the treatment plan, such as the location and severity of root resorption, canine position, lack of space and dental development stage. The case of severe root resorption of permanent maxillary incisors caused by bilaterally impacted permanent maxillary canines and its multidisciplinary therapeutic approach in a 12-year-old girl is presented. After clinical and imaging examination, a treatment plan was outlined including preservation of primary canines, extraction of the permanent maxillary right canine and permanent maxillary left lateral incisor followed by its replacement with the orthodontically tractioned permanent canine and esthetic restoration of the permanent maxillary anterior teeth. One year after treatment, the result was satisfactory and the remaining teeth were still asymptomatic. The risk of root resorption in children with impacted permanent maxillary canines should not be neglected thus reducing subsequent complications.

Keywords: Impacted tooth, Mixed dentition, Root resorption.

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INTRODUCTION

The permanent maxillary canine has a long and complex path of eruption from its place of initial formation (lateral to the piriform fossa) to its final position of occlusion which may predispose it to impaction.¹ Following the third molars, maxillary canines are the teeth most often impacted with an incidence ranging from 1 to 3%,^{2,3} occurring more often in women (2:1).⁴⁻⁷ Palatally impacted canines are more common than those positioned labially^{4,6,8} and, in most patients, it occurs unilaterally⁹ with an estimated 8% incidence of bilateral impaction.⁴ There are many suggested causes for this occurrence, including general and local factors. General factors include endocrine deficiencies, febrile diseases, vitamin deficiencies and irradiation.⁵ Local factors include discrepancy between dental arch length and tooth size, prolonged retention or early loss of primary canine, abnormal position of the tooth germ, ankylosis, cystic or neoplastic formation, root dilaceration, presence of alveolar cleft and traumatic factors.¹⁰

The impaction of permanent maxillary canines may lead to adverse consequences. The most common sequel is external root resorption of adjacent teeth.^{4,11} It is estimated that this phenomenon affects 48% of children with impaction of canines between 9 and 15 years of age.¹² Early diagnosis of canine impaction is essential in preventing root resorption of incisors.^{1,8,11,13} The diagnosis is made by clinical (inspection and palpation) and radiographic examination.^{9,11,13} Some events may indicate the presence of impaction during the clinical examination, such as delayed eruption of canines after age 14, prolonged retention of primary canines, bulging of the palatal mucosa and distal migration of the lateral incisors.⁹ Annual clinical evaluation of the alveolar process by palpation should begin at age 8 (palpation is possible in 70% of cases). If deviation of normal eruption patterns is perceived between 10 and 12 years of age, clinical evaluation should be associated with radiographic examinations.¹⁴

Radiographic examination is essential for diagnosis and several techniques may be used, such as periapical, occlusal and panoramic radiographs and lateral and frontal cephalograms.^{7,11} Currently, the use of a cone-beam

computed tomography (CBCT) exam has been suggested.¹¹ The CBCT allows to visualize the exact location of the unerupted teeth and detects the extent and location of the incisors root resorption, improving the diagnosis and treatment of patients with impacted teeth.^{7,11}

After diagnosed the impacted permanent canines, the first issue to consider in treatment planning is the presence or absence of root resorption in adjacent teeth and its severity.^{11,13} In cases of severe root resorption of the incisor, the risk of tooth loss should be considered during and after treatment.¹¹ Treatment options include radiographic follow-up, canine autotransplantation, extraction of impacted canine, re-establishment of occlusion with prosthesis and surgical exposure and orthodontic traction of the canine.⁹

A multidisciplinary therapeutic approach was reported in a case of severe root resorption of permanent maxillary incisors caused by bilaterally impacted permanent maxillary canines.

CASE REPORT

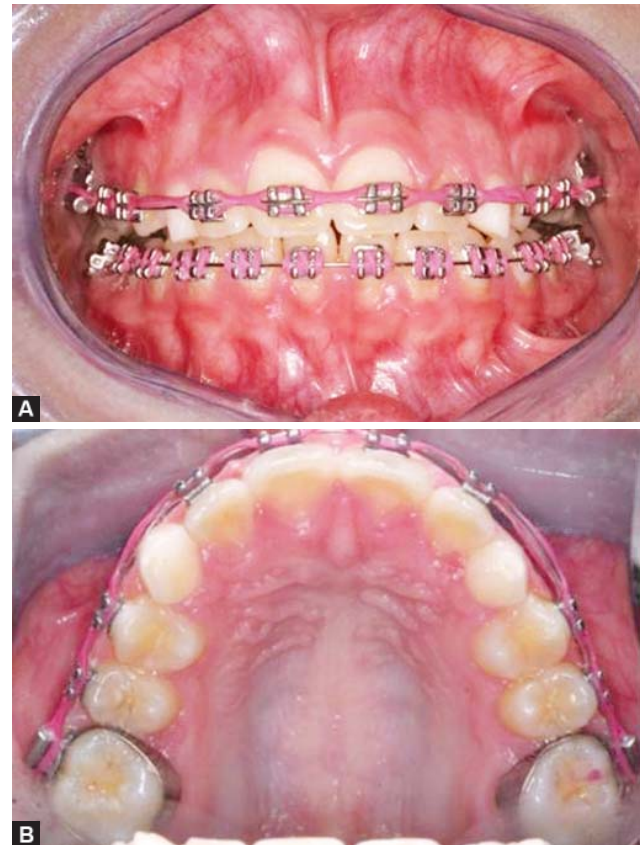
A 12-year-old girl complaining of retention of primary canines and noneruption of the permanent correspondents searched for treatment in our dental office. The past medical history showed no remarkable alteration.

The clinical examination revealed the presence of orthodontic appliance and prolonged retention of primary maxillary canines (Figs 1A and B).

A panoramic radiograph was taken, which showed an ectopic position of impacted maxillary canines causing the root resorption of all maxillary incisives (Fig. 2). Further information was not obtained regarding morphology and position of the impacted permanent maxillary canines. Then, the patient was submitted to CBCT exam of the maxilla. The examination revealed right permanent maxillary canine in mesioangulation with the long axis almost in the horizontal plan, causing resorption of more than two-third of the central incisor root and more than one-third of the lateral incisor root. The left canine presented itself in a mesioangular position causing resorption of the lateral incisor root until the cervical third and resorption of the apical third of the central incisor root (Fig. 3).

Vitality of teeth was assessed prior to treatment initiation. Only the permanent maxillary left lateral incisor responded negatively to the vitality test, and due to its extensive root resorption it was extracted. The crown of the permanent maxillary left lateral incisor was used as a pontic during the orthodontic traction of the permanent maxillary left canine (Figs 4A and B).

Permanent maxillary right canine was also extracted due to its almost horizontal angulation and the risk of increasing root absorption of proximity teeth during an orthodontic traction. Primary canines were preserved.



Figs 1A and B: (A) Frontal view (B) occlusal view



Fig. 2: Panoramic radiograph

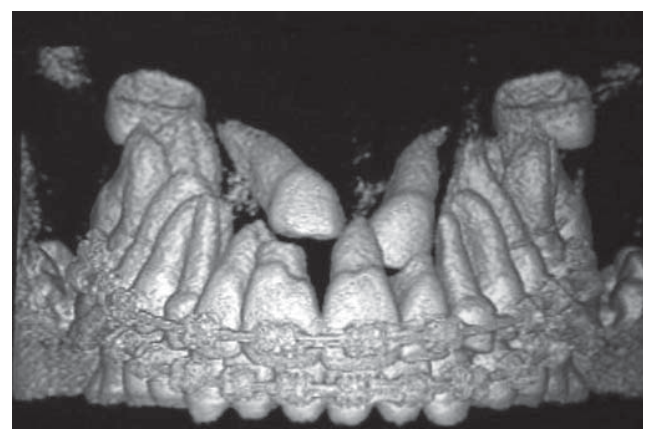
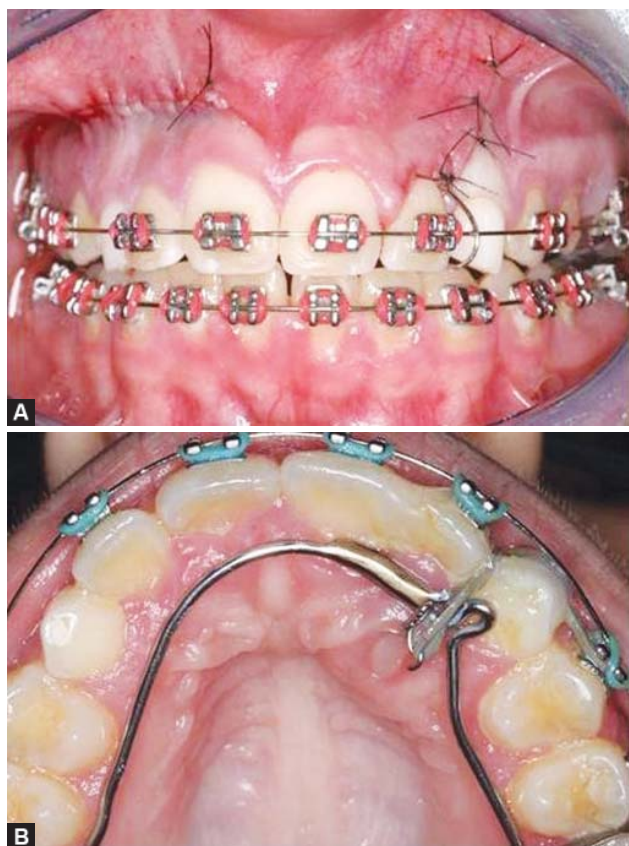


Fig. 3: Cone-beam CT reconstruction of the maxilla showing the position of the impacted canines and the root resorption of incisors



Figs 4A and B: (A) Immediate postsurgical, (B) adaption of permanent maxillary left lateral incisor as pontic during orthodontic traction of canine



Fig. 5: One-year clinical control

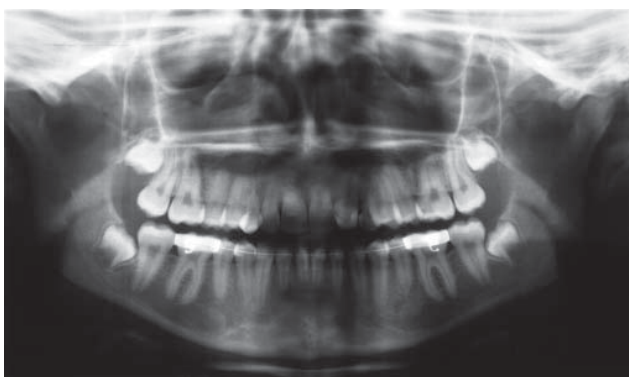


Fig. 6: One-year radiographic control

Parents were also informed about the importance of close monitoring the resorption of the permanent maxillary right lateral and central incisors and left central incisor and the possible need for implant rehabilitation in the future.

Orthodontic treatment required extra care due to the permanent maxillary incisors resorption. Traction of the permanent maxillary left canine was performed using a palatal bar. After eruption and positioning of permanent maxillary left canine in place of the lateral incisor after 18 months initiation of traction, a restorative treatment was performed on the permanent maxillary anterior teeth.

Currently, patient is under permanent control of the resorption of the anterior primary and permanent teeth. Clinical (Fig. 5) and radiographic (Fig. 6) signs of normality were observed in 1 year follow-up.

DISCUSSION

External root resorption of permanent maxillary incisors is a serious complication of impaction permanent maxillary canines and may result in tooth loss and increased time of treatment.¹⁵ This complication may be uni- or bilateral and affect permanent maxillary incisors.

However, several papers did not find case of impacted permanent maxillary canines and resorption of permanent maxillary incisors.^{13,16-20}

Incisors with root resorption and pulp involvement may not show clinical symptoms.^{12,16} Thus, clinical diagnosis is difficult and, when it occurs, resorption may be at an advanced stage, no longer treatable.^{13,21,22} In the described case, patient had no symptoms associated with root resorption, even in tooth with pulp necrosis. It is often difficult to diagnose root resorption on conventional radiographs, such as intraoral and panoramic films because of superimposition of the malpositioned permanent maxillary canine.¹¹ The CBCT has been shown to be superior to conventional radiographic methods once it detects the position of the impacted canine and the extent and exact location of root resorption of adjacent teeth.^{7,15,18} The superiority of the CBCT for this type of diagnosis was clearly demonstrated in a study that compared the treatment plans of 80 patients with impaction of maxillary canines before and after analysis by 3D images. Authors noted that there was a change in planning for almost 44% of patients and more than half (53%) of treatment plans of patients with root resorption were modified; however, in the conventional radiography, 11 patients were not diagnosed with severe root resorption.¹⁵

In our case, despite the radiographic image showing resorption of the permanent maxillary incisors induced by impaction and eruption path alteration of the permanent maxillary canines, its true extent could only be assessed after the analysis of CBCT.

When root resorption of permanent maxillary incisors due to impacted permanent maxillary canines occurs, several factors determine should be taken to account when planning the treatment for each particular case. That includes the location and severity of root resorption, canine position, lack of space and dental development stage. Surgical exposure for the impacted canine's traction is the most commonly used treatment¹³ since they play an important esthetic and functional roles in the development of normal occlusion.¹⁰ The main purpose of clinicians should be to eliminate the proximity between permanent maxillary incisors and unerupted permanent maxillary canines as early as possible.²³ Canine extraction is rarely a therapeutic option and it is indicated in the following situations: ankylosis, severe laceration root, external or internal root resorption, pathological changes (e.g. cystic formation), severe impaction, or if the patient desires no orthodontic treatment.⁵ In this study, opted for the extraction of permanent maxillary right canine due to its almost horizontal inclination and proximity to the already extensively resorbed roots of the lateral and central incisors of the same side, stopping the aggression to them. Maxillary left lateral incisor was also removed due to severe root resorption and the absence of pulpal vitality and maxillary left canine was tractioned to its position. The use of lateral incisor's crown as a pontic during the orthodontic traction of the canine preserved the patient's esthetic throughout the treatment—a major concern for the patient and her parents.

Falahat et al (2008)¹³ followed 27 patients with root resorption of incisors (32 teeth) caused by impacted canines for a period of 2 to 10 years (mean: 3.5 years) and found that the resorptions had undergone repair in 13 teeth, remained unchanged in 12 teeth and increased in seven teeth. No resorbed incisor had been lost during the follow-up period. Whether the resorbed but healed incisors function in long term has yet to be determined, small to moderate defects have a good prognosis. Incisors with extensive resorption involving pulp are probably more vulnerable and less amenable to repair, but they may act as temporary space maintainers during growth of child period until final treatment may be undertaken.

The main goals in this treatment were to minimize treatment time, to overcome root resorption of incisors and provide psychological comfort to the adolescent patient who showed great concern about her dental esthetics. The close monitoring of the case is necessary due to permanent maxillary incisors root resorption and the permanence of primary canines in the dental arch.

Early diagnosis and treatment of impacted permanent maxillary canines is of fundamental importance for

the prevention of related complications and reduction of treatment time, complexity and costs. Clinical and radiography examinations of the permanent maxillary canines by the age of 9 to 10 years are recommended.¹¹ Early removal of the primary canines is shown to reverse the path of ectopic eruption of permanent maxillary canines.^{19,23,24} The concomitant removal of the primary canines and first molars has also been proposed and proved to be a more effective procedure in improving permanent maxillary canines intraosseous position.²³

The risk of root resorption in children with impacted permanent maxillary canines should not be neglected. Early detection of impacted teeth is of fundamental importance to reduce subsequent complications.

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