British Journal of Medicine & Medical Research
19(6): 1-6, 2017; Article no.BJMMR.31109
ISSN: 2231-0614, NLM ID: 101570965

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The Use of Computed Tomography to Locate and Remove a Third Molar Accidentally Displaced into the Maxillary Sinus

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Authors' contributions

This work was carried out in collaboration between all authors. Authors JRV and MG designed the study and wrote the manuscript. Authors AG and GMT helped with the final editing of the manuscript. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/BJMMR/2017/31109
Editor(s):
(1) Manuele Mancini, Department of Restorative Dentistry and Endodontics, University of Rome "Tor Vergata," Rome, Italy.
Reviewers:
(1) Parveen Akhter Lone, Indira Gandhi Government Dental College Jammu, India.
(2) Koji Watanabe, Meikai University, Japan.
Complete Peer review History: http://www.sciencedomain.org/review-history/17532

Case Study

Received 22nd December 2016
Accepted 11th January 2017
Published 16th January 2017

ABSTRACT

Aims: The aim of this article is to illustrate a case of oroantral communication caused by an accidental introduction of the third upper molar into the maxillary sinus and the importance of computed tomography to its location and removal.
Presentation the Case: This study reports a case in which a tooth accidentally displaced into the maxillary sinus was properly located by imaging exams and surgically removed while preserving most of the adjacent oral structures.
Discussion: Although dental accidental intrusion into the maxillary sinus has been reported in the literature with greater frequency in relation to other facial areas, such as pterigo - palatal fossa, the fat of the cheek or the lower submandibular space, we should not rule out any hypothesis until the tooth is properly located.
Conclusions: 1) In cases of accidental dental displacements, computed tomography should be adopted as a standard supplementary examination in order to locate the tooth and plan appropriate surgical procedures. 2) Caldwell-Luc surgery was efficient, ensuring the access and removal of

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third molars which have been accidentally moved; it is also relatively simple, low cost and allows the preservation of tissue. 3) Removal of the tooth or fragment should be performed as soon as possible to avoid further complications, but initial alveolar drilling should be avoided.

Keywords: Caldwell Luc surgery; oroantral communications; computed tomography; displaced third molars.

1. INTRODUCTION

Third molars are teeth that usually require surgical removal because they are largely included and/or impacted. This procedure is performed by maxillofacial surgeons who in some cases may find trans and post-operative complications and even cause accidents [1]. These complications may come due to various factors such as the location of these teeth in the arch; preview difficulty; proximity to noble anatomical structures or the presence of infectious processes. Among the accidents and complications, there is the displacement of the third molar or a fragment into the maxillary sinus, with consequent oroantral communication. In view of this, for correct diagnosis and surgical planning, additional exams are used like X-rays and CT scans. With these exams, the acting surgeon may use an access to remove the foreign body inside the sinus cavity, called the Caldwell-Luc access, or quickly refer the patient to the most qualified professional for such a procedure, preventing the development of major complications such as fistulae, sinusitis, cellulitis and even subdural empyema [2]. The aim of this study is to report a case in which a tooth accidentally displaced into the maxillary sinus was properly located by imaging exams and surgically removed while preserving most of the adjacent oral structures.

1.1 Literature Review

The third molar is a tooth that is often included or affected due to factors such as overlying dense bone, overlying thick fibrous tissue, incorrect tooth angulation and insufficient space relative to adjacent teeth [3].

According to the American Association of Oral and Maxillofacial Surgeons [4] the main indications for the removal of third molars are to facilitate the treatment and limit the advancement of periodontal disease; treat teeth which are in an ectopic position; facilitate prosthetic rehabilitation; treat teeth that interfere with orthognathic surgery or bone reconstruction and reduction of fractures; treat cavities that cannot be restored; treat the external resorption of adjacent teeth; manage teeth-associated pathologies; prophylactically remove teeth in cases of radiotherapy or chemotherapy; treat patients who refuse non-surgical treatment; manage untreatable pulpal injury; and treat teeth associated with infectious processes.

In addition, extractions can be performed for orthodontic reasons, which are the most common. Likewise, although less frequent, these are prophylactically removed in order to inhibit the development of pathological lesions, like dentigerous cysts, which affect third molars, premolar canines and second molars, and are usually asymptomatic unless associated with infection [5].

Although most patients undergoing the removal of third molars show some expected symptoms like pain, discomfort, swelling and chewing difficulty after surgery, they are usually short-lived, allowing patients to return to normal activities within 2 to 3 days. Thus, within 4 to 6 weeks, the patients are completely recovered and full movement of the jaws [6].

However, there may be severe complications associated with the extraction of third molars, such as abnormal bleeding, lockjaw, bone fractures, oroantral communications and paraesthesia of the inferior alveolar and lingual nerves. These complications are usually related to three main factors: the condition of the patient, such as age, dental ankylosis, position and angle of the tooth and proximity to vital structures such as the maxillary sinus and inferior alveolar nerve [1]; surgeon's technique (including their experience) and the inadequate use of instruments [7].

Oliveira et al. [1] studied 83 patients and found that the trismus was the main complication found in the postoperative period for a total of 15.66% (13 patients), followed by paraesthesia of the inferior alveolar nerve and lockjaw in 8.43% (7 patients).

Oberman et al. [7] and Dimitrakopoulos and Papadaki [8] concluded that oroantral communication with tooth displacement into the maxillary sinus is a rare complication. However, this possibility is there when the third molar is deeply impacted, especially with undeveloped roots and when in close contact with the maxillary sinus.

This article describes a case in which a third molar included was accidentally displaced into the maxillary sinus during attempted extraction, its location and removal.

2. CLINICAL CASE

The patient was M.J.P, a 23 year-old Caucasian, who attended the maxillofacial surgery clinic, referred by another dentist for a left third molar to be located and removed that had, according to reports of the professional, disappeared during the extraction procedure. From examination of the preoperative panoramic radiographs, it was clear that the tooth in question was in close contact with the floor of the maxillary sinus, thus increasing the chance that this would accidentally move into the sinus cavity during the procedure. During surgery, there was a new panoramic radiograph (Fig. 1), but because this test provides images in two dimensions, it was inconclusive, since it was still possible that the tooth could be located in the soft tissues of the cheek.

Thus, a CT scan of the patient (examination able to provide images in 3 dimensions) was requested, allowing the exact location of tooth 28 and preparation of the surgical plan, respecting the noble anatomical structures that were located nearby.

After evaluation of the images obtained by means of axial, sagital and coronal sections, it was concluded that tooth 28 had been accidentally introduced into the left maxillary sinus, resulting in the formation of an extensive oroantral communication (Fig. 2).

Given this, we opted for the immediate removal of the tooth 28 through a surgical procedure side opening of the maxillary sinus, known as Caldwell-Luc access, which is suitable for the removal of foreign bodies that are accidentally introduced into this cavity, because the previously created oroantral communication is not enlarged excessively for viewing and removal of the tooth, as the subsequent closure of the same is easier.

2.1 Surgical Procedure

Under local anaesthesia using Mepiadre 100® (Nova DFL, Rio de Janeiro/RJ – Brazil) the patient underwent a vestibular lunate-type incision in the transition region between the gingival mucosa and the keratinised gingiva, with an amplitude of about 3 cm, respecting the basic principles of diaeresis. Then, the mucoperiosteal flap was moved in order to expose the lateral wall of the maxillary sinus, allowing sufficient access to perform the ostectomy with the aid of a spherical diamond drill, irrigated thoroughly with saline, thereby creating a sufficiently wide opening for viewing, seizure and removal of teeth (Fig. 3).

Fig. 1. Panoramic radiograph showing element 28 displaced from its alveolar position, pointed by arrow

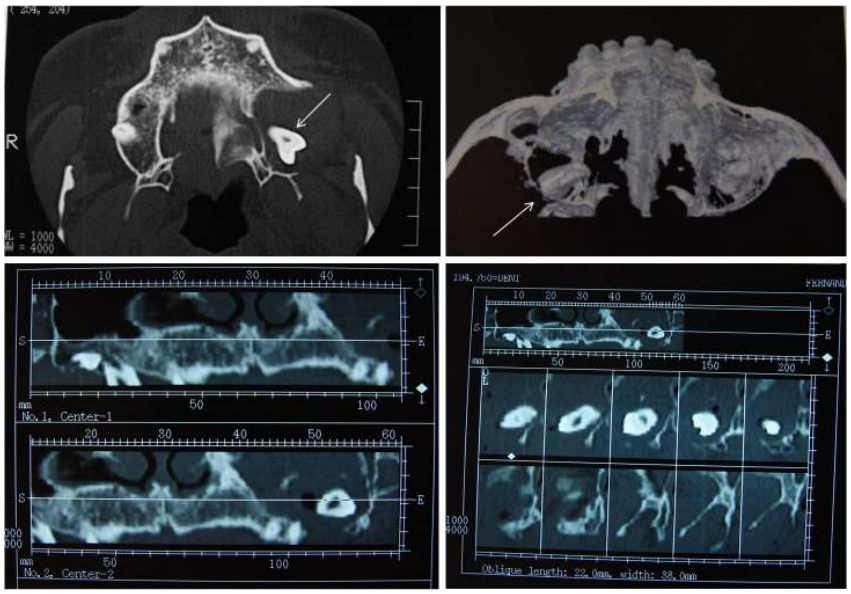

Fig. 2. Computed tomography showing tooth 28, pointed by arrows, inside the left maxillary sinus

The tooth cavity was inspected and displayed; it was noted that it was loose inside the maxillary sinus. Removal was then performed by holding the tooth by a root portion (Fig. 4) with the aid of a curved haemostat (dental crown of a molar presents a rounded and bulky anatomy, coupled with the enamel presence, if makes a slippery surface and difficult to grasp with the instrumental). Then, the sinus cavity was cleaned with gauze soaked in Rifocina Spray® (Aventis Pharma, Suzano/SP - Brazil) and thoroughly irrigated with saline, in order to eliminate possible bone splinters and other debris that may have been accidentally introduced by the tooth into the maxillary sinus.

Fig. 3. Ostectomy with the aid of a spherical diamond drill, irrigated thoroughly with saline solution

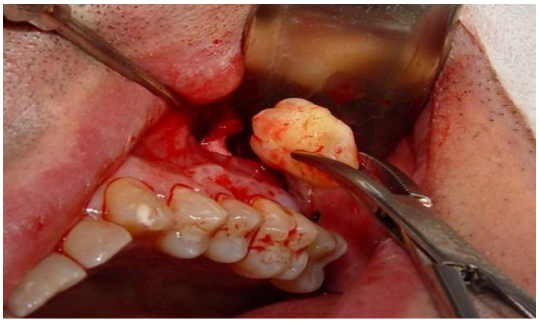

Fig. 4. Tooth removal with the aid of a haemostat curve

Following this, the soft tissue was closed through continuous scalloped-type sutures (Fig. 5) with silk thread 4-0 (Ethicom® - Johnson and Johnson, São Paulo/SP Brazil) and antibiotics were prescribed for seven days as a combination of amoxicillin and potassium clavulanate, along with anti-inflammatories and analgesics to reduce pain and postoperative edema.

After the removal surgery and clinical investigation, the initial oroantral communication (caused by accidental disruption of cortical bone surrounding the root apex during the movement of extraction) was found to have closed spontaneously without the need for additional treatment, in accordance with most of the cases reported in the literature [9].

Fig. 5. Continuous suture of the gingival mucosa

3. DISCUSSION

Accidents and complications can occur during any kind of surgery, given the infinite and personal anatomical variations of each individual. Although dental accidental intrusion into the maxillary sinus has been reported in the literature with greater frequency in relation to other facial areas, such as pterigo - palatal fossa [10], the fat of the cheek [11] or the lower submandibular space [12], we should not rule out any hypothesis until the tooth is properly located [13].

Thus, effective complementary examinations are crucial in the prevention, identification and treatment of these occurrences [14]; for example, the computed tomography, which is capable of providing a view of the anatomy of the region in three dimensions. Although computed tomography subjects the patient to the highest dose of radiation when compared to panoramic radiography, it shows be able to provide the exact location of the displaced tooth, requiring no additional image exams, and especially, promoting prompt treatment to the patient [7,15]. This way, the benefits justify the means.

This is unlike panoramic radiographs, which have reduced cost and are more accessible, but display images in only two dimensions, causing an overlap of various bones and soft tissue structures [16].

When the location of the tooth in the maxillary sinus was identified, leaving the surgeon to choose the best technique to obtain access and perform its removal. It is important to note that we must avoid the attempted removal of the tooth or fragment through a communication created by the accident as this may further increase the opening and hinder any subsequent closure [17]. In most cases, the option is Caldwell-Luc surgery [18,19] because it is a relatively simple procedure that can be performed under local anaesthesia. However, other professionals opt for removal by endoscopy [20], which involves relatively conservative bone drilling, and is indicated for cases of small tooth fragments; however, the disadvantage of this technique is that is must be performed under general sedation.

4. CONCLUSIONS

In cases of accidental dental displacements, computed tomography should be adopted as a standard examination in order to locate the tooth and plan appropriate surgical procedures.

Caldwell-Luc surgery was efficient, ensuring the access and removal of third molars which have been accidentally moved; it is also relatively simple, low cost and allows the preservation of tissue.

Removal of the tooth or fragment should be performed as soon as possible to avoid further complications, but initial alveolar drilling should be avoided.

CONSENT

As per international standard or university standard written patient consent has been collected and preserved by the authors.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:
The peer review history for this paper can be accessed here:
http://sciencedomain.org/review-history/17532