ROOT TIP MIGRATION INTO THE INFUNDIBULUM OF THE MAXILLARY SINUS AFTER COMPLICATED FIRST MOLAR EXTRACTION

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ABSTRACT

Aim: To show how an unsuccessful retrieval attempt of a broken root tip of an upper molar could lead to dislocation into the maxillary sinus and end up at the ostium of the maxillary sinus, necessitating a FESS procedure for retrieval.

Summary: An upper right first molar was removed with forceps extraction. The extraction was complicated with a root fracture. Manipulating the residual root tip resulted in root tip dislocation into the maxillary sinus. It was decided to leave the root tip at the bottom of the sinus, but in the following months the root tip migrated and got stuck into the ostium of the maxillary sinus. There, it was retrieved using functional endoscopic sinus surgery (FESS).

Key Learning Points: 1. Manipulating a residual root tip after forceps extraction of an upper molar significantly increases the risk of root tip dislocation into the maxillary sinus. 2. Broken root tips of upper molar roots protruding into the maxillary sinus need not to be removed when it concerns healthy vital pulps. 3. Retrieval attempts of broken root tips can lead to dislocation of the root tip into the maxillary sinus if the roots were protruding into the maxillary sinus or if an insufficient bony barrier is separating the maxillary sinus from the alveolar socket. 4. Cone beam ct is the radiological exam of preference to locate a dislocated root tip in the upper jaw. 5. A root tip stuck at the ostium of the maxillary sinus is best removed with a FESS-procedure.

Keywords: Tooth extraction; Root tip fracture; Functional endoscopic sinus surgery.

1. Introduction

Extraction of maxillary molars with multiple and separated roots can be complicated with root fracture. Accidentally, these roots can be displaced into the maxillary sinus and cause oroantral fistula, sinusitis, cellulitis and subdural empyema [1]. Displacement of roots into the maxillary sinus can be identified by imaging, which also provides information on the root size and the location within the sinus. Some studies suggest leaving the root fragment in the sinus. However, keeping in mind the potential development of complications, surgical removal of displaced root tips may always be considered. Three major methods are described to remove root tips displaced into the maxillary sinus: a crestal approach, a bone window approach and more recently an endoscopic approach [2].

In this report, a displaced root fragment of a first upper molar on the right side was located by cone-beam CT imaging (CBCT). Using and endoscopic approach, the fragment was removed six months after the extraction, after mucosal healing and in the absence of sinusitis.

2. Case history

A 14-year old female was referred by the orthodontic department for extraction of the four first molars (16, 26, 36 and 46) for orthodontic reasons (Fig. 1). Instead of removing four premolars, it was decided to remove the first molars because of the presence of deep restorations. The deep restorations on teeth 46 and 36 were visible on the panoramic radiograph (Fig. 2). No CBCT was taken at the time. It was decided...
to perform the extractions under local anaesthesia, in four sessions, one at a time. The technique used was forceps extraction. The local anaesthetic used was articaine 4% with 1:200,000 adrenaline (Septodont, France). The removal of elements 26, 46 and 36 were uneventful. Upon forceps extraction of element 16, a fracture occurred of the distovestibular root tip. An attempt was made to remove this root tip with an apical pick instrument and further with a root tip removal forceps. However, the root tip disappeared cranially and could not be retrieved. Transalveolar endoscopy did not show any root tip. An apical X-ray could not reveal the root tip (Fig. 3). An additional CBCT was immediately taken, which showed the root at the base of the maxillary sinus (Fig. 4). As this position suggested a perforation of the sinus membrane, the alveolus was filled with 4 L-PRF membranes (Leucocyte-rich and platelet-rich fibrin). The decision was made not to remove the lost root tip, but rather to observe the situation and to re-evaluate after 4 months. Healing was uneventful. Four months later, a new CBCT revealed a changed position of the root tip (Fig. 5). Now the root tip had migrated towards the ostium of the right maxillary sinus. Despite this position, no opacification of the maxillary sinus occurred, no thickening of the mucosa could be visualized on CBCT and the patients was asymptomatic. Two months later a new CBCT was performed, showing the root tip at the same position. To prevent future complications, it was then decided to remove the root tip. Since a Caldwell-Luc approach would be too traumatic, a FESS-procedure (functional endoscopic sinus surgery) was proposed. This was performed by the ear, nose and throat (ENT) department under general anesthesia. The root tip was retrieved. Further healing was uneventful. The orthodontic therapy was immediately restarted after healing of the four extraction wounds with an uneventful course.

3. Discussion
Dental extractions are a common oral procedure in dental and maxillofacial departments. The removal of upper molars is frequently accompanied by a root fracture or an oro-antral communication. In a series of 2355 dental extractions, the incidence of an oro-antral communication was 0.56% after M3 and 0.94% after non-M3 extractions [3]. Rarely, the fractured root can migrate into the maxillary sinus. Such displacement depends on several factors such as the surgical technique (elevating roots with excessive force) and the bony interface between the alveolar socket and the sinus membrane. In a series of 1596 maxillary third molar extractions, only one case of displacement of a tooth or root fragment into the
maxillary sinus was reported [4]. Another large series did not report any root tip migration [3]. If a displaced root fragment is diagnosed before healing of the alveolar socket, a crestal approach to remove the fragment can be performed. The socket is then enlarged to visualize the fragment or to rinse the maxillary sinus with saline. Disadvantages of this technique are damage to the alveolar bone which may influence the healing procedure and the residual bone height (2). Some studies suggest leaving the root fragment in the sinus if it is below 3mm in size and if there is no evidence of sinusitis or other local disease [1]. When a displaced root fragment is diagnosed after mucosal healing, a bone window approach or an endoscopic approach for the retrieval of the fragment have been described. The traditional method used is a Caldwell-Luc approach (bone window) in which a fenestration of the anterior wall of the maxillary sinus provides a clear vision and improving the surgical range. However, complications such as severe reactive swelling and nerve damage is described after this procedure [2]. Alternatively, endoscopically-assisted procedures are reliable and minimally invasive methods for removing root fragments displaced into the maxillary sinus. Access for the endoscopic procedure can be obtained through the anterior maxillary sinus wall or the middle or inferior nasal meatus (FESS) [2]. There is a direct vision of the surgical area and a minimal risk on bleeding and nerve injury. On the other hand, the success of endoscopic procedures depends on operator experience and requires general anesthesia.

In the presented case, immediate treatment of the root tip displacement in the maxillary sinus was attempted, but without success. Although the fragment was large, immediately performing a Caldwell-Luc procedure seemed too invasive at that time. After six months follow-up, but with repeated CBCT imaging in this young patient, it was deemed necessary to remove the fragment afterwards to avoid future complications. Instead of performing the Caldwell-Luc procedure, the less invasive FESS approach was successfully performed.

4. Conclusion

Manipulating a residual root tip after forceps extraction of an upper molar when little bony interface exists between the alveolar socket and the sinus membrane, significantly increases the risk of root tip dislocation into the maxillary sinus. Migration towards the ostium of the maxillary sinus is possible but rare. A FESS access to retrieve the root tip from the maxillary sinus ostium is an efficient approach, keeping sinus function intact.

Author contributions

All authors contributed to reporting the case, performing literature review and drafting the manuscript.

References


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Dr. Isabel Miclotte was born in 1986 and became recognised as an OMFS surgeon in 2019. She will become senior resident of the department of Oral and Maxillo Facial Surgery at Leuven University Hospitals as of November 2019. Dr. Miclotte has published on complications of extractions and has elaborated guidelines for dento-alveolar surgery in patients under anticoagulant therapy. Her clinical focus is in orthodontic and orthognathic surgery.
Questions

1. Which is the best radiographic exam to find a dislocated root tip of an upper molar tooth?
   - a. Apical radiograph;
   - b. Panoramic radiograph;
   - c. MRI;
   - d. Cone-beam CT scan.

2. Which root is most often involved in an oro-antral communication?
   - a. Third molar;
   - b. Second molar;
   - c. First molar;
   - d. First premolar.

3. Which is the best technique to retrieve a dislocated root tip of an upper molar tooth at the ostium of the maxillary sinus?
   - a. Denker technique;
   - b. Caldwell Luc technique;
   - c. FESS technique;
   - d. Rehrmann flap.

4. Which precaution could be taken to avoid dislocation of a root tip into the maxillary sinus?
   - a. Leaving a broken root tip undisturbed;
   - b. Frequent peroperative repeats of the Valsalva manoeuvre;
   - c. Performing the extraction in a supine position;
   - d. Performing the extraction under general anaesthesia.