

Tooth Root Displacement in Soft Tissues Along the Anterior Sinus Wall (Canine Fossa): A Clinical Case Report

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Abstract

Introduction. The displacement of tooth roots into the surrounding soft tissues of the alveolus is an uncommon complication that, if not properly managed, may lead to significant and persistent adverse outcomes. These include moderate to severe pain, discomfort, infectious processes, and functional impairments, ultimately affecting the patient's overall well-being.

Aim. This report aims to present a clinical case of a perioperative complication that arose long after the extraction of an upper molar, in which one of the tooth roots was inadvertently displaced superiorly and vestibularly along the anterior wall of the maxillary sinus. Over time, this led to the development of a recurrent chronic inflammatory process, which progressively diminished the patient's quality of life and resulted in persistent, unexplained symptoms.

Results and Conclusion. This case highlights the critical importance of comprehensive clinical and radiographic evaluations in instances where a complication is suspected during tooth extraction. Particular attention should be given to cases involving single roots when their number does not align with the expected anatomical morphology, as unrecognized root displacement may lead to long-term complications.

Keywords: displacement root, maxillary sinus, soft tissue infection, fossa canina, tooth

Introduction

The primary indication for tooth extraction is the removal of teeth that are severely compromised, predispose the patient to recurrent inflammatory processes, or are non-restorable using contemporary prosthodontic techniques. Extractions are performed with minimal trauma and without pain to the patient. However, various complications may arise during the procedure. Perioperative complications refer specifically to those occurring during the extraction itself. These include the displacement of entire teeth or tooth roots into the soft tissues surrounding the alveolus or into more distant anatomical spaces, such as the buccal space, maxillary sinus, infratemporal fossa, pterygomandibular space, submandibular region, and sublingual area. Additional potential complications during extraction include infection, alveolar osteitis, paresthesia [1], fracture of the

tooth being extracted or adjacent teeth, extraction of the wrong tooth, fracture of the maxillary tuberosity, hemorrhage, formation of an oroantral fistula, mandibular fracture, temporomandibular joint (TMJ) dislocation, and accidental inhalation or ingestion of the extracted tooth [2, 3].

The specific location of a displaced tooth or root determines the nature of the complications, which may include pain, swelling, trismus, difficulty swallowing and speaking, and inflammatory processes. These complications may result not only from the displacement itself but also from the pathological condition of the extracted tooth, as extractions are often necessitated by preexisting infections or previous unsuccessful treatments.

The most common cause of tooth or root displacement is the application of excessive or improperly directed force during extraction, particularly when using a straight elevator. Incorrect use of surgical instruments can lead to fracture of the buccal alveolar wall, which consists of trabecular bone covered by a thin cortical plate. Consequently, the tooth or root may be displaced beneath the soft tissues on the anterior or lateral surface of the maxillary sinus. A similar mechanism may explain the displacement of teeth into anatomical spaces such as the sublingual, pterygomandibular, and lateral parapharyngeal regions, where the lingual cortical plate of the mandibular alveolus is thinner than its vestibular counterpart. Additionally, pathological mobility of the tooth and traction exerted by muscle fibers may contribute to the displacement of teeth and roots during extraction [4].

Case report

The present case report concerns a 35-year-old male patient who sought treatment at the Medical Dental Centre of the Medical University – Varna, Bulgaria, with complaints of pain localized in the area of the anterior sinus wall of the left maxilla. The patient reported periodic episodes of pain, a sensation of heaviness, and discomfort on the affected side, which occurred spontaneously and were alleviated only by the use of anti-inflammatory and analgesic medications. The pain was described as moderate to severe, diffuse, and unprovoked, frequently accompanied by a feeling of heaviness, and was not associated with any dental pain in the corresponding region.

According to the patient's medical history, tooth #26 had been extracted 7–8 years prior without any reported postoperative complications. At the time of the extraction, the patient was not informed of any intraoperative irregularities. Clinical examination revealed no extraoral pathological changes or facial asymmetry, and the patient demonstrated full mouth opening. Intraorally, the mucosa in the vestibular region exhibited no abnormalities, including signs of edema, in the vicinity of teeth #25, #26, and #27. The patient presented an X-ray, that showed no evidence of any unusual pathology. A cone-beam computed tomography (CBCT) scan was performed, revealing the presence of a root-like structure located high on the anterior sinus wall, within the canine fossa. The patient did not report of any diseases. Based on the patient's medical history—specifically, the recurrent, non-specific pain and sensation of heaviness—along with the clinical and radiographic findings, a decision was made to surgically remove the fragment under local and general orotracheal anesthesia, following the patient's informed consent.

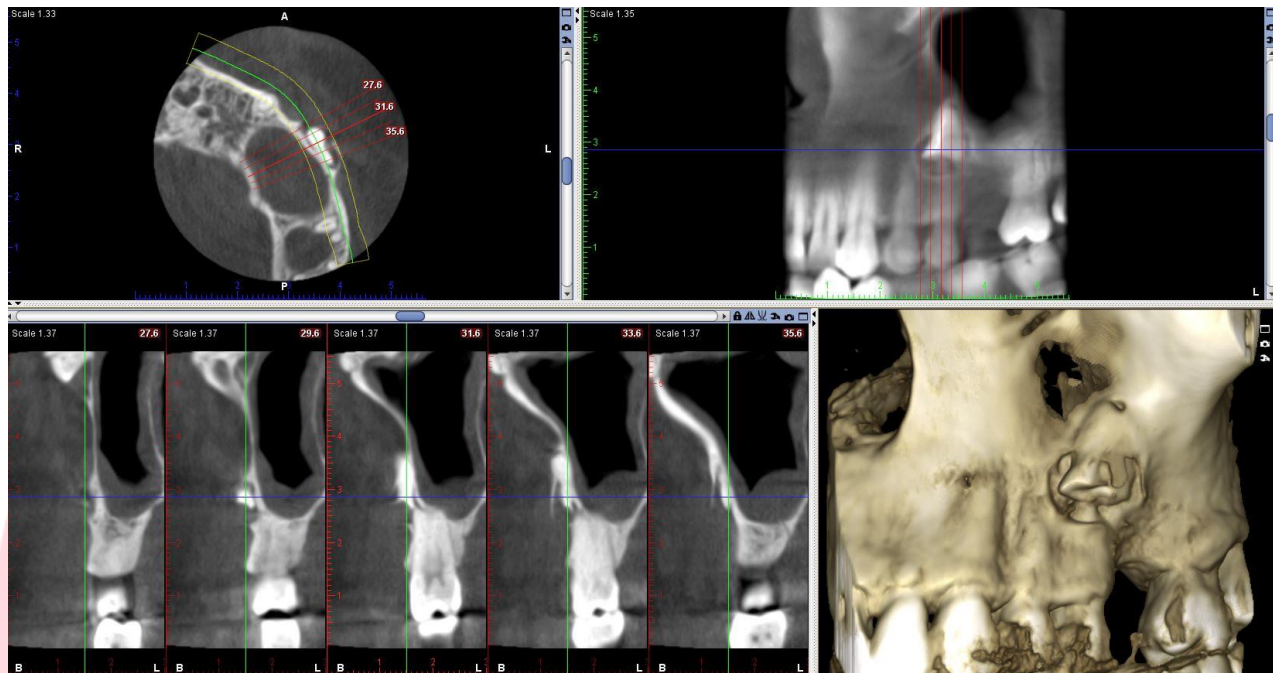


Fig. 1 Preoperative cone-beam tomography view of the displaced dental root

The surgical procedure involved the reflection of a trapezoidal mucoperiosteal flap with a vertical incision, extending intrasulcularly around teeth #24, #25, and #27, with oblique vertical divergent incisions over teeth #24 and #27. Upon elevation of the flap, a tooth root fragment, likely originating from tooth #26, was identified as being fused to the anterior surface of the maxilla and encapsulated by granulation tissue. The fragment was successfully removed without communication with the maxillary sinus. The surgical site was then adapted and sutured using 3/0 silk sutures, and the patient was prescribed a 7-day course of antibiotic- Augmentin 500mg (three times a day for seven days), and anti-inflammatory therapy- Ibuprofen 200mg. Postoperative follow-up examinations were conducted at one month and six months post-surgery. The patient reported an absence of pain or discomfort, with no recurrence of the symptoms previously experienced.



Fig. 2- Exposing the tooth root surrounded granulation tissues



Fig. 3 Exposing the dislocated tooth root by the inflamed under soft tissues



Fig. 4- Intraoral view of the anterior maxillary wall after tooth root removal

Discussion

Displacement of teeth or tooth roots into the surrounding soft tissues is a rare iatrogenic complication that may lead to a range of adverse outcomes for the patient, including inflammatory conditions such as maxillary sinusitis, sensations of heaviness and discomfort, varying degrees of pain, edema, functional impairments, paresthesia of the lingual nerve (n. lingualis) [5], and restricted mandibular movement [6]. Among the most frequently reported periextraction complications in oral surgery is the displacement of tooth roots into the maxillary sinus [7], followed by the infratemporal displacement of third molars and the luxation of tooth roots beneath the soft tissues surrounding the alveolus.

Notably, there is a documented case of a fragmented tooth root migrating into the nasolacrimal duct, resulting in partial obstruction and subsequent conditions such as epiphora, acute dacryocystitis, or chronic dacryocystitis [8]. However, in the course of preparing the present report, no similar case of tooth root luxation along the anterior sinus wall has been identified in the published literature over the past ten years.

The primary causes of tooth luxation into soft tissues can be categorized into two groups: iatrogenic factors, resulting from dental intervention, and patient-related factors, including anatomical-topographic characteristics, age-related changes, or other individual predispositions. The first category is associated with insufficient clinical skills, excessive force application, or improper technique during tooth extraction. Additionally, the absence of preoperative imaging or misinterpretation of radiographic findings may contribute to treatment errors. A lack of knowledge and clinical experience can further impede the clinician's ability to anticipate and prevent potential complications. Inadequate understanding of dental anatomy and surrounding structures, inappropriate flap design and planning, as well as restricted visibility and access, may lead to the displacement of teeth or tooth fragments beyond the alveolus into atypical anatomical locations.

Patient-related factors contributing to tooth luxation may involve anatomical and functional characteristics, including a pneumatic sinus type, racial variations, bone tissue loss, elongated, thin, and curved tooth apices and roots, an exaggerated gag reflex, and significant fear or anxiety, which may provoke impulsive and sudden movements by the patient. Additionally, patients who exhibit poor responsiveness to anesthesia or undergo excessively prolonged procedures are also at increased risk for complications such as the luxation of tooth roots into the tissues surrounding the alveolus. Furthermore, displacement of teeth and roots may result from coughing due to inadequate aspiration during the use of dental handpieces or from sneezing [7].

The appropriate timing for managing such complications remains a subject of debate among dental professionals. Some advocate for immediate intervention following the occurrence of tooth or root displacement, emphasizing the need for prompt removal to minimize potential risks [9]. For instance, Di Nardo et al. suggest that if a displaced tooth or root cannot be safely extracted, the patient should be promptly referred to an oral and maxillofacial surgeon to prevent severe, potentially life-threatening complications, such as facial vein thrombosis, carotid artery erosion, mediastinitis, and peripheral nerve damage, which may arise depending on the anatomical location of the displaced structure [10]. Immediate removal of displaced tooth roots and fragments is particularly recommended when they have migrated into the sublingual or submandibular spaces, as these locations present a higher risk of further displacement into deeper anatomical areas [11].

In the clinical case described, there was potential for abscess or phlegmon formation within the fossa canina or regio infraorbitalis due to the specific anatomical location of the luxated tooth root. Inflammatory processes in such regions may also involve the facial venous system, potentially following an ascending path: v. facialis – v. angularis – v.v. ophthalmicae inferior et superior. Thrombosis of these veins could result in a severe, possibly fatal complication—cavernous sinus thrombophlebitis.

Conversely, some surgeons advocate for a more conservative approach, recommending delayed removal of displaced fragments only in cases where symptoms develop [2, 12]. Postponing extraction for several weeks may allow fibrous tissue to form, which could encapsulate and localize the displaced fragment, thereby preventing further migration into deeper anatomical regions [10, 13, 14]. This perspective is supported by clinical observations of patients with tooth fragments in the sublingual space who remained asymptomatic for over two years [15]. In all instances where removal is delayed, antibiotic therapy is prescribed to mitigate the risk of infection or inflammatory complications at the site of displacement [16, 17]. However, in the majority of cases, delayed intervention is eventually required due to the onset of pain, discomfort, swelling, or infection, as observed in the present clinical case. The surgical approach for fragment retrieval is highly individualized and can present significant challenges. The displacement of teeth and tooth fragments into the sublingual or pterygomandibular space, for example, carries a substantial risk of vascular and neural injury, as well as the potential for floor-of-mouth edema, which could compromise respiration, speech, and mastication. In some cases, a combined extraoral and intraoral approach is necessary, particularly when dealing with displaced fragments in the submandibular space [18, 19]. Such procedures are often performed under general anesthesia. Consequently, whenever feasible, less invasive and lower-risk techniques should be prioritized, such as the “blunt dissection” method, wherein the tissues are carefully dissected to access the displaced tooth or its fragments. The refinement of surgical techniques and the determination of the safest approach are greatly facilitated by three-dimensional imaging modalities, particularly cone-beam computed tomography (CBCT), which has become an almost routine perioperative diagnostic tool [20, 21].

In the present case, the root of tooth #26 was identified within the fossa canina, beneath the soft tissues and positioned against the facies anterior maxillae. Due to its relatively small size compared to an intact tooth, it was not palpable. It is likely that the luxated root had become infected, leading to the development of a chronic inflammatory process characterized by episodic exacerbations, pain, and discomfort. Therefore, in instances where there is suspicion of root luxation or migration following an extraction, meticulous examination of the soft tissues surrounding the alveolus is essential. If the displaced root is palpable through the mucosa, a mucosal incision should be performed to facilitate its removal. In cases where the fragment cannot be localized clinically, radiographic evaluation is warranted. Additionally, reports exist describing the use of computed tomography (CT)-assisted interventional radiology to precisely determine the real-time position of the displaced tooth or fragment, thereby enabling a direct and minimally invasive retrieval approach. Another preventive measure against retained fragments in the perimaxillary soft tissues is the careful inspection of the extracted tooth to assess its integrity. If fragmentation has occurred, the fragments should be reassembled to ensure that no portions remain unaccounted for.

Conclusion

Any surgical procedure, even one as seemingly straightforward as tooth extraction, may result in complications if not meticulously planned and executed. This report underscores the critical importance of accurate diagnosis, appropriate clinical execution, and thorough interpretation of both clinical and paraclinical assessments to prevent potential complications. In the present case, timely additional diagnostic evaluations may have facilitated the earlier localization and removal of the luxated root within the soft tissues of the fossa canina, thereby preventing the development of chronic inflammation and the associated pain and discomfort experienced by the patient

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