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An unusual impacted maxillary canine encircling the root of an adjacent premolar: A rare case report

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Abstract
Background: Impacted maxillary canines are frequently encountered in dental practice and may present with variations in position and root morphology. Accurate radiographic assessment is essential for proper surgical planning; however, unusual root configurations may not always be clearly identified preoperatively.
Case Report: A 33-year-old male patient presented with pain in the upper right tooth region. Clinical examination revealed a missing maxillary right canine. Cone-beam computed tomography demonstrated an impacted maxillary right canine with apparent root dilaceration in close proximity to the adjacent first premolar. Surgical removal was planned. Intraoperatively, the impacted canine exhibited an unexpected root curvature encircling the root of the adjacent premolar. Careful surgical extraction was performed while preserving the root integrity of the premolar. The surgical site was sutured, and postoperative healing was uneventful.
Conclusion: This case highlights the importance of intraoperative vigilance, as complex root morphology of impacted teeth may not be fully appreciated on radiographic imaging alone.

Keywords: Impacted maxillary canine, Root morphology, Dilaceration, CBCT, Surgical extraction

Introduction

Maxillary canine impaction represents a common developmental disturbance and ranks second only to third molars in frequency of tooth impaction. The reported prevalence ranges between 1% and 3% of the general population, with a higher incidence in the maxilla and a greater predilection among females [1, 2]. Owing to its strategic position in the dental arch and its contribution to facial esthetics, occlusal function, and canine guidance, impaction of the maxillary canine presents a significant clinical challenge, particularly for the oral and maxillofacial surgeon when surgical intervention is indicated.

The etiology of impacted maxillary canines is multifactorial and includes local, systemic, and genetic factors. Local factors such as lack of space in the dental arch, prolonged retention or premature loss of the deciduous canine, abnormal positioning of the tooth germ, presence of supernumerary teeth, odontomas, cystic lesions, and root dilaceration have been widely reported. Genetic influences have also been implicated, particularly in palatally displaced canines, which are often associated with other dental anomalies [1]. From a surgical standpoint, the prolonged and complex eruption pathway of the maxillary canine increases the likelihood of ectopic positioning and close proximity to adjacent teeth, thereby complicating surgical access and removal.

Accurate radiographic assessment is critical for surgical planning in cases of impacted canines. Conventional two-dimensional imaging modalities such as intraoral periapical radiographs and panoramic radiographs provide preliminary information regarding the presence and general location of impacted teeth. However, these imaging techniques are limited by distortion, magnification errors, and superimposition of anatomical structures, which may obscure critical details required for surgical decision-making. Cone-beam computed tomography (CBCT) has therefore become an essential diagnostic tool in oral and maxillofacial surgery, enabling three-dimensional visualization of impacted teeth, surrounding bone, and their relationship with adjacent anatomical structures [3].

CBCT imaging plays a particularly important role in evaluating root morphology, angulation, and proximity to adjacent teeth. Root dilaceration is a developmental anomaly characterized by an abnormal curvature of the crown or root relative to the normal long axis of the tooth and may significantly influence surgical difficulty and risk of iatrogenic damage. CBCT-based studies have demonstrated that canine teeth exhibit a relatively higher prevalence of root dilaceration compared to other anterior teeth, although the overall occurrence remains uncommon [4]. From an OMFS perspective, failure to recognize the severity, direction, and extent of root curvature preoperatively may result in complications such as fracture of the impacted tooth, damage to adjacent roots, or excessive bone removal.

One of the most significant complications associated with impacted maxillary canines is damage to adjacent teeth, particularly root resorption. Systematic reviews and CBCT-based studies have reported a clear association between impacted canines and root resorption of adjacent teeth, including lateral incisors and premolars. Root resorption is frequently asymptomatic and may remain undetected until advanced stages if not evaluated using three-dimensional imaging [2]. For the oral and maxillofacial surgeon, preservation of adjacent teeth during surgical extraction of impacted canines is a primary objective, especially in adult patients where orthodontic options may be limited.

Despite the advanced diagnostic capabilities of CBCT, unexpected intraoperative findings may still be encountered. Rare cases have been reported in which impacted canines demonstrate atypical root morphology or direct involvement with adjacent premolar roots, necessitating modification of the surgical approach to avoid iatrogenic damage [5]. Such cases underscore the importance of intraoperative vigilance,

surgical skill, and conservative bone removal techniques in OMFS practice.

The present case report describes an unusual intraoperative finding of an impacted maxillary canine with a complex root morphology encircling the root of the adjacent first premolar. This rare presentation highlights the limitations of radiographic interpretation alone and emphasizes the critical role of careful surgical planning and intraoperative judgment in achieving successful outcomes while preserving adjacent tooth structures.

Case Report

A 33-year-old male patient reported to the Department of Oral and Maxillofacial Surgery with a chief complaint of pain in the upper right anterior tooth region for the past five years. The patient's medical, dental, and personal histories were non-contributory. No history of trauma or systemic illness was reported.

Clinical Examination

Extraoral examination revealed no facial asymmetry, swelling, or tenderness. Intraoral examination showed a clinically missing maxillary right permanent canine [13] (Fig 1). The overlying palatal mucosa appeared normal with no signs of inflammation, sinus tract, or swelling (Fig 2). Adjacent teeth were clinically sound, and no mobility was detected.

Fig 1

Fig 2

Radiographic Evaluation

An intraoral periapical radiograph revealed an impacted maxillary right canine in close proximity to the root of the maxillary right first premolar [14] (Fig 3). To further assess the exact position, orientation, and root morphology of the impacted tooth, cone-beam computed tomography (CBCT) was advised.

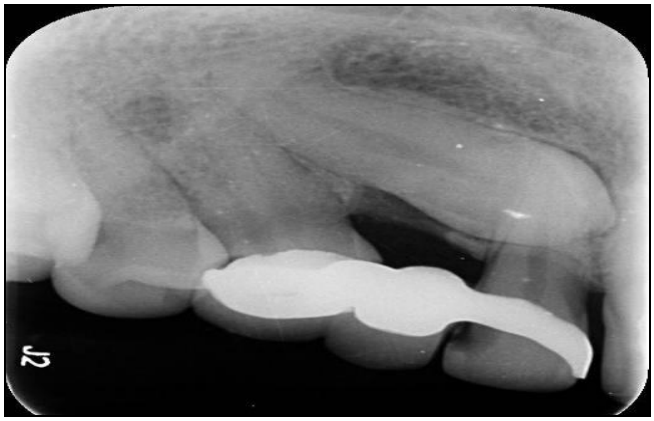

Fig 3

CBCT imaging demonstrated a palatally impacted maxillary right canine with an apparent root dilaceration and intimate proximity to the adjacent premolar root (Fig 4). Three-dimensional CBCT reconstruction further aided in understanding the spatial orientation of the impacted canine in relation to the adjacent teeth (Fig 5).

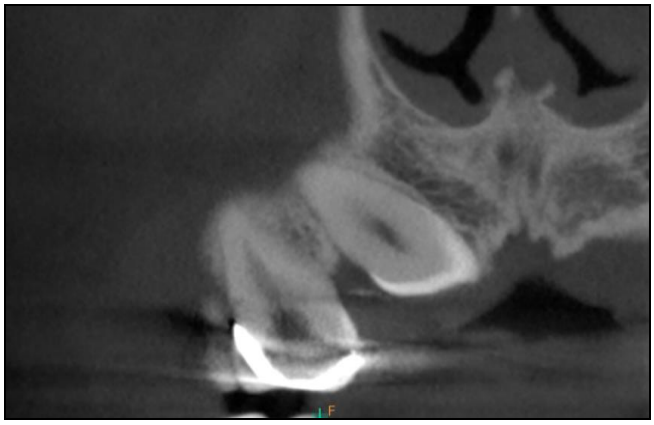

Fig 4

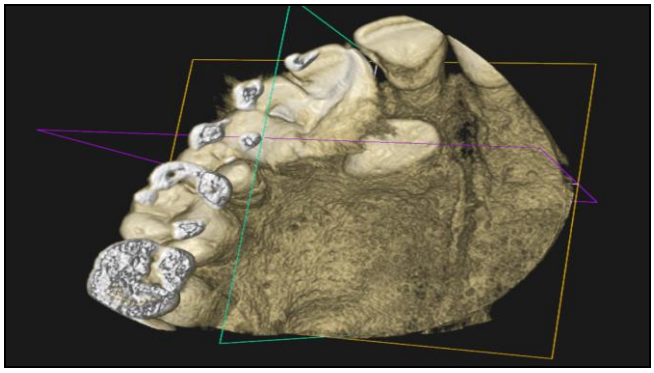

Fig 5

Diagnosis

Based on clinical and radiographic findings, a diagnosis of impacted maxillary right canine [13] was established.

Surgical Procedure

After obtaining informed consent, the procedure was performed under local anesthesia. A palatal crevicular incision was placed in relation to the maxillary right canine region, and a full-thickness mucoperiosteal flap was reflected to expose the underlying bone (Fig 6). Conservative bone removal was carried out to access the impacted tooth.

Fig 6

During surgical exposure, an unusual intraoperative finding was noted. The root of the impacted canine exhibited a severe curvature, encircling and closely hugging the root of the adjacent maxillary first premolar [14], as appreciated intraoperatively and confirmed by examination of the extracted tooth (Fig 7). Careful odontosection and controlled bone removal were performed to disengage the impacted tooth while preserving the integrity of the adjacent premolar.

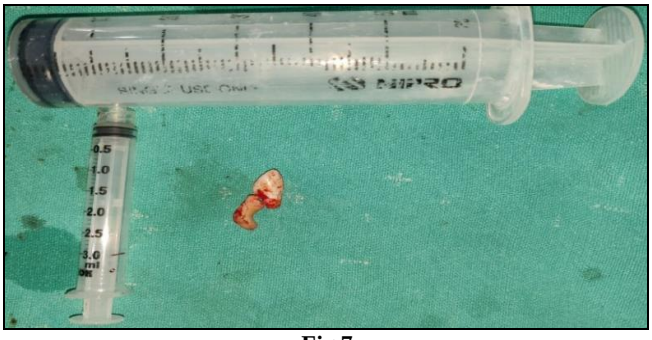

Fig 7

The impacted canine was successfully removed in toto. Examination of the extracted tooth revealed a markedly curved root morphology consistent with the intraoperative findings.

Postoperative Outcome

The surgical site was thoroughly irrigated with sterile saline, hemostasis was achieved, and the flap was repositioned and sutured using resorbable sutures (Fig 8 & Fig 9). Postoperative instructions and medications were prescribed. Follow-up visits revealed satisfactory soft tissue healing with no evidence of infection, dehiscence, or damage to adjacent teeth.

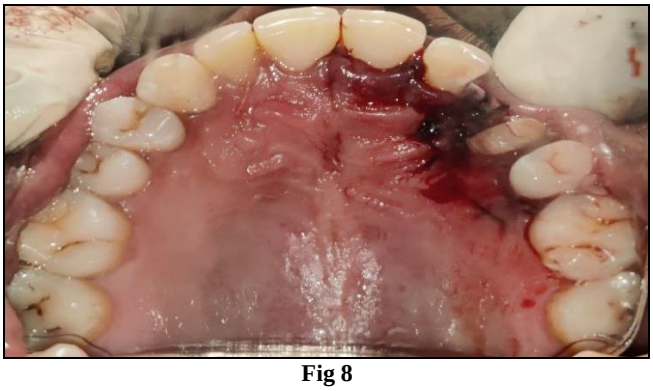

Fig 8

Fig 9

Fig Legends

Fig 1: Preoperative intraoral photograph showing the clinically missing maxillary right permanent canine [13].

Fig 2: Preoperative palatal intraoral view demonstrating normal overlying mucosa in the region of the impacted maxillary right canine.

Fig 3: Intraoral periapical radiograph showing the impacted maxillary right canine [13] in close proximity to the root of the maxillary right first premolar [14].

Fig 4: Cone-beam computed tomography (CBCT) sectional image demonstrating a palatally impacted maxillary right canine with apparent root curvature and intimate relation to the adjacent premolar root.

Fig 5: Three-dimensional CBCT reconstruction illustrating the spatial orientation of the impacted maxillary right canine relative to adjacent teeth.

Fig 6: Intraoperative photograph showing palatal flap reflection and surgical exposure of the impacted maxillary right canine.

Fig 7: Photograph of the extracted impacted maxillary right canine showing an unusual curved root morphology consistent with intraoperative findings.

Fig 8: Postoperative view showing the sutured surgical site following extraction of the impacted maxillary canine, demonstrating satisfactory flap adaptation and wound closure.

Fig 9: Postoperative view from front showing the sutured surgical site following extraction of the impacted maxillary canine, demonstrating satisfactory flap adaptation and wound closure.

Discussion

Impaction of the maxillary canine is a frequently encountered clinical condition and represents a significant challenge for both orthodontists and oral and maxillofacial surgeons. The prevalence of impacted maxillary canines has been reported to range from 1% to 3% in the general population, with a higher predilection for the maxilla and a greater incidence in females [1, 2]. Due to the strategic position of the maxillary canine in the dental arch and its long and complex eruption pathway, disturbances in eruption are relatively common and may lead to impaction, particularly when early diagnosis and interceptive measures are not undertaken.

The etiology of impacted maxillary canines is multifactorial. Local factors such as tooth size-arch length discrepancy,

abnormal position of the tooth germ, prolonged retention of the deciduous canine, presence of supernumerary teeth, and root dilaceration have been widely implicated. Genetic influences have also been reported, particularly in palatally displaced canines, which are often associated with other dental anomalies [1]. From an oral and maxillofacial surgery perspective, these etiological factors are clinically relevant as they influence the position of the impacted tooth, its relationship with adjacent structures, and the complexity of surgical management.

Radiographic evaluation is a cornerstone in the diagnosis and treatment planning of impacted canines. Conventional two-dimensional radiographs such as intraoral periapical and panoramic radiographs provide initial information but are limited by distortion and superimposition. Cone-beam computed tomography (CBCT) has therefore become an indispensable diagnostic tool, particularly in cases where surgical intervention is planned. Three-dimensional CBCT imaging allows comprehensive evaluation of the position, angulation, root morphology, and spatial relationship of impacted teeth to adjacent structures, thereby facilitating accurate surgical planning [3].

Root dilaceration is a developmental anomaly characterized by an abnormal curvature of the crown or root relative to the long axis of the tooth. CBCT-based studies have demonstrated that canine teeth exhibit a relatively higher prevalence of root dilaceration compared with other anterior teeth, although the overall prevalence remains low [4]. The presence of root dilaceration has important clinical implications, as it may complicate orthodontic traction and surgical removal and increase the risk of iatrogenic damage to adjacent structures. In the present case, CBCT imaging suggested the presence of root dilaceration; however, the true extent and complexity of the root curvature were only appreciated intraoperatively. This highlights an important limitation of radiographic interpretation, even with advanced imaging modalities.

Another significant concern associated with impacted maxillary canines is the potential for damage to adjacent teeth, particularly root resorption. A systematic review using CBCT imaging demonstrated a clear association between impacted canines and root resorption of adjacent teeth, most commonly affecting lateral incisors, although premolars may also be involved [2]. Root resorption is often asymptomatic and may remain undetected until advanced stages, underscoring the importance of three-dimensional imaging in preoperative assessment. Preservation of adjacent teeth is therefore a primary objective during surgical management of impacted canines, especially in adult patients where orthodontic alternatives may be limited.

Despite the diagnostic advantages of cone-beam computed tomography, unexpected intraoperative findings may still occur, particularly in cases involving atypical root morphology or complex spatial relationships between impacted canines and adjacent teeth. Previous case reports have documented impacted maxillary canines associated with severe root dilaceration of adjacent premolars, requiring modification of the treatment approach to prevent iatrogenic damage [5]. In the present case, the impacted canine demonstrated an unusual root morphology encircling the root of the adjacent first premolar, a finding that was not fully evident on preoperative CBCT imaging. This observation highlights the limitation of radiographic imaging in accurately depicting complex root configurations and reinforces the need for intraoperative vigilance during surgical management [3, 4].

From an oral and maxillofacial surgery perspective, meticulous surgical technique and sound intraoperative judgment are essential in managing impacted canines with atypical root morphology. Conservative bone removal, careful flap design, and controlled odontosection have been emphasized in the literature as key principles to minimize trauma and preserve the periodontal integrity of adjacent teeth during surgical intervention [1, 2]. In the present case, adherence to these principles allowed successful removal of the impacted canine while preserving the root and supporting structures of the adjacent premolar, resulting in uneventful postoperative healing. Such conservative surgical management aligns with previously reported recommendations and underscores the importance of individualized treatment planning in adult patients with impacted canines [1].

Conclusion

Impacted maxillary canines may present with complex and atypical root morphology that is not always fully appreciated on preoperative radiographic imaging, even with the use of cone-beam computed tomography. The present case highlights a rare intraoperative finding of an impacted maxillary canine with a curved root encircling the root of an adjacent first premolar. Such presentations pose significant surgical challenges and emphasize the importance of meticulous surgical planning, intraoperative vigilance, and conservative surgical techniques. Preservation of adjacent teeth should remain a primary objective during the surgical management of impacted canines, particularly in adult patients. Awareness of potential radiographic-surgical discrepancies can aid oral and maxillofacial surgeons in anticipating intraoperative difficulties and achieving favorable clinical outcomes.

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