Research Article

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Supernumerary Teeth and Their Complications: A Cone Beam Computed Tomography Study

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ABSTRACT

Introduction: Supernumerary teeth (ST) are dental anomalies presenting as extra tooth or teeth like structures that frequently cause complications.

Objective: The main objectives of this study were to describe the features of ST and assess the occurrence of complications using cone beam computed tomography (CBCT).

Materials and Method: A retrospective chart review was conducted in CBCT records of non-syndromic patients with ST. Various parameters such as their occurrence and distribution with age, numbers, jaws, position, morphology, location, and complications were recorded. Data were analysed and descriptive statistics calculated.

Result: There were a total of 406 ST from 300 participants, of whom 99 (33%) had multiple ST. Most ST were located in the anterior maxillary region (375, 92.36%), placed palatally or lingually (272, 66.99%), and had a conical appearance (361, 88.92%), in the form of mesiodens (363, 89.41%). In total, 222 ST had complications, hence the occurrence of complications was calculated at 54.68% (95% CI: 49.84-59.52%). The most common complication was midline diastema (99, 24.38%) while rare complications included cyst formations (10, 2.46%) and ectopic eruptions such as ST close to the nasal cavity (23, 5.67%) and soft palate (2, 0.49%).

Conclusion: Conical shaped mesiodens were the most common type of ST. More than half of ST were associated with complications such as midline diastema, displacement of adjacent tooth, delayed eruption, rotation, cyst formation, and ectopic eruption. Therefore, careful examination of any suspected cases of ST, preferably with CBCT imaging should be advised for their early diagnosis and accurate localisation.

Keywords: Complications; cone beam computed tomography; supernumerary teeth.

INTRODUCTION

Supernumerary teeth (ST) are developmental anomalies presenting as an extra tooth or teeth like structures either singly or in multiples, unilaterally or bilaterally, in either or both of the jaws.[1] Although the exact aetiology is not known, various theories have

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been proposed for their presence such as atavism, dichotomy of the tooth germ, excessive growth of the dental lamina, and heredity.[1,2] The prevalence of ST varies from 0.5% to 5.6% according to dentition, ethnicity, geography and has a male predilection by around 2:1 or more.[2-4] Studies show that more than 40% of the ST can cause complications, such as displacement or rotation of adjacent tooth, delayed eruption, impaction, crowding, root resorption, cyst formation, and ectopic eruptions.[5-7]

Frequent occurrence and associated complications make ST an important condition for diagnosis in routine dental practice. Radiographically, a three-dimensional (3D) cone beam computed tomography (CBCT) can help to diagnose the exact location of ST and their complications more precisely than the two-dimensional (2D) images of panoramic and intraoral radiographs.[8,9] Using CBCT imaging, this study aimed to describe the features of ST and assess the occurrence of their complications among patients in a tertiary dental hospital of Xuzhou, China.

MATERIALS AND METHOD

A retrospective chart review study was conducted using CBCT radiographs of patients in 2015, in the department of Oral Radiology at Xuzhou Stomatological Hospital, Xuzhou of Jiangsu province, China. CBCT records of patients with the presence of ST from January 1st to October 16th 2014 were included in this study whereas the patients previously recorded with syndromes such as cleft lip and palate, Gardner's syndrome, and cleidocranial dysplasia were excluded. This study was conducted after the approval from the review committee of Xuzhou Stomatological Hospital following the ethical principles of Declaration of Helsinki 2013.

A minimum sample size of 383.27 ≈ 384 ST was calculated using OpenEpi (www.OpenEpi.com), assuming the prevalence of complications among supernumerary teeth of 47.6% (as obtained from a previous CBCT study conducted in China),[7] a Type I error rate of 5%, and absolute precision of 5% points. The sample size was inflated by 5% to accommodate for any missing information in the patient records or insufficient image quality due to any artifact. In total, 406 ST from 300 CBCT images were selected for the study using a consecutive sampling technique.

For imaging, the NewTom CBCT system (NewTom VG, Verona, Italy) (Figure 1) was used which had a field of view (FOV) of 9 inches (110 kV, 1-20 mA, 24 s, voxel size: 0.30 mm). The radiation dose was automatically adjusted by automatic exposure control (AEC) depending upon the age and size of the patient. Both 2D and 3D images were viewed using the proprietary software of the CBCT device (NNT Viewer). The participants were categorised into three age groups based on their dentition status: deciduous dentition (till five years), mixed dentition (6-13 years), and permanent dentition (>13 years). The CBCT images were examined and ST details such as their numbers, jaw distribution, location, position, morphology, and complications were recorded. All data were then entered into a Microsoft Excel Sheet and further analysed using IBM statistical package for social sciences (SPSS) Statistics for Windows, version 20 (IBM Corp., Armonk, N.Y., USA).

RESULT

A total of 406 ST were evaluated from 300 CBCT records. A majority of ST were found in the mixed dentition age group (208, 69.33%) and had a single

Figure 1: NewTom VG cone beam computed tomography machine.

Figure 2: Presence of two supernumerary teeth (supplemental premolars on either side) in mandible seen in reconstructed panoramic view taken by CBCT.

Table 1: Participant and supernumerary teeth characteristics.

Parameters	n (%)
Characteristics of study participants (n=300)	
1. Age-groups	
Primary dentition (0-5 years)	29 (9.67%)
Mixed dentition (6-13 years)	208 (69.33%)
Permanent dentition (>13 years)	63 (21%)
2. Number of supernumerary teeth in a patient	
One	201 (67%)
Two	93 (31%)
Three or more	6 (2%)
Characteristics of supernumerary teeth (n=406)	
1. Jaw distribution of supernumerary teeth	
Maxilla	385 (94.83%)
Anterior region	375 (92.36%)
Posterior region	10 (2.46%)
Mandible	21 (5.17%)
Anterior region	1 (0.25%)
Posterior region	20 (4.93%)
2. Position of supernumerary teeth	
Palatally/lingually	272 (66.99%)
Within the arch	125 (30.79%)
Labially/buccally	9 (2.22%)
3. Morphology of supernumerary teeth	
Conical	361 (88.92%)
Supplemental	32 (7.88%)
Tuberculate	7 (1.72%)
Odontome	6 (1.48%)
4. Classification according to location	
Mesiodens	363 (89.41%)
Para premolar	22 (5.42%)
Distomolar	3 (0.74%)
Paramolar	2 (0.49%)
Others	16 (3.94%)
5. Complications	222 (54.68%)
Diastema	99 (24.38%)
Displacement	40 (9.85%)
Delayed eruption	31 (7.64%)
Close to nasal cavity	23 (5.67%)
Rotation	17 (4.19%)
Cyst formation	10 (2.46%)
Close to soft palate	2 (0.49%)

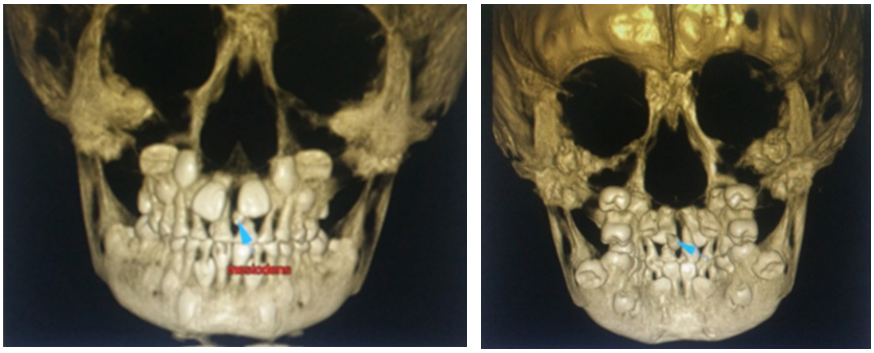

Figure 3: A single mesiodens present between the upper central incisors seen in 3D view of CBCT (a) AP view (b) PA view.

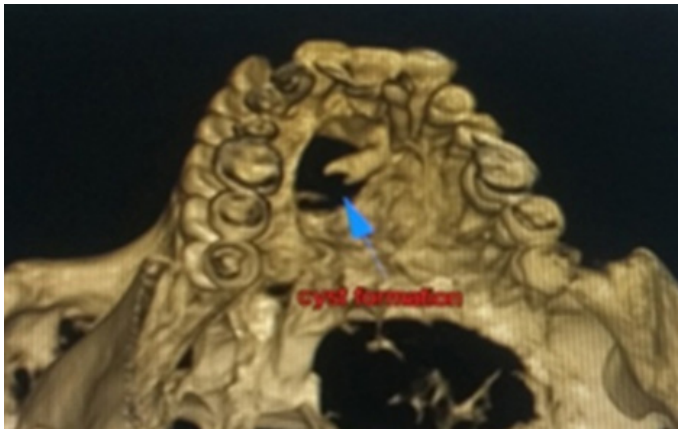

Figure 4: Cyst formation seen in the impacted supernumerary tooth palatally.

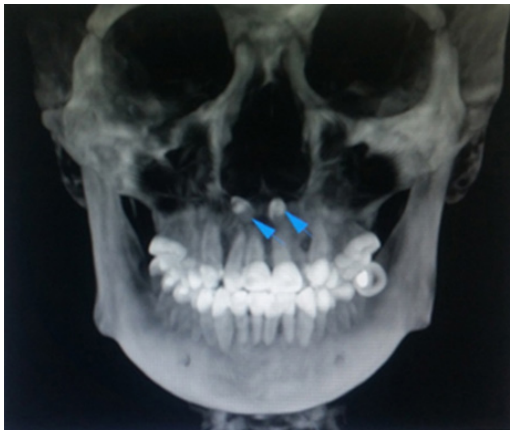

Figure 5: Supernumerary teeth in the anterior region of maxilla seen in close approximation to the nasal cavity seen in MIP view of CBCT.

ST (201, 67%) (Table 1). Multiple ST were found in nearly one-third of the participants, most commonly two in number (n=99) (Figure 2). Of all 406, 385 (94.83%) of ST were located in the maxillary arch, most commonly in the anterior region of the maxilla (375, 92.36%) (Table 1). Most ST were placed palatally or lingually (272, 66.99%), had a conical appearance (361, 88.92%), and were found in between two maxillary central incisors in form of a mesiodens (363, 89.41%) (Figure 3 a and b).

More than half of ST (222, 54.68%) were associated with dental complications in which, midline diastema (99, 24.38%) was recorded as the most common complication of ST. Various other complications recorded were displacement of an adjacent tooth (40, 9.85%), delayed eruption (31, 7.64%) (Table 1) as well as rare complications such as cyst formations (10, 2.46%) (Figure 4) and ectopic eruptions of ST (ST close to the nasal cavity (5.67%) (Figure 5) and towards the soft palate (2, 0.49%).

DISCUSSION

Supernumerary teeth are more commonly seen in individuals associated with syndromes such as Gardners's syndrome, cleft lip and palate, and cleidocranial dysostosis.[10] However, their presence is not uncommon in non-syndromic individuals. Most of the ST in this study were seen in the anterior region of the maxillary arch, which is in line with many past studies of ST among the non-syndromic Chinese population.[4,7] A similar high frequency (88.9%) of occurrence of ST in the maxillary anterior region was also seen among Nepalese children in a study in the eastern region in the city of Dharan.[11] In contrast, Demiriz et al. reported a higher occurrence of ST in the maxillary molar region in Turkey.[12] This discordance may be attributed to the age of participants in that study where, unlike other studies, participation was limited to adult patients only. Similarly, mesiodens was recorded as the most common location of ST which was similar to various studies in literature review.[4,11,13] Likewise, ST can also occur in various

numbers in any region of the jaws. Although their presence in a single number is the most common finding, ST can also occur in multiple numbers in non-syndromic individuals.[3,11,14,15] The present study recorded one-half of the participants with the presence of two or more numbers of ST, with a maximum of four numbers of ST presented in a single individual. Higher numbers of ST, although rare, have been recorded in the past studies, For example, a case report by Diaz et al. presented a maximum of 17 numbers of ST in a single, non-syndromic individual.[16] These findings signify the possibility of the presence of multiple ST even in non-syndromic individuals.

Importantly, there was a high occurrence of complications associated with the presence of ST in the present study. Even though the occurrence was not as high as 88.5% of patients as observed by Gomes et al. in Brazil,[6] some complications were observed in every other ST. Midline diastema was the most common complication followed by displacement of an adjacent tooth. Besides, complications like ectopic eruptions (such as nasal tooth or ST close to the nasal cavity, or close towards the soft palate) and cyst formations which have been rarely reported in the literature were also observed. These findings also suggest that each ST should be suspected of being associated with complications that require careful inspection and accurate localisation for developing an appropriate treatment plan. Another rare but possible form of ST is complex odontoma which can cause cortical bone expansion of the posterior region of the jaw causing facial asymmetry.[17] A study by Reddy et al. reported a case of complex odontoma, where both panoramic, as well as 3D computed tomography (CT) imaging, was advised. The panoramic image helped localise the presence of complex odontoma, but the perforation of both buccal and lingual cortical plates could be appreciated from the 3D CT images only.[18] All these findings highlight the utility of CBCT for early diagnosis and accurate localisation of ST and any complication brought by them.

CBCT provides a detailed 3D image of ST and their adjacent teeth structures which can be viewed in all three axial, sagittal, and coronal planes without superimposition from their nearby anatomical structures. Compared to CT, CBCT emits a cone-shaped X-ray beam which requires less exposure and radiation.[13] However, the radiation in CBCT is much higher than that in orthopantomogram and intraoral radiograph.[8,13] Therefore, smallest possible FOV that produces the lowest radiation exposure should be used rather than focusing on the highest image quality (low voxel size) when using CBCT. Acknowledging the advantages of CBCT, Liu et al.[7] suggested routine use of CBCT in presence of ST, while Gurler et al.[10] prescribed the need for CBCT especially if the ST is impacted. This analysis supports the use of CBCT for any presence of ST, to evaluate their multiple presence or any ectopic eruptions, which could be easily missed out from 2D radiographic images alone.

While CBCT images of ST were successfully analysed, there are few limitations in the present study. The distribution of ST in males and females could not be ascertained in this study as the CBCT database in the study hospital did not have these records. Furthermore, the analysis was based on the records of a single hospital in Xuzhou, therefore it cannot be used to generalise the whole population.

CONCLUSION

ST can occur in single or multiple numbers in which conical shaped mesiodens were the most common type of ST presented in the anterior region of maxilla. More than half of ST were associated with complications such as midline diastema, displacement of the adjacent tooth, delayed eruption, rotation, cyst formations, and ectopic eruptions. Therefore, any suspected case of ST in the routine dental practice, requires a further careful radiographic examination, preferably with 3D CBCT imaging for early diagnosis and accurate localisation of ST to formulate an optimal treatment plan.

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Conflict of Interest: None.

REFERENCES

1. Anthonappa RP, King NM, Rabie ABM. Aetiology of supernumerary teeth: a literature review. Eur Arch Paediatr Dent. 2013 Oct;14(5):279-88. [PubMed | Full Text | DOI]
2. Kumar DK, Gopal KS. An epidemiological study on supernumerary teeth: a survey on 5,000 people. J Clin Diagn Res. 2013 Jul;7(7):1504-7. [PubMed | Full Text | DOI]
3. Fidele NB, Bourley SI, Kazadi EK, Augustin MM, Suwal R, Muinamiyi M, et al. Prevalence and pattern occurrence of supernumerary teeth in the north-east heilongjiang population of china. Open J Stomatol. 2016 Feb;6(02):47-53. [Full Text | DOI]
4. Jiang Y, Ma X, Wu Y, Li J, Li Z, Wang Y, et al. Epidemiological, clinical, and 3-dimentional CBCT radiographic characterisations of supernumerary teeth in a non-syndromic adult population: A single-institutional study from 60,104 chinese subjects. Clin Oral Investig. 2020 Dec;24(12):4271-81. [PubMed | Full Text | DOI]
5. Sarica I, Derindag G, Kurtuldu E, Naralan ME, Caglayan F. A retrospective study: Do all impacted teeth cause pathology? 2019 Apr;22(4):527-33. [PubMed | Full Text | DOI]
6. De Oliveira Gomes C, Drummond SN, Jham BC, Abdo EN, Mesquita RA. A survey of 460 supernumerary teeth in brazilian children and adolescents. Int J Paediatr Dent. 2008 Mar;18(2):98-106. [PubMed | Full Text | DOI]
7. Liu DG, Zhang WL, Zhang ZY, Wu YT, Ma XC. Three-dimensional evaluations of supernumerary teeth using cone beam computed tomography for 487 cases. Oral Surg Oral Med Oral Pathol Oral Radiol Endod. 2007 Mar;103(3):403-11. [PubMed | Full Text | DOI]
8. Abdelkarim A. Cone-beam computed tomography in orthodontics. Dent J. 2019 Sept;7(3):89. [PubMed | Full Text | DOI]
9. Mossaz J, Kloukos D, Pandis N, Suter VGA, Katsaros C, Bornstein MM. Morphologic characteristics, location, and associated complications of maxillary and mandibular supernumerary teeth as evaluated using cone beam computed tomography. Eur J Orthod. 2014 Dec;36(6):708-18. [PubMed | Full Text | DOI]
10. Gurler G, Delilbasi C, Delilbasi E. Investigation of impacted supernumerary teeth: A cone beam computed tomograph (cbct) study. J Istanb Univ Fac Dent. 2017 Oct;51(3):18-24. [PubMed | Full Text | DOI]
11. Singh VP, Sharma A, Sharma S. Supernumerary teeth in nepalese children. ScientificWorld J. 2014;2014:215396. [PubMed | Full Text | DOI]
12. Demiriz L, Durmuslar MC, Misir AF. Prevalence and characteristics of supernumerary teeth: A survey on 7348 people. J Int Soc Prev and Community Dent. 2015 May;5(Suppl 1):S39-43. [PubMed | Full Text | DOI]
13. Tumen E.C, Yavuz I, Tumen D.S, Hamamci N, Berber G, Atakul F, et al. The detailed evaluation of supernumerary teeth with the aid of cone beam computed tomography. Biotechnol Biotechnol Equip. 2010;24(2):1886-92. [Full Text | DOI]
14. Chou ST, Chang HP, Yang YH, Lung CY, Tseng YC, Pan CY, et al. Characteristics of supernumerary teeth among non syndromic dental patients. J Dent Sci. 2015;10(2):133-8. [Full Text | DOI]
15. Brauer HU. Case report: non-syndromic multiple supernumerary teeth localised by cone beam computed tomography. Eur Arch Paediatr Dent. 2010 Feb;11(1):41-3. [PubMed | Full Text | DOI]
16. Diaz A, Orozco J, Fonseca M. Multiple hyperodontia: report of a case with 17 supernumerary teeth with non syndromic association. Med Oral Patol Oral Cir Bucal. 2009 May;14(5):E229-31. [PubMed | Full Text]
17. Vengal M, Arora H, Ghosh S, Pai KM. Large erupting complex odontoma: a case report. J Can Dent Assoc. 2007 Mar;73(2):169-73. [PubMed | Full Text]
18. Reddy GSP, Reddy GV, Sidhartha B, Sriharsha K, Koshy J, Sultana R. Large complex odontoma of mandible in a young boy: A rare and unusual case report. Case Rep Dent. 2014;2014:854986. [PubMed | Full Text | DOI]