

# 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).

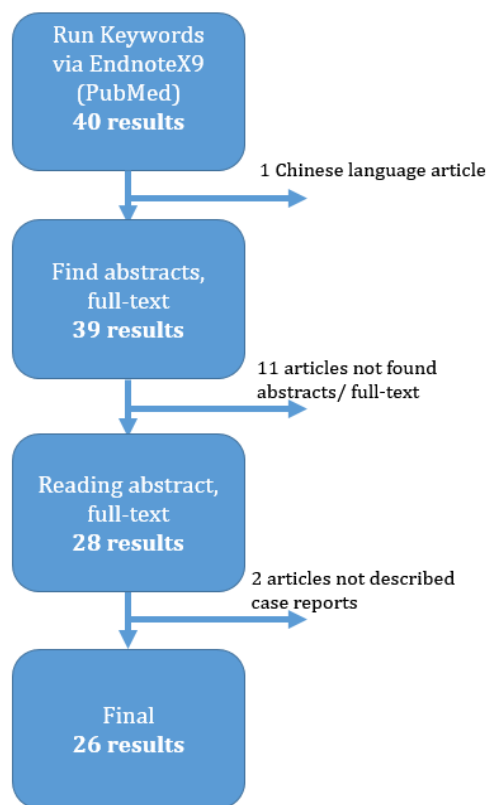


Figure 1: Data Collection

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
S. C. Dagistan et al., (2007) [31]	Swelling	32	Male	Left
	Enlarged soft swelling	30	Male	Left
	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).

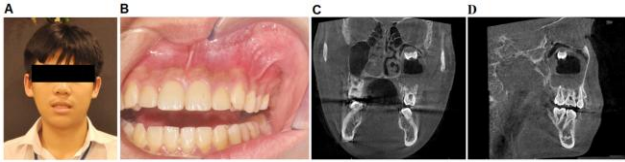


Figure 2: Imaging examination of the patient; Extraoral photo A); Oral mucosa B); Coronal image C); Sagittal image D)

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.

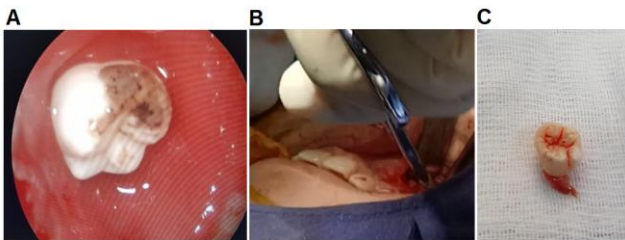


Figure 3: Treatment for the patient; Tooth via ENT endoscope A); Tooth clipped out by forceps B); Post-operation C)

## 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  $\mu$ Sv, much lower than dose from multi-slice computed tomography (MSCT) (474 to 1160  $\mu$ Sv) [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.

## References

1. İşman Ö, et al. Indications for cone beam computed tomography in children and young patients in a Turkish subpopulation. *International Journal of Paediatric Dentistry*. 2017; 27(3):183-190. <https://doi.org/10.1111/ipd.12250> PMID:27452447

2. Erkmen N, Ölmez S, Önerci M. Supernumerary tooth in the maxillary sinus: Case report. *Australian Dental Journal*. 1998; 43(5):385-386. <https://doi.org/10.1111/j.1834-7819.1998.tb00196.x> PMID:9973705
3. Gulbranson SH, et al. Squamous Cell Carcinoma Arising in a Dentigerous Cyst in a 16-Month-Old Girl. *Otolaryngology-Head and Neck Surgery*. 2002; 127(5):463-464. <https://doi.org/10.1067/mhn.2002.129039> PMID:12447244
4. Ustuner E, et al. Bilateral maxillary dentigerous cysts: A case report. *Oral Surgery, Oral Medicine, Oral Pathology, Oral Radiology, and Endodontology*. 2003; 95(5):632-635. <https://doi.org/10.1067/moe.2003.123> PMID:12738957
5. Kasat V, Karjodkar F, Laddha R. Dentigerous cyst associated with an ectopic third molar in the maxillary sinus: A case report and review of literature. *Contemporary Clinical Dentistry*. 2012; 3(3):373. <https://doi.org/10.4103/0976-237X.103642> PMID:23293505 PMID:PMC3532812
6. Lombroni L, et al. Ectopic teeth in the maxillary sinus: A case report and literature review. *Indian Journal of Dental Research*. 2018; 29(5):667. [https://doi.org/10.4103/ijdr.IJDR\\_347\\_17](https://doi.org/10.4103/ijdr.IJDR_347_17) PMID:30409951
7. Liao I, Lynch N, Hearn B, Cheng A. Endoscopically Assisted Modified Caldwell-Luc Approach to Enucleation of Dentigerous Cyst With Ectopic Tooth From the Maxillary Sinus. *J Craniofac Surg*. 2018; 29(6):e568-e570. <https://doi.org/10.1097/SCS.0000000000004346> PMID:29762318
8. Topal Ö, Dayısoylu EH. Ectopic Tooth in the Maxillary Sinus. *Türk Arch Otorhinolaryngol*. 2017; 55(3):151-152. <https://doi.org/10.5152/tao.2017.2308> PMID:29392075 PMID:PMC5782996
9. Júnior OL, Moura LB, Sonogo CL, de Farias EO, Giongo CC, Fonseca AA. Unusual Case of Sinusitis Related to Ectopic Teeth in the Maxillary Sinus Roof/Orbital Floor: A Report. *Craniofacial Trauma Reconstr*. 2016; 9(3):260-3. <https://doi.org/10.1055/s-0036-1581063> PMID:27516844 PMID:PMC4980138
10. Aydın Ü, Aşık B, Ahmedov A, Durmaz A. Osteoma and Ectopic Tooth of the Left Maxillary Sinus: A Unique Coexistence. *Balkan Med J*. 2016; 33(4):473-6. <https://doi.org/10.5152/balkanmedj.2016.15052> PMID:27606148 PMID:PMC5001830
11. Kang SH, Bae TH, Kim HK, Kim WS, Kim MK. Immediate reconstruction of the maxillary sinus after resection of preoperatively misdiagnosed unicystic ameloblastoma with an ectopic third molar. *J Craniofac Surg*. 2015; 26(1):e53-5. <https://doi.org/10.1097/SCS.0000000000001072> PMID:25569416
12. Furuya Y, Norizuki Y, Yajima Y. A Case of Simultaneous Ectopic Tooth Extraction and Removal of Migrated Dental Implant from Maxillary Sinus. *Bull Tokyo Dent Coll*. 2015. 56(4):253-8. <https://doi.org/10.2209/tdcpubliation.56.253> PMID:26657524
13. Touiheme N, Messary A. Supernumerary ectopic tooth on the maxillary sinus. *Pan Afr Med J*. 2014; 18:353. <https://doi.org/10.11604/pamj.2014.18.353.4912> PMID:25574329 PMID:PMC4282798
14. Mamatha NS, KriShNaMoorthy B, Savitha JK, Bhai P. Diagnostic CBCT in Dentigerous Cyst with Ectopic Third Molar in the Maxillary Sinus-A Case Report. *J Clin Diagn Res*. 2014. 8(6):ZD07-9.
15. Demirtas N, Kazancioglu HO, Ezirganli S. Ectopic tooth in the maxillary sinus diagnosed with an ophthalmic complication. *J Craniofac Surg*. 2014; 25(4):e351-2. <https://doi.org/10.1097/SCS.0000000000000795> PMID:25006943
16. Datli A, Pilanci O, Cortuk O, Saglam O, Kuvat SV. Ectopic tooth superiorly located in the maxillary sinus. *J Craniofac Surg*. 2014; 25(5):1927-8. <https://doi.org/10.1097/SCS.0000000000000914> PMID:25119397
17. Bello SA, Oketade IO, Osunde OD. Ectopic 3rd molar tooth in the maxillary antrum. *Case Rep Dent*. 2014; 2014:620741. <https://doi.org/10.1155/2014/620741> PMID:25132999 PMID:PMC4123483
18. Viterbo S, Griffa A, Boffano P. Endoscopic removal of an ectopic tooth in maxillary sinus. *J Craniofac Surg*. 2013; 24(1):e46-8. <https://doi.org/10.1097/SCS.0b013e31826d07d0> PMID:23348335
19. Ramanojam S, Halli R, Hebbale M, Bhardwaj S. Ectopic tooth in maxillary sinus: Case series. *Ann Maxillofac Surg*. 2013; 3(1):89-92. <https://doi.org/10.4103/2231-0746.110075> PMID:23662268 PMID:PMC3645620
20. Rai A, Rai NJ, Rai MA, Jain G. Transoral removal of ectopic maxillary third molar situated superiorly to maxillary antrum and posteroinferiorly to the floor of orbit. *Indian J Dent Res*. 2013; 24(6):756-8. <https://doi.org/10.4103/0970-9290.127628> PMID:24552941
21. Lai YT, Luk YS, Fung KH. Anomalous morphology of an ectopic tooth in the maxillary sinus on three-dimensional computed tomography images. *J Radiol Case Rep*. 2013; 7(2):11-6. <https://doi.org/10.3941/jrcr.v7i2.1227> PMID:23705035 PMID:PMC3661307
22. Guruprasad Y, Chauhan DS, Kura U. Infected dentigerous cyst of maxillary sinus arising from an ectopic third molar. *J Clin Imaging Sci*. 2013; 3(Suppl 1):7. <https://doi.org/10.4103/2156-7514.117461> PMID:24516770 PMID:PMC3906662
23. Abdollahifakhim S, Mousaviagdas M. Ectopic molar with maxillary sinus drainage obstruction and oroantral fistula. *Iran J Otorhinolaryngol*. 2013; 25(72):187-92.
24. Kasat VO, Karjodkar FR, Laddha RS. Dentigerous cyst associated with an ectopic third molar in the maxillary sinus: A case report and review of literature. *Contemp Clin Dent*. 2012; 3(3):373-6. <https://doi.org/10.4103/0976-237X.103642> PMID:23293505 PMID:PMC3532812
25. Thakur G, Nair PP, Thomas S, Ahuja R, Kothari R. Dentigerous cyst associated with ectopic maxillary third molar in maxillary antrum. *BMJ Case Rep*. 2011; 2011. <https://doi.org/10.1136/bcr.02.2011.3873> PMID:22696724 PMID:PMC3094783
26. Nisa L, Giger R. Images in clinical medicine. Ectopic tooth in the maxillary sinus. *N Engl J Med*. 2011; 365(13):1232. <https://doi.org/10.1056/NEJMicm1101021> PMID:21991896
27. Mohan S, Kankariya H, Harjani B, Sharma H. Ectopic third molar in the maxillary sinus. *Natl J Maxillofac Surg*. 2011; 2(2):222-4. <https://doi.org/10.4103/0975-5950.94488> PMID:22639520 PMID:PMC3343399
28. Saleem T, Khalid U, Hameed A, Ghaffar S. Supernumerary, ectopic tooth in the maxillary antrum presenting with recurrent haemoptysis. *Head Face Med*. 2010; 6:26. <https://doi.org/10.1186/1746-160X-6-26> PMID:21070657 PMID:PMC2992486
29. Buyukkurt MC, Omezli MM, Miloglu O. Dentigerous cyst associated with an ectopic tooth in the maxillary sinus: a report of 3 cases and review of the literature. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod*. 2010; 109(1):67-71. <https://doi.org/10.1016/j.tripleo.2009.07.043> PMID:19875313
30. Prasad TS, Sujatha G, Niazi TM, Rajesh P. Dentigerous cyst associated with an ectopic third molar in the maxillary sinus: a rare entity. *Indian J Dent Res*. 2007; 18(3):141-3. <https://doi.org/10.4103/0970-9290.33793> PMID:17687180
31. Dagistan S, Çakur B, Göregen M. A dentigerous cyst containing an ectopic canine tooth below the floor of the maxillary sinus: a case report. *J Oral Sci*. 2007; 49(3):249-52. <https://doi.org/10.2334/josnurd.49.249> PMID:17928734
32. Yamalik K, B.S., Erkmen E, Baris E., Nonsyndromic Bilateral mandibular dentigerous cysts: report of a rare case. *Turkiye Klin J Dent Sci*. 2007; 13:129-34.
33. Takagi S, Koyama S. Guided eruption of an impacted second premolar associated with a dentigerous cyst in the maxillary sinus of a 6-year-old child. *J Oral Maxillofac Surg*. 1998; 56(2):237-9. [https://doi.org/10.1016/S0278-2391\(98\)90876-X](https://doi.org/10.1016/S0278-2391(98)90876-X)
34. Loubele M, et al. Comparison between effective radiation dose of CBCT and MSCT scanners for dentomaxillofacial applications. *European Journal of Radiology*. 2009; 71(3):461-468. <https://doi.org/10.1016/j.ejrad.2008.06.002> PMID:18639404
35. Avery JK. Development of the branchial arches, face, and palate. *Oral Development and Histology*. Thieme Medical Publishers, Inc., New York, 1994:20-41.
36. Goh YH. Ectopic eruption of maxillary molar tooth--an unusual cause of recurrent sinusitis. *Singapore Med J*. 2001; 42(2):80-1.