Original Research Article

Prevalence of tonsillolith on cone beam computed tomography images in patients attending Shahid Beheshti University of Medical Sciences

ABSTRACT

Aims: The purpose of the present study was to determine the prevalence and characteristics of tonsilloliths on the CBCT radiographs in the archive of the department of oral and maxillofacial radiology in the Shahid Beheshti Dental School.

Study design: the design of this study was descriptive cross-sectional.

Methodology: The CBCT imaging archive of Shahid Beheshti Dental School was investigated for the presence and characteristics of tonsilloliths. In the axial view, which is considered the best diagnostic view for detection of tonsillar calcifications, the medial region of the mandibular ramus adjacent to the lateral wall of oropharyngeal airway was probed. Presence of calcifications was confirmed by investigation in coronal and sagittal views.

Results: 290 CBCT images were evaluated for presence of tonsilloliths. Patients' age ranged between 6-79 years (mean=40.96±16.6). 59% of the patients were female and 41% were male. Prevalence of tonsillolith was 18.6%. Tonsilloliths were more common in 30-50 year old patients. However, presence of tonsilloliths was not significantly associated to age (*P*=0.098) and gender (*P*=0.164). Unilateral, multiple and irregular tonsilloliths were more common.

Conclusion: Prevalence of tonsillar calcifications in CBCT images was approximately 19% in our sample. These calcifications were more common in 30-50 year old patients. Therefore, tonsillar calcifications should be included in the differential diagnosis in middle-aged patients.

Keywords: tonsillolith, cone-beam computed tomography, prevalence

1. INTRODUCTION

Tonsillar calcifications or tonsilloliths are rare forms of calcifications in the palatal tonsils. These calcifications consist of calcium salts such as hydroxyapatite, calcium carbonate apatite, oxalate and magnesium salts and are result of chronic infection of the tonsils (1). Tonsilloliths are formed within desquamated epithelium, serum, food debris, and bacterial colonies (2). Tonsilloliths are reported in 2% to 16% of the population in patients ranging from 10 to 77 years without any gender predominance (3, 4) .

Tonsilloliths vary from several millimeters to several centimeters in size (5). Moreover, they can be round or irregular, single or multiple, and unilateral or bilateral (6-8). Small tonsilloliths are usually asymptomatic, but when they become bigger in size, they can cause pain, foreign body perception in the pharynx, swallowing discomfort, peritonsillar abscess, and halitosis (1).

Tonsilloliths can be found incidentally on panoramic images (5). In panoramic radiography, tonsilloliths present as radio-opaque shadows in the anterior border of oropharyngeal airway or the middle part of ascending ramus (7, 9, 10). Depending on the location of calcification, tonsilloliths can be mistaken to be foreign bodies, odontomas, sialoliths, phleboliths, calcified lymph nodes, carotid atherosclerosis, and mineralization of the stylohyoid ligament. Moreover, soft and hard tissue superimpositions and ghost images can mislead the clinician to diagnosis of pathologic lesions (11). Computed tomography (CT) can be helpful in order to overcome these diagnostic problems. Currently, CT is the most accurate technique in detection of tonsilloliths and the clinician can detect size and location of the calcification and peripheral inflammation (12). 3-dimensional imaging modalities help to improve the information provided by 2-dimentional images and can lead to a more accurate diagnosis and treatment planning (13). Cone-beam computed tomography (CBCT), as a newer imaging modality, uses a lower radiation dose, requires less exposure time, and has higher spatial resolution compared to conventional CT. However, detection of tonsilloliths is not a common indication for CBCT (4, 14-18).

The aim of the present study was to determine the prevalence and characteristics of tonsilloliths in the CBCT archive of the department of oral and maxillofacial radiology in Shahid Beheshti Dental School.

2. METHODOLOGY

In this descriptive cross-sectional study, the CBCT imaging archive of department of oral and maxillofacial radiology in the Shahid Beheshti dental school from 2011 to 2014 was investigated for the presence and characteristics of tonsilloliths. All images were obtained using NewTom VGi (NewTom, Bologna, Italy) in a setting of 110 kVp, 0.5 mA, 3.6 s and standard resolution with 200 µm voxel size.

Images were assessed and excluded if the field of view was not suitable for detection of tonsilloliths. Included images were evaluated by a trained examiner for presence or absence of tonsillolith using a multiplanar view. In the axial view, which is considered the best diagnostic view for detection of tonsillar calcifications, the medial region of the mandibular ramus adjacent to the lateral wall of oropharyngeal airway was evaluated. The presence or absence of calcifications was confirmed by investigation in coronal and sagittal views. Figure 1 demonstrates tonsillar calcifications in different views.

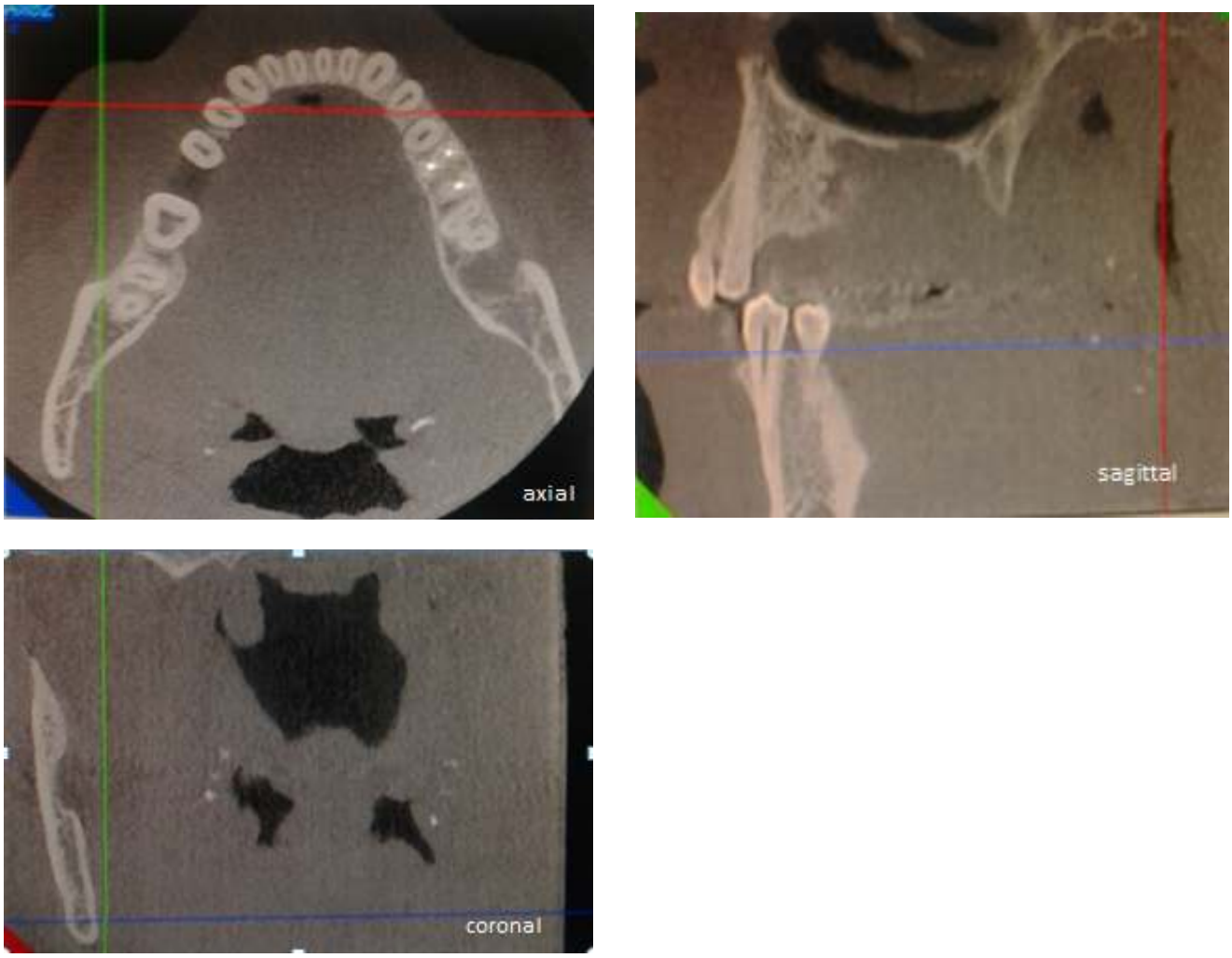

Figure 1. Tonsillar calcifications in axial, sagittal, and coronal views of CBCT images

Data was entered into Statistical Package for the Social Sciences (SPSS, version of 19, Chicago, IL, USA). Binominal test, Fisher's exact test, and Chi-square test were used for statistical analysis.

3. RESULTS AND DISCUSSION

A total number of 290 CBCT images were evaluated for the presence of tonsillar calcifications. Ages of the patients ranged from 6-79 years with a mean age of 40.96±16.6. 59% of the patients were female and 41% were male. Tonsilloliths were observed in 54 of the 290 images (18%). ~~Therefore, the prevalence of tonsilloliths was 18.6%.~~

The prevalence of tonsilloliths was not significantly different between genders (P=0.497). Tonsillar calcification was significantly more common in patients in 30-39 and 40-49 year range (P=0.037). Table 1 demonstrates age distribution of tonsillar calcifications.

Table 1. Age distribution of tonsillar calcifications

Age (years)	Frequency	Percent
Less than 30	7	12.9
30-39	15	27.8
40-49	17	31.4
50-59	7	12.9
More than 60	8	14.8
Total	54	100

Unilateral calcification was observed in 64.8% of the images, while 35.2% of the images showed bilateral calcifications. Fisher's exact test failed to prove significant relation between distribution of tonsilloliths and gender (*P*=0.164). Moreover, Chi-square test did not show significant relation between distribution of tonsilloliths and age (*P*=0.098). 35.2% of the tonsillar calcifications were on the right side and 29.6 were on the left side.

46.3% of the tonsilloliths were round in shape and 53.7% were irregular. No significant difference was observed regarding the shape of the tonsilloliths (*P*=0.583). 59.3% of the calcifications were multiple and 40.7% were solitary.

Based on the results of the present study, the incidence of tonsillar calcification was 18.6%. A study performed by Fauroux et al in France reported that tonsilloliths were present in 24.6% of CT images (19). Moreover, Centurion et al reported a prevalence of 27% in 100 CBCT images (13). Oda et al in their study in Japan reported that tonsillar calcification was present in 46.1% of the 482 CT images (20). In a former study carried out in Shahid Beheshti dental school prevalence of tonsilloliths in panoramic radiographs was 4.9% (21). Different prevalence of tonsillar calcification in these studies may be attributed to different geographical, racial, and nutritional factors and also different age range of the study population. CBCT is more accurate in detection of tonsilloliths and this can explain the prevalence of tonsilloliths in CBCT images as compared to panoramic radiographs. In their study. Oda et al compared panoramic radiography and CBCT images in the detection of tonsilloliths and reported that the panoramic radiography detects fewer tonsilloliths when compared to the CBCT (20). Moreover, in another study, the prevalence of tonsilloliths in the same patient was 18% and 27% in panoramic and CBCT images, respectively (13).

Our study demonstrated statistically significant higher prevalence of tonsillar calcifications in 30-39 and 40-49 year age groups. In the study performed by Aghdasi et al, tonsilloliths were more frequently found in patients 40-60 years of age (21). Moreover, Garay et al reported a higher prevalence of tonsilloliths in patients older than 40 years (22). Therefore, our study along with similar studies, found that tonsillar calcifications are less common in younger patients. Moreover, In our study, no statistically significant difference was observed in prevalence of tonsilloliths between different genders which is in agreement with similar studies (13, 20, 21, 23, 24).

Unilateral tonsillolith was significantly higher than bilateral calcifications. This is consistent with other studies utilizing CT images (19). However, in the study of Aghdasi et al 50% of tonsillar calcifications were bilateral (21). This may be due to less accuracy in panoramic radiography for detection of these calcifications. As shown by Misirlioglu et al, 29% of bilateral calcifications in panoramic radiographs were, in fact, unilateral calcifications on CBCT images (25).

In our study, tonsilloliths were more common on the right side. Different studies report different results in this regard (21, 23). Also in the present study multiple calcifications were more common which is in agreement with the study of Fauroux et al (19).

4. CONCLUSION

The prevalence of tonsillar calcifications on CBCT images was approximately 19% in our study. These calcifications were more common in 30-50 year old patients. Therefore, tonsillar calcifications should be included in a differential diagnosis in middle-aged patients.

CONSENT

Not applicable

ETHICAL APPROVAL

Helsinki Declaration was followed in the research study. Patient information was not transferred out of the CBCT imaging archive of Shahid Beheshti Dental School.

REFERENCES

1. Silvestre-Donat FJ, Pla-Mocholi A, Estelles-Ferriol E, Martinez-Mihi V. Giant tonsillolith: report of a case. Medicina oral, patologia oral y cirugia bucal. 2005;10(3):239-42.
2. Neville B DD, Allen CM, Bouquot J. Oral & maxillofacial pathology. 2nd ed ed. Philadelphia: WB Saunders; 2002.
3. Siber S, Hat J, Brakus I, Biocic J, Brajdic D, Zajc I, et al. Tonsillolithiasis and orofacial pain. Gerodontology. 2012;29(2):e1157-60.
4. Mandel L. Multiple bilateral tonsilloliths: case report. Journal of oral and maxillofacial surgery : official journal of the American Association of Oral and Maxillofacial Surgeons. 2008;66(1):148-50.

5. Mesolella M, Cimmino M, Di Martino M, Criscuoli G, Albanese L, Galli V. Tonsillolith. Case report and review of the literature. Acta otorhinolaryngologica Italica : organo ufficiale della Societa italiana di otorinolaringologia e chirurgia cervico-facciale. 2004;24(5):302-7.
6. JA. H. Tonsilloliths.
7. Ozcan E, Ural A, Oktemer TK, Alpaslan G. Bilateral tonsillolithiasis: a case report. Oral surgery, oral medicine, oral pathology, oral radiology, and endodontics. 2006;102(3):e17-8.
8. Carter LC, Tsimidis K, Fabiano J. Carotid calcifications on panoramic radiography identify an asymptomatic male patient at risk for stroke. A case report. Oral surgery, oral medicine, oral pathology, oral radiology, and endodontics. 1998;85(1):119-22.
9. Caldas MP, Neves EG, Manzi FR, de Almeida SM, Boscolo FN, Haiter-Neto F. Tonsillolith--report of an unusual case. British dental journal. 2007;202(5):265-7.
10. Scarfe W, Farman A. Soft tissue calcifications in the neck: Maxillofacial CBCT presentation and significance. Australian Dental Practice. 2008:102-8.
11. Sezer B, Tugsel Z, Bilgen C. An unusual tonsillolith. Oral surgery, oral medicine, oral pathology, oral radiology, and endodontics. 2003;95(4):471-3.
12. Lo RH, Chang KP, Chu ST. Upper airway obstruction caused by bilateral giant tonsilloliths. Journal of the Chinese Medical Association : JCMA. 2011;74(7):329-31.
13. Centurion BS, Imada TS, Pagin O, Capelozza AL, Lauris JR, Rubira-Bullen IR. How to assess tonsilloliths and styloid chain ossifications on cone beam computed tomography images. Oral diseases. 2013;19(5):473-8.
14. Ludlow JB, Davies-Ludlow LE, Brooks SL, Howerton WB. Dosimetry of 3 CBCT devices for oral and maxillofacial radiology: CB Mercuray, NewTom 3G and i-CAT. Dento maxillo facial radiology. 2006;35(4):219-26.
15. Araki K, Maki K, Seki K, Sakamaki K, Harata Y, Sakaino R, et al. Characteristics of a newly developed dentomaxillofacial X-ray cone beam CT scanner (CB MercuRay): system configuration and physical properties. Dento maxillo facial radiology. 2004;33(1):51-9.
16. Poeschl PW, Schmidt N, Guevara-Rojas G, Seemann R, Ewers R, Zipko HT, et al. Comparison of cone-beam and conventional multislice computed tomography for image-guided dental implant planning. Clinical oral investigations. 2013;17(1):317-24.
17. Giudice M, Cristofaro MG, Fava MG, Giudice A. An unusual tonsillolithiasis in a patient with chronic obstructive sialoadenitis. Dento maxillo facial radiology. 2005;34(4):247-50.
18. Ram S, Siar CH, Ismail SM, Prepageran N. Pseudo bilateral tonsilloliths: a case report and review of the literature. Oral surgery, oral medicine, oral pathology, oral radiology, and endodontics. 2004;98(1):110-4.
19. Fauroux MA, Mas C, Tramini P, Torres JH. Prevalence of palatine tonsilloliths: a retrospective study on 150 consecutive CT examinations. Dento maxillo facial radiology. 2013;42(7):20120429.
20. Oda M, Kito S, Tanaka T, Nishida I, Awano S, Fujita Y, et al. Prevalence and imaging characteristics of detectable tonsilloliths on 482 pairs of consecutive CT and panoramic radiographs. BMC oral health. 2013;13:54.
21. Aghdasi M VS, Amintavakoli N. prevalence of tonsillolith on panoramicradiographs of outpaient referred to oral and maxillofacial department of dentistry of shaheed beheshti university in the year 1386-87. tehran,iran: shahid beheshti university of medical sciences; 2009.
22. Garay I, Netto HD, Olate S. Soft tissue calcified in mandibular angle area observed by means of panoramic radiography. International journal of clinical and experimental medicine. 2014;7(1):51-6.
23. Bamgbose BO, Ruprecht A, Hellstein J, Timmons S, Qian F. The Prevalence of Tonsilloliths and Other Soft Tissue Calcifications in Patients Attending Oral and Maxillofacial Radiology Clinic of the University of Iowa. ISRN dentistry. 2014;2014.

196 24. ImaniMoghaddam M, JavadzadehBluori A, AhmadianYazdi A, Daneshvar F. A one year
197 prevalence study on soft tissue opacities in panorarnic radiography in patients referred to radiology
198 department of Mashhad dental school. Journal of Mashhad Dental School. 2011;34:4.
199 25. Misirlioglu M, Nalcaci R, Adisen MZ, Yardimci S. Bilateral and pseudobilateral tonsilloliths: Three
200 dimensional imaging with cone-beam computed tomography. Imaging Sci Dent. 2013;43(3):163-9.

201