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Prevalence of the developmental bone defect of the mandible in cone-beam computed tomography scans

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ABSTRACT | The developmental bone defect of the mandible is a bone cavity presenting as a well-defined, radiolucent lesion, located in the posterior region of the mandible, just below the inferior dental canal and above the mandibular base. It is asymptomatic, has a greater predilection for males, and a prevalence between 0.1% and 0.48%. The aim of this study was to conduct a review of the literature on the prevalence of this bone defect and compare the literature data to that of an assessment conducted of routine cone-beam computerized tomography (CBCT) scans from a radiological clinic. The use of diagnostic resources such as cone-beam volumetric tomography was also highlighted. CBCT routine scans taken from July 1st, 2012 to September 27, 2012 were retrieved from the digital archives of a private dental radiology clinic and evaluated, for a total of 1,344 CBCT images. Stafne's cavity was observed In 22 cases (0.16%). Among the 19 male cases, 15 were Type I, 3 were Type II and 1 was Type III, according to Ariji's classification.[5] All of the 3 female cases (the male-to-female ratio was 6.33:1) were Ariji Type I. The findings of this study were consistent with those from the literature consulted, in that the highest prevalence rates were observed for unilateral, Ariji Type I lesions and in the male gender.

DESCRIPTORS | Odontogenic Cysts; Cone-Beam Computed Tomography; Prevalence.

RESUMO | **Prevalência do defeito ósseo de desenvolvimento da mandíbula em exames de tomografia computadorizada por feixe cônico** • O defeito ósseo de desenvolvimento da mandíbula (DODM) é uma cavidade óssea que se apresenta como uma lesão radiolúcida de limites definidos e corticalizados. É assintomático, apresenta uma maior predileção pelo gênero masculino, e tem uma prevalência de 0.1% a 0.48%. O objetivo deste estudo foi realizar uma revisão de literatura com o intuito de ampliar o conhecimento a respeito da prevalência desse defeito ósseo e comparar os dados da literatura com os obtidos por meio de uma avaliação de 1344 exames de rotina realizados por meio da tomografia computadorizada de feixe cônico (TCFC) recuperados dos arquivos de uma clínica privada de radiologia odontológica. As imagens foram analisadas no período de 1º de julho de 2012 a 27 de setembro de 2012. Foram observados 22 casos de DODM (0,16%), sendo que 19 casos eram do gênero masculino, totalizando 15 casos do Tipo I, 3 casos do Tipo II e 1 caso do Tipo III de Ariji.[5] Foram também encontrados 3 casos do gênero feminino, todos classificados como Tipo I de Ariji, equivalendo a uma proporção entre os gêneros masculino e feminino de 6,33:1. Os resultados encontrados no presente estudo foram compatíveis com os relatados na literatura consultada. Constatou-se uma maior prevalência de lesões unilaterais, Tipo I de Ariji e envolvendo o gênero masculino.

DESCRITORES | Cistos Odontogênicos; Tomografia Computadorizada de Feixe Cônico; Prevalência.

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INTRODUCTION

The developmental bone defect of the mandible (DBDM), or Stafne's bone cyst, is seen radiographically as a radiolucent and circular or oval image, with defined and corticalized limits, very similar to those of an odontogenic cyst. However, the limits of the DBDM are more dense and thick, as first described by Stafne.[1] He observed 35 bone cavities located bilaterally near the angle of the mandible, between the canal and the base of the mandible. This condition is usually seen in patients who are in their 5th or 6th decade of life, and the prevalence of this radiographic finding is in the 0.10%–0.48% range. Patients are usually asymptomatic and the defect is often diagnosed by routine radiography.[2,3] Male patients aged 50–70 years are most affected.[2,4]

Ariji *et al.*[5] analyzed CT scans of 15 patients (16 cavities) with Stafne's bone cyst and classified the bone cavities according to their margins, relationship with the buccal cortical bone, and internal content. In the images, the deepest portion of the cavities either did not reach the buccal cortical bone (Type I), reached the buccal cortical bone, but not causing their expansion (Type II), or did so causing their expansion (Type III). Regarding their internal content, three classifications were also made according to tissue characteristics:

- fat density (F type),
- soft tissue density (S type), and
- gland within the cavity or close to it (G type).

Cone-beam computed tomography (CBCT) is a useful diagnostic tool and allows to confirm the initial radiographic findings obtained by conventional radiography, e.g. extraoral panoramic radiography.[3,6,7]

OBJECTIVES

In this context, the aim of this study was to conduct a literature review to allow a better understanding of the etiology and epidemiology of this bone defect and to assess its prevalence among 1,344 CBCT scans retrieved from the files of a private dental radiography clinic.

METHOD

Images from 1,344 routine CT scans obtained with an iCat cone-beam CT scanner (Imaging Sciences, Hartfield, USA) and retrieved from the digital files of a private dental radiography clinic were analyzed to search for the presence of Stafne's bone defect.

The images were analyzed from July 1st to September 27, 2012. No criteria for inclusion or exclusion in the sample were applied in this observational study.

RESULTS

Among the digital files analyzed in this study (1,344 CBCT scans), 22 (0.16%) cases of DBDM were observed in male (19) and female (3) patients, with a male:female ratio of 6.3:1 (86.36% versus 13.64%). Images of DBDM were observed on the right (14) and left (8) sides. Among male patients, the defect was observed on the right (12) and left (7) sides, distributed into Ariji[5] Type I (with a right:left ratio of 9:6), Type II (2:1), and Type III (1:0). Among female patients, the defect was observed on the right (2) and left (1) sides, and was Ariji[5] Type I (2:1) in all cases (Table 1 and Figure 1).

DISCUSSION

The incidence of the posterior variant of the developmental bone defect of the mandible (DBDM) is in the 0.10%–0.48% range.[8-13] This large incidence rate variation found in the literature has been attributed to difficulty in radiographically identifying this entity.[10] In the present study, 1,344 CBCT scans were analyzed. Among them, 22 cases of Stafne's bone cyst (0.16%) were found, in agreement with previously reported findings. Sisman *et al.*[10] analyzed 34,221 panoramic radiographs and found 29 Stafne cysts (0.08%), a rate slightly lower than that

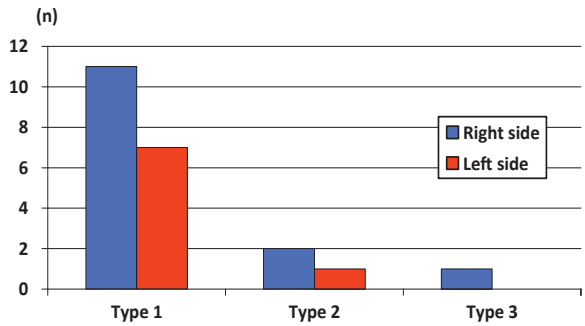

Figure 1 | Distribution of CBDM types into right and left sides.

Table 1 | Distribution of CBDM cases into genders and types.

Genders	Sides		Total
	Right	Left	
Male	12	7	19
Type 1	9	6	15
Type 2	2	1	3
Type 3	1	0	1
Female	2	1	3
Type 1	2	1	3
Type 2	0	0	0
Type 3	0	0	0
Total	14	8	22

previously reported.

Stafne's bone cysts occur more commonly in males. Philipsen *et al.*[9] reviewed the literature extensively and found a male:female ratio of 6:1. Quesada-Gómez *et al.*[8] reported 11 cases of Stafne's bone cyst, of which 8 were from male patients. Schneider *et al.*[4] found a male:female ratio of 14:7, and all cavities were in the posterior region of the mandible. This study reports 19 male and only 3 female patients. The male:female proportion (6.3:1) is in agreement with that reported in previous studies showing a higher prevalence in males. Regarding age range, most studies reported that cavities were found in patients over 20 years of age, with the average located in the 50–60 year range.

The etiology of this cavity remains unclear.[4] Various theories have been proposed, and Stafne *et al.*[1] suggested a possible failure in the process of ossification of Meckel's cartilage. This theory is controversial,[14] and the presence of this bone cavity in patients younger than 10 years old has not been reported so far. Most studies suggest the presence of normal or inflamed glandular histological tissue[5,8,10,15,16] within the cavity. Minowa *et al.*[14] analyzed the bone cavities of 4 patients using CT and correlated these results with those of histopathology. The study revealed the presence of adipose tissue and many dilated vessels inside the 4 cavities, but no tissue related to submandibular glands, indicating its vascular origin. Another 10 cases were analyzed[17] using CT and MRI, and no glandular tissue was found inside the bone cavity, only blood vessels and other soft tissues. Sisman *et al.*[10] suggest that the variety of tissues found in bone cavities may be due to the removal of surrounding soft tissues. Barker[18] used sialography and reported a case in which the bone cavity was closely related with salivary and parotid gland tissues.

Since the DBDM is an anatomical depression and not a pathological cavity, it requires no treatment, just radiographic control,[8-10,15] as described in the study by Dereci and Duran[19] and Herranz-Aparicio *et al.*[3] According to these authors, CBCT is the most suitable diagnostic examination because it is noninvasive and allows visualization of the lingual cavity. Our study showed that use of CBCT allows both the obtaining of more detailed images and the effective observation of the DBDM. The cavity may not be perceived with the use of panoramic radiography when it is out of the image layer or its size is reduced.

CONCLUSION

The use of CBCT allowed locating the DBDM, detailing its characteristics, and determining its classification according to the types described by Ariji.[5] Our findings are in agreement with those of

the literature, in that the male gender, Ariji[5] Type I and unilateral presentation were the most prevalent occurrences. New studies on the DBDM must be conducted with larger samples and in other geographic regions (multicenter studies) to confirm its prevalence in different populations.

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