

Cone Beam Computed Tomography Application in Finding Ectopic Tooth: A Systemic Analysis and a Case Report

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Abstract

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BACKGROUND: Nowadays, cone beam computed tomography (CBCT) are commonly used in dentistry with an advantage about significantly lower dose comparing with CT-Scanner. Utilizing CBCT images which are indicated in dentistry like orthodontics can help diagnose diseases beyond dentistry field. One rare phenomenon can be seen in maxillary sinus, which is often overlooked by dentists, is ectopic teeth.

CASE REPORT: This article describes one orthodontic case found accidentally an ectopic tooth in maxillary sinus by inspecting CBCT images.

CONCLUSION: Dentists and oral radiologists should carefully inspect non-dental structures, like maxillary sinus, even its distance from the dentoalveolar region, especially in asymptomatic patients.

Introduction

Nowadays, cone beam computed tomography (CBCT) have been an efficient tool for imaging diagnosis with a variety of dentomaxillofacial applications. Malocclusion and dentomaxillofacial anomalies are the most common indications for CBCT in the age groups of primary and permanent dentition [1]. CBCT provides adequately images about both dental structures, for instance teeth and jaws, and other non-dental structures like maxillary sinus, nasal cavity, and palate. Nevertheless, dentists or oral radiologists occasionally neglected these non-dental structures due to its distance from the dentoalveolar region, especially in asymptomatic patients. Thus, abnormalities and anatomic changes in this region is frequently overlooked. One rare abnormality can be seen in maxillary sinus is ectopic teeth [2], [3], [4]. Ectopic eruption may derive from one of three

processes: developmental disturbance, pathological process and iatrogenic activity [5]. Most of these cases are recurrent sinusitis or asymptomatic and are found accidentally by routine examination and radiography like CBCT. This article describes one orthodontic case with recurrent sinusitis, found accidentally an ectopic tooth in maxillary sinus by inspecting CBCT images.

We run 5 keywords: "ectopic tooth in maxillary sinus", "ectopic teeth in maxillary sinus", "ectopic tooth in maxillary antrum", "ectopic molar in maxillary sinus" and "ectopic molar in maxillary antrum" via EndNote X9, using Pubmed database, we have had 40 results, from 1972 to 2018.

After reading titles, abstracts, whole articles, we eliminated those articles with non-English language (Chinese), non- molar tooth (canines, incisors), could not find abstracts/ full-text (too old, often before year of 2000) or content not relevant to ectopic tooth, we have had 26 articles described case

reports about ectopic tooth in maxillary sinus (Figure 1).

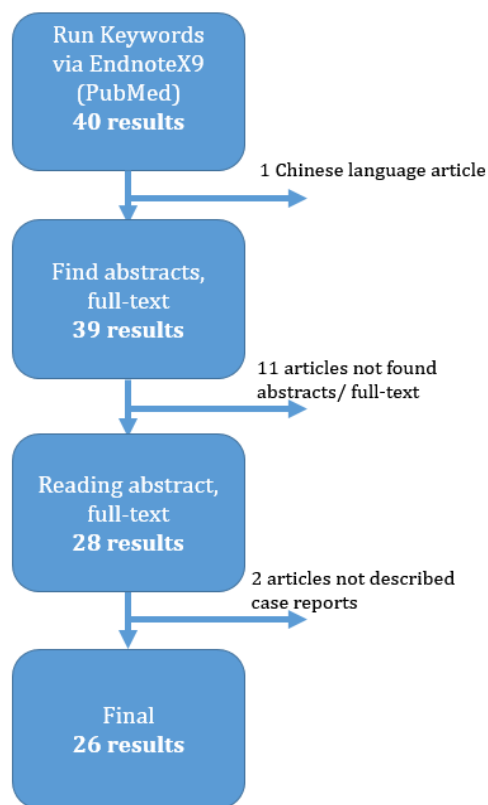


Figure 1: Data Collection

In this review, 33 patients were observed. Compared to the position in maxillary sinus, 16 cases (48.5 %) were on the right and 17 (51.5%) on the left. They are likely located in variable areas of the sinus: antrum, floor, roof, orbital floor, superomedial and anterosuperior aspects, and posterior and anterolateral walls. Among the 33 case reports, the incidence is higher in male (n = 22; 66.7%) compared with female (n = 11; 33.3%).

The age spectrum was relatively wide, varied from 15 to 73 years old. The mean age was 33. According to previous articles, most patients with a dentigerous cyst are likely younger than 20 years [32], [33]. However, patients are likely to have the condition for many years before being diagnosed and treated. The dentigerous cyst develops gradually in maxillary sinus for several years without any symptoms. When the sinus space is occupied significantly, symptoms will occur. Therefore, the ectopic teeth might be symptomatic or asymptomatic. There were 4 cases (12.1%) with asymptomatic [6], [12], [18], [19], 13 out of 33 cases observed pain condition, most of them were mild pain. Other symptoms can be found on these patients includes: Swelling (11 cases), purulent rhinorrhea (10 cases). Few more rare symptoms were: decrease in sensation [19], phonatory difficulties [9], and blurred vision [15].

Table 1: Literature review of the dentigerous cyst associated with an ectopic third molar in maxillary sinus

Authors, year	Symptoms	Age (yrs)	Gender	Side of sinus
L. G. F. Lombroni et al., (2018) [6]	Asymptomatic	37	Female	Left
I. L. Liao et al., (2018) [7]	Chronic nasal obstruction, purulent rhinorrhea	63	Male	Right
O. D. Topal et al., (2017) [8]	Swelling, pain in eye, left upper teeth and ear	32	Female	Left
O. L. M. Chagas Junior et al., (2016) [9]	Discomfort, phonatory difficulties.	60	Male	Left
U. A. Aydin et al., (2016) [10]	Pain, feeling of pressure, especially during biting	21	Male	Left
S. H. B. Kang et al., (2015) [11]	Swelling	49	Male	Right
Y. N. Furuya et al., (2015) [12]	Asymptomatic	73	Male	Right
N. M. Touiheme, et al., (2014) [13]	Pain, mucopurulent rhinorrhoea	23	Female	Left
MaMatha N.S et al., (2014) [14]	Foul smelling, salty discharge, Mild pain and slight swelling	17	Male	Left
N. K. Demirtas et al., (2014) [15]	Pain, discomfort, and fullness Blurred vision	19	Male	Right
A. P. Datli et al., (2014) [16]	Chronic sinusitis	41	Male	Right
S. A. O. Bello, et al., (2014) [17]	Swelling, mild pain, discharging sinus	17	Male	Right
S. G. Viterbo et al., (2013) [18]	Asymptomatic	29	Male	Right
S. H. Ramanojam et al., (2013) [19]	Pain and swelling	21	Female	Right
	Heaviness, decrease in sensation	48	Female	Left
	Occasional dull pain	22	Male	Left
	Asymptomatic	26	Male	Left
A. R. Rai et al. (2013) [20]	Repeated dull pain	24	Male	Left
	Continuous dull pain	32	Female	Right
Y. T. L. Lai, et al., (2013) [21]	Watering from the left eye, pain and swelling	46	Female	Left
Y. C. Guruprasad et al. (2013) [22]	-	52	Female	Left
S. M. Abdollahifakhim et al., (2013)[23]	Swelling, discharge of pus from the nostril	21	Female	Right
V. O. K. Kasat, et al. (2012) [24]	Chronic mucopurulent rhinorrhoea	17	Male	Right
G. N. Thakur et al., (2011) [25]	Discharge from upper right posterior region	22	Male	Right
L. G. Nisa, et al., (2011) [26]	Cough, recurrent purulent discharge, facial pain	25	Male	Left
S. K. Mohan et al., (2011) [27]	Dental pain, purulent oral discharge	15	Male	Right
T. K. Saleem et al., (2010) [28]	Recurrent purulent rhinorrhea	28	Female	Right
M. C. O. Buyukkurt et al., (2010) [29]	Recurrent episodes of haemoptysis	45	Male	Left
T. S. Srinivasa Prasad et al., (2007) [30]	Swelling	19	Female	Left
	Swelling	32	Male	Left
S. C. Dagistan et al., (2007) [31]	Enlarged soft swelling	30	Male	Left
S. C. Dagistan et al., (2007) [31]	Recurrent purulent rhinorrhea	45	Male	Right
	Multiple missing teeth	37	Male	Right

Case Report

A 15 year-old-male patient came to a Dental Clinic with orthodontic requirement but accompanied with mild pain and recurrent pus discharge from his left maxillary sinus since last 1 year. The symptoms reduced with antibiotics but recurred after 1-2 weeks. Patient also reported about stuffy nose and congestion. There was no history of any systemic disorders or maxillofacial trauma. Extraoral examination revealed no facial swelling (Figure 2A). Intraoral examination showed no carious teeth or abnormality in oral mucosa (Figure 2B).

Patient was indicated CBCT for orthodontic purpose and also maxillary inspecting. CBCT image revealed an ectopic maxillary third molar near the roof of left maxillary sinus with a cystic lesion surrounded. The mucosa of the sinus was thickened suggested the chronic sinusitis condition in CBCT images. (Figure

2C and 2D).

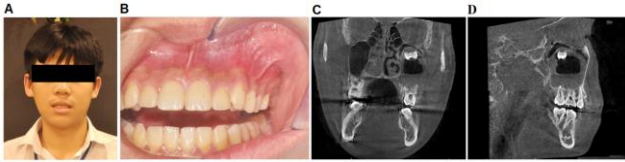


Figure 2: Imaging examination of the patient; Extraoral photo A); Oral mucosa B); Coronal image C); Sagittal image D)

The patient then was referred to an Ears, nose, and throat (ENT) clinic for tooth removal. Caldwell-Luc approaching on the left side were operated under general anesthesia. A vesicular incision was made from tooth 22 to tooth 26. A bony widow was created, 0-degree ENT endoscope revealed an ectopic molar located in the left wall, near the roof of the sinus (Figure 3A), as same as CBCT images. An elevator was used to separate the root from the mucosa then both tooth and surrounded cyst were clipped out by forceps (Figure 3B and 3C). The patient has remained asymptomatic after the operation and 6-month follow-up.

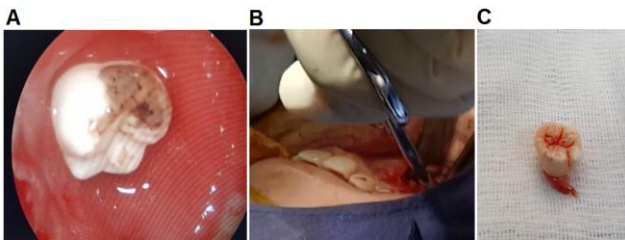


Figure 3: Treatment for the patient; Tooth via ENT endoscope A); Tooth clipped out by forceps B); Post-operation C)

Discussion

Thanks to advantages (low effective dose, short time working...) of cone beam computed tomography (CBCT), imaging diagnosis in dentistry have been easier and more accurate. Effective dose for CBCT values ranged from 13 to 82 μSv , much lower than dose from multi-slice computed tomography (MSCT) (474 to 1160 μSv) [34]. In this case, the patient was indicated CBCT for orthodontic need. Utilizing CBCT images indicated in dentistry like orthodontics requirement for beyond-dentistry field diagnosis bring to patients' great benefits. Nevertheless, dentists or oral radiologists occasionally neglected these non-dental structures, for instance maxillary sinus, due to its distance from the dentoalveolar region, especially in asymptomatic patients. Hence, ectopic teeth are often overlooked in dentistry.

Tooth development results from a complex multistep interaction between the oral epithelium and the underlying mesenchymal tissue. The development

begins from the 6th week in utero at the time of maxillary and mandibular dental lamina formation. This ectodermal structure then forms into crowns and roots. Any abnormality occurring in this progress may result in ectopic eruption of teeth [35]. Although there have been reports of teeth in the nasal septum, mandibular condyle, coronoid process, palate and maxillary antrum, ectopic eruption of teeth into other regions instead of the oral cavity is rare. [36]. This article reported an ectopic tooth located in the roof of the left maxillary sinus. According to a review of L.G. Lombron et al., there were 19 cases on the right and 18 on the left maxillary sinus. They occupied different areas of the sinus: antrum, floor, roof, orbital floor, superomedial and anterosuperior aspects, and posterior and anterolateral walls [6].

Teeth removal procedure invading severely into maxilla sinus requires experienced surgeons and dedicated equipment. Hence, interdisciplinary collaboration involved dentistry and ENT is of importance in best health care providing. The patient came to the Dental clinic for orthodontic need but sinusitis condition and an ectopic tooth accidentally found by dentists, treated by otolaryngologists. If there is no well managed for ectopic teeth, they are likely to form a cyst or a tumor. The symptoms may include: facial pain, facial swelling, headache, recurrent purulent rhinorrhea, chronic nasal obstruction, phonatory difficulties. The most popular approaching for teeth removal is Caldwell-Luc operation [6].

In conclusion, utilizing CBCT images indicated in dentistry like orthodontics requirement for beyond-dentistry field diagnosis bring to patients' great benefits. Dentists and oral radiologists should carefully inspect non-dental structures, like maxillary sinus, even its distance from the dentoalveolar region, especially in asymptomatic patients. Ectopic teeth are likely to become a cyst or tumor without well managed. The most popular approaching for teeth removal is Caldwell-Luc operation.

Informed consent

Informed consent was obtained from the patient's parents included in the study. The family read and signed to allow their child as a volunteer to participate in research.

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