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

Vo Truong Nhu Ngoc¹, Le Quynh Anh¹, Nguyen Minh Duc¹,², Thien Chu Dinh³, Toi Chu Dinh⁴

¹School of Odonto Stomatology, Hanoi Medical University, Hanoi, Vietnam; ²Division of Research and Treatment for Oral Maxillofacial Congenital Anomalies, Aichi Gakuin University, Nagoya, Japan; ³Institute for Research and Development, Duy Tan University, 03 Quang Trung, Danang, Vietnam; ⁴Department of Human and Animal Physiology, Faculty of Biology, Hanoi National University of Education, Hanoi, Vietnam

Abstract

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).

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: anteroinferior 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].

### 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 2B).

![Image 1](https://www.id-press.eu/mjms/index)

**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. Lorbiniö et al., (2018) [6] | Asymptomatic | 37 | Female | Left |
| I. L. Liu 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 tooth 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. Toulhame, et al., (2014) [13] | Pain, mucopurulent rhinorrhea | 23 | Female | Left |
| Mathnna M.S. et al., (2014) [14] | Foul smelling, sally discharge. | 17 | Male | Left |
| N. K. Demirtas et al., (2014) [15] | Pain, discomfort, and fulness | 19 | Male | Right |
| A. P. Dall et al., (2014) | Chronic sinusitis | 41 | Male | Right |
| S. A. O. Betti, et al., (2014) | Swelling, mild pain, discharging sinus | 17 | Male | Right |
| S. G. Viterbo et al., (2013) [18] | Asymptomatic | 29 | Male | Right |
| S. S. M. Abdollahifakhim et al., (2013) | Pain and swelling | 21 | Female | Right |
| H. R. Ramanujam et al., (2013) [19] | Heaviness, decrease in sensation | 48 | Female | Left |
| Y. T. L. Lai, et al., (2013) [20] | Occasional dull pain | 22 | Male | Left |
| Y. C. Gunprasad et al., (2013) [22] | Asymptomatic | 26 | Male | Left |
| B. M. Abdallahkhatim et al., (2013) [23] | Repeated dull pain | 24 | Male | Right |
| V. A. K. Kasal, et al., (2012) [24] | Continuous dull pain | 32 | Female | Right |
| G. N. Thakur et al., (2011) [25] | Watering from the left eye, pain and swelling | 46 | Female | Left |
| L. G. Nisa, et al., (2011) [26] | | | | |
| S. K. Mohan et al., (2011) [27] | Recurrent purulent rhinorrhea | 28 | Female | Right |
| T. R. Saleem et al., (2010) [28] | Recurrent episodes of haemoptysis | 45 | Male | Left |
| M. C. O. Buyukkurt et al., (2010) [29] | Swelling | 19 | Female | Left |
| S. E. O. L. K. Kasat, et al. (2012) [30] | Swelling | 32 | Male | Left |
| O. D. Topal et al., (2017) [31] | Enlarged soft swelling | 30 | Male | Left |
| T. S. Srinivas Prasad et al., (2007) [32] | Recurrent purulent rhinorrhea | 45 | Male | Right |
| S. C. Dagistan et al., (2007) [33] | Multiple missing teeth | 37 | Male | Right |
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.

Tooth 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.

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].

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, Ölmmez 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.1343-7819.1998.tb01196.x PMID:9793705

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(6):483-494. https://doi.org/10.1067/mhn.2002.129039 PMID:12447244

4. Ustuner E, et al. Bilateral maxillary dentigerous cysts: A case report and review of literature. Contemporary Clinical Dentistry. 2012; 3(3):373. https://doi.org/10.4103/0976-237X.103642 PMID:22393505 PMCID:PMC3532812

5. Kasat V, Karanjadkar F, Laddha R. Dentigerous cyst associated with an ectopic third molar in the maxillary sinus: A case report and review of literature. Indian Journal of Dental Research. 2018; 29(5):476-480. https://doi.org/10.4103/0970-9290.251393 PMID:28559416 PMCID:PMC4985138

6. Lodboni L, et al. Ectopic teeth in the maxillary sinus: A case report and literature review. Indian Journal of Dental Research. 2018; 29(5):476-480. https://doi.org/10.4103/0970-9290.251393 PMID:28559416 PMCID:PMC4985138

7. Aydin U, Aşık B, Ahmedov A, Durmaz A. Osteoma and Ectopic Tooth of the Left Maxillary Sinus: A Unique Coexistence. Balkan Med J. 2016; 23(3):473-6. https://doi.org/10.5152/bmj.2016.15052 PMID:27606148 PMCID:PMC5001830

8. Núñez OL, Mouri LB, Sonego CL, de Farias EO, Giongo CC. CBCT and MSCT scanners for dentomaxillofacial applications. Oral Anatomy and Histology. Thieme Medical Publishers, Inc., New York, 1994:20158

9. Júnior OL, Moura LB, Sonego 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. Cranio maxillofac Trauma Reconstr. 2016; 9(3):260-3. https://doi.org/10.5152/crmt.2014.16052 PMID:27518844 PMCID:PMC4985138

10. Buyukkurt MC, Omezli MM, Miloglu O. Dentigerous cyst associated with ectopic third molar in maxillary sinus. BMJ Case Rep. 2011; 2011. https://doi.org/10.1136/bcr.02.2011.3873 PMID:22686724 PMCID:PMC3094783

11. Prasad TS, Sujatha G, Niazi TM, Rajesh P. Dentigerous cyst 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. 2013; 109(1):67-71. https://doi.org/10.1016/j.orsal.2010.06.002 PMCID:PMC2992486

12. Buyukkurt MC, Omezli MM, Miloglu O. Dentigerous cyst associated with an ectopic third molar in the maxillary sinus. Nat J Maxillofac Surg. 2011; 2(2):222-4. https://doi.org/10.4103/0975-5950.94488 PMID:22639520 PMCID:PMC3343399

13. Saleem T, Khalid U, Hameed A, Ghaffar S. Supernumerary, ectopic tooth in the maxillary antro presenting with recurrent haemoptysis. Head Face Med. 2010; 6:26. https://doi.org/10.1186/1746-156X-6-26 PMID:20170657 PMCID:PMC2992486

14. Dagistan S, Çakır B, Görgen 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/josnd2004.234 PMID:17928734

15. Yamalik K.B.S., Erkmen E, Baris E., Nonsyndromic Bilateral mandibular dentigerous cysts: report of a rare case. Turkish J Dent Sci. 2007; 13:129-34.

16. Takagi S, Koyama S. Guided eruption of an impacted second premolar associated with a dentigerous cyst in the maxilla of a 6-year-old child. J Oral Maxillofac Surg. 1998; 56(2):237-9. https://doi.org/10.1016/S0278-2991(89)8076-X

17. Loubele M, et al. Comparison between effective radiation dose of CBCT and MSCT scanners for denormalbolastic applications. European Journal of Radiology. 2005; 7(3):461-468. https://doi.org/10.1016/j.ejrad.2005.09.006 PMID:16839404

18. Avery JK. Development of the branchial arches, face, and palate. Oral Development and Histology. Thieme Medical Publishers, Inc., New York, 1994:20-41.

19. Goh VH. Ectopic eruption of maxillary molar tooth—an unusual cause of recurrent sinusitis. Singapore Med J. 2001; 42(2):80-1.

https://www.id-press.eu/mjms/index