Severe incisor resorption by impacted maxillary canines: case report and literature review

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Summary. This paper reviews the literature relating to incisor resorption caused by impacted maxillary canines, and describes the presentation and management of a patient with unusually severe early resorption. This case highlights the need for careful monitoring of maxillary canine eruption for all paediatric patients.

Introduction

The reported incidence of impacted maxillary canines varies from 0.98% [1] to 2.2% [2]. The percentage of impacted canines which are palatally placed also varies between studies. Ericson & Kurol [3] reported that 20% of impacted canines are buccally placed, with the remainder either palatal or distal to the lateral incisor.

Incisor root resorption is a well-recognized complication of impacted canines. Most studies focus upon resorption caused by palatal canines, although buccal canines can also cause incisor resorption [4,5]. Many studies have found incisor resorption to be more common in females, with the female:male ratio quoted variously as 2:1 [5], 4:1 [6] and 10:1 [7]. No sex differences have been found in the severity or location of root resorption [6]. The lateral incisor root is most commonly resorbed, although central incisors can also be affected [4–6].

The aetiology of resorption is unclear. There appears to be no association with enlarged canine follicles [3,8]. Brin *et al.* [9] found that resorbed incisors were usually of normal size, unlike those patients with impacted canines and no resorption, who have significantly more incisors with small roots. They postulated that, if a canine deviates in its eruption path, then it would be more likely to hit and resorb a normal tooth than a small tooth. The reported incidence of resorption depends upon the imaging technique used. Superimposition of the incisor roots and the crown of an impacted canine on intraoral radiographs obscures root morphology in 45% of cases [3]. Polytomography overcomes this problem, helping to diagnose root resorption more accurately. When using polytomography and intraoral radiographs, incisor root resorption is found to be associated with 12.5% of impacted canines [3]. This is double the frequency detected with intraoral radiographs alone.

Computed tomography (CT) provides very detailed images of impacted canine location and root resorption [10–12]. Ericson & Kurol [13] have shown that CT accurately reveals the extent of lateral incisor root resorption. They found a high correlation between the CT diagnosis and direct visual observation of the roots of extracted teeth. When using CT, 38% of lateral incisors and 9% of central incisors adjacent to ectopic canines were seen to be resorbed [14]. Fortyeight per cent of patients with impacted canines were found to have root resorption, although it was conceded that the population might have been biased because of the referral pattern to their specialist unit.

The apical and middle thirds of the incisor roots are most commonly resorbed. Ericson & Kurol [6] found that 82% of laterals were resorbed in the middle third and 13% apically, with the remainder resorbed cervically. Rimes *et al.* [5] found that 60% were resorbed in the apical and middle thirds, and 31% apically only. The remainder were resorbed in the cervical third with or without the middle third.

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A high proportion of teeth have been graded as severely resorbed by authors. Ericson & Kurol [6] found that almost 50% of resorbed lateral incisors and one out of the six resorbed central incisors had resorption reaching the pulp. Severe resorption was even found in the 10-10.9-year-old age group. Brin et al. [9] found that 60% of lateral incisors were resorbed by at least one-third of the original root length. They proposed that, because mild resorption was rare and only seen in younger patients, then root resorption must be a rapidly progressive condition. Rimes et al. [5] judged 30 of the 35 resorbed incisors in their study to have resorption into the pulp. Using CT, Ericson & Kurol [15], found that 60% of resorbed lateral incisors and 43% of resorbed central incisors had pulpal involvement. Interestingly, there was no correlation between age and degree of resorption.

Case report

An 11-year-old girl was referred by her dentist to the Orthodontic Department of Southend Hospital, Westcliff on Sea, Essex, UK. She had complained of pain in the upper anterior arch region a few months prior to the referral.

She presented with a Class I incisor relationship on a Skeletal I base, with average vertical dimensions and no asymmetry. Intraoral examination showed the patient to be in the early mixed dentition, with the first permanent molars and all the incisors erupted. There was very mild crowding in the lower labial segment and an aligned upper arch. In occlusion, the molars were Class I. The overjet was 2 mm and the overbite slightly increased. The upper canines were palpable palatally. The incisors were all vital.

Radiography revealed all the permanent teeth, excluding the third molars, to be present. There was severe root resorption of the apical and middle thirds of all four upper incisors. Vertical parallax confirmed the upper canines to be palatally placed (Figs 1 & 2).

The patient and her parents were informed of the guarded prognosis for the upper incisors. The canines were surgically exposed and temporary packs were put in place. Following healing, the canines were clearly visible in the palate, close to the incisor roots (Fig. 3). The incisors had Grade II mobility after surgery. Open exposure was favoured over closed exposure and orthodontically assisted eruption, so



Fig. 1. Orthopantomogram showing severe resorption of all maxillary incisors by the palatally impacted canines.



Fig. 2. Upper anterior occlusal radiograph showing severe incisor root resorption. Taking this image in conjunction with the previous orthopantomogram (Fig. 1), the canines can be located palatally by vertical parallax.



Fig. 3. Position of the canines after surgical exposure.

that the correct force vector could easily be determined to move the canines clear of the incisors.

Elastic threads, stretching from the canines to a transpalatal arch between the first permanent molars, retracted them away from the incisors. In an attempt to avoid orthodontic force on the damaged incisors, sectional wires were used to move the canines buccally into the line of the arch. However, the patient was unable to cope with these and repeatedly broke them. Therefore, the upper incisors were bracketed, and a continuous archwire and elastic threads were used to move the canines towards the arch. Forces were kept as light as possible on the incisors. By the time the canines were aligned, the remainder of the permanent dentition had erupted, and full upper and lower fixed appliance therapy proceeded on a non-extraction basis.

The long-term prognosis of the incisors remains guarded. They have become more mobile during treatment, and given their very shortened roots at the initial diagnosis, it is anticipated that they will be lost. However, the canines are in a reasonable position, reducing the potential number of prosthetic units from six to four, and giving natural tooth canine guidance in lateral excursions. If the incisors do need to be prosthetically replaced at a later date, osseointegrated implants would be the preferred choice, once the patient has completed growth. By maintaining the incisors for as long as possible, even if they are mobile and require splinting, the alveolar bone will also be maintained. This will facilitate implant placement, and it is hoped, avoid the need for a bone graft.

Discussion

Whilst resorption is a relatively common phenomenon, the number of teeth resorbed in this patient is rare. Reporting on a group of 11 patients, Sasakura et al. [7] had only one with three incisors resorbed, and none with all four incisors resorbed. In their study of 41 patients with incisor resorption, Ericson & Kurol [6] had no cases with resorption of all four incisors. Only three children had bilateral resorption of the lateral incisors. Rimes et al. [5] studied 26 patients with resorption; only eight were affected bilaterally, and no patients had all four incisors resorbed. Computed tomography is acknowledged to diagnose resorption very reliably [13]. Even using CT, Ericson & Kurol [14] found that only seven out of 156 canines caused resorption of both the central and lateral incisor.

Ericson & Kurol [15,16] recommended a stepwise diagnostic sequence to assess canine eruption. Radiographic examination is required if one or both canines are not palpable buccally by the age of 10 years, and the rest of the dentition is developing at the normal rate. An orthopantomogram should be taken since it will also be valuable for overall screening. Supplementary intraoral radiographs should also be taken to accurately locate the impacted canine using the parallax technique. If there is overlapping of incisor roots and canine crowns, polytomography is ideally recommended to help diagnose root resorption.

This case illustrates the importance of monitoring canine eruption. This patient had some pain, but patients are usually asymptomatic, even in the presence of advanced resorption [5–7]. As shown, even young patients can have severe root resorption as a result of impacted canines. There is also good evidence that the interceptive removal of primary canines can help to normalize the eruption of impacted maxillary canines in a high percentage of patients when carried out at a sufficiently young age [17,18]. Therefore, vigilance is essential in the monitoring of maxillary canine eruption.

Résumé. Cet article passé en revue la littérature consacrée à la résorption des incisives liée à l'impaction de canines maxillaires, et décrit l'aspect et la prise en charge d'un patient avec une résorption sévère inhabituelle. Ce cas illustre le besoin pour une surveillance soigneuse de l'éruption des canines maxillaires chez tous les enfants.

Zusammenfassung. Diese Arbeit betrachtet die Literatur zu Schneidezahnresorption durch impaktierte Oberkiefer-Schneidezähne, ein Fall eines Patienten mit ungewöhnlich schwerem, frühem Verlauf wird beschrieben. Dieser Fallbericht verdeutlicht die Bedeutung der Überwachung der Eruption von Oberkiefer-Eckzähnen für alle pädiatrischen Patienten.

Resumen. Este artículo revisa la literatura relacionada con la reabsorción de un incisivo causada por caninos superiores impactados y describe la presentación y tratamiento de un paciente con una reabsorción inusualmente severa y precoz. Este caso subraya la necesidad de monitorizar cuidadosamente la erupción del canino superior en todos los pacientes pediátricos.

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