Stafne bone cavity: A retrospective panoramic evaluation on prevalence in Turkish subpopulation

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ABSTRACT

Objective: Stafne’s bone cavity was first described by Stafne, who reported 35 cases of unilateral, asymptomatic radiolucencies in 1942. The bone cavities are located on the posterior mandible and below the mandibular canal, above the mandibular base. They usually include an ectopic salivary gland and their incidence was reported as between 0.1% and 0.48%. The aim of this study is to investigate the frequency of Stafne bone cavity (SBC) in a Turkish subpopulation. Materials and Methods: A retrospective, observational study was designed with panoramic radiographies. A total of 14,250 panoramic radiographies were inspected. 192 of panoramic radiographs were considered as unfit for the study due to various reasons (e.g., low image quality and big artefact) and were excluded from the study. The localizations of the defects on the mandible were noted. Results: Among the 14,058 patients, only 13 (0.09%) had SBC, of whom 4 were female (30.7%), and 9 were male (69.3%). The age range of patients with SBC was 21-75 years (mean age: 49.2). All the cavities were detected in the posterior region of the mandible. Conclusion: SBC is a rare developmental anomaly and has a typical radiologic appearance. Panoramic radiography seems to be a sufficient diagnostic tool for detecting SBC.

KEY WORDS: Bone defects, panoramic radiography, salivary gland, Stafne bone cavity

INTRODUCTION

Edward Stafne, who reported 35 radiolucent lesions in the mandibular angle, noticed utilizing intraoral dental films, first discovered Stafne bone cavity (SBC) in 1942. The bone cavities were located linguually on the posterior mandible and below the mandibular canal, above the mandibular base [1]. Since then many different terms have been used to describe this entity including; static bone cyst, lingual mandibular bone defect, SBC, idiopathic bone cavity, or lingual mandibular bone depression [2-4]. Although the “cyst” term has traditionally been used to identify this lesion, fluid content in the cavity has never been reported. They usually include an ectopic salivary gland [1,5]. Although the posterior lingual type has an incidence between 0.1% and 0.48%, some cadaver studies show that the incidence could be as high as 6.06% [2,4]. Usually, 50-70 years old males are affected [2,6].

The anterior variant was reported first by Richard and Ziskind [7] in 1957 as a lingual bone concavity in the anterior region of the mandible. Since then, only few cases have been reported in the literature [8]. The frequency of the anterior type of SBCs are seen seven times less than posterior type and usually located between the incisor and the premolar areas, above the insertion of the mylohyoid muscle [2,9]. Although posterior type of SBCs can usually be diagnosed clearly on panoramic radiographs because of their unique location, anterior bone defects may be misdiagnosed or mislead with several different pathologic entities of the jaw such as traumatic bone cyst, periapical cyst, keratocyst, non-ossifying fibroma, ameloblastoma, or focal osteoporotic bone marrow defect. In these situations, therefore, further confirmatory testing is warranted for differential diagnosis [10].

The aim of this study is to describe the radiological characteristics of SBC and to reveal its frequency in Turkish subpopulation for the purpose of avoiding misdiagnosis.
MATERIALS AND METHODS

This is a retrospective study of panoramic radiographs collected from patients’ files that consisted of patients who applied to the Department of Dentomaxillofacial Radiology, Gulhane Military Medical Academy, Ankara, Turkey, between years of 2010 and 2014. A total of 14,250 panoramic radiographies were evaluated, and 192 images were excluded due to poor image quality and technical reasons. As a result, 14,058 panoramic radiographies were included in this study.

All panoramic radiographs were taken by Kodak 8000C Digital Panoramic System at setting of 78 kV and 12 mA exposure. Two dentomaxillofacial radiologists, who had minimum 7 years of experience, examined all images. Kodak Dental Imaging Software Viewer (version 6.12.10.0) was used for image evaluation on a standard personal computer with calibrated monitor (HP Compaq LE1711 LCD Monitor, Palo Alto, CA, USA). The level of contrast and brightness of the images was left to examiners’ choices.

Inclusion criteria were: Round or ovoid radiolucency in the mandible; homogeneous appearance; sharp cortical demarcation with a clear distinction from anatomical structures [Figure 1]. Exclusion criteria were: Panoramic radiographs with poor diagnostic quality, distortions or big artefacts. The age and sex were recorded for all patients and for the cases of SBC, age, sex, side, and location of the lesions were noted as well. The complaints as pain, swelling, paresthesia or tooth migration, and radiologic appearance of the patients who have Stafne bone defect were also recorded after 1-year follow-up. All statistical analyzes were performed using SPSS software (version 15.0; SPSS Inc., Chicago, IL, USA).

RESULTS

A total of 14,058 images met the inclusion criteria and were examined. Of these 7,009 (49.86%) were male and 7,049 (50.14%) were females. The age and sex distribution of the study population are presented in Table 1.

13 (0.09%) of the 14,058 individuals had SBCs, of whom 4 (0.02%) were female and 9 (0.06%) were male. All of them were found on the mandibular posterior site. The bilateral presentation was not seen. Of the 13 unilateral cases, 9 (69.2%) were on the left, and 4 (30.8%) were on the right side. The frequency of SBC was found higher in individuals aged over 40 years. The ages of the patients with SBC ranged from 21 to 75 years (mean age 49.23 years). Stafne prevalence of the right side was found to be 0.06%, whereas left side’s prevalence was calculated as 0.02%. The distribution of gender, age and localization is seen in Table 2. There were no pathological changes after 1 year clinical and radiologic follow-up.

DISCUSSION

Since its first description by Stafne, many terms have been coined to describe asymptomatic radioluencies at the angle of the mandible [2-4,11-13]. The bone cavity is usually found incidentally during routine radiologic evaluation, most often appearing as radiolucent, unilateral, ovoid defect near the angle area below the inferior alveolar canal. Even though it is mostly seen in the posterior of mandible near the angle, rarely it has been found in an anterior portion of the mandible. When it is seen in the anterior mandible region, distribution of bone cavities’ locations are as follows; 65% between the cuspid and the first molar, and 24% incisor area. SBCs are most often unilateral defects however less frequently bilateral defects are seen. To the best of our knowledge, bilateral anterior bone defects were reported only 9 times in literature [14-22].

According to literature, SBCs are diagnosed commonly in men and aged between 50 and 70 years [2,6,23]. Men represent most cases with a ratio of 3:1, but Philipsen et al. [2] reported a ratio of 6:1. In this study, there was 9:4 of ratio on behalf of men. Although its prevalence in the published series ranges from 0.08% to 0.5%, prevalence in some cadaver reports is relative high (1.3-6.6%) [2]. The limitations of two-dimensional imaging modalities in the aforementioned series could be the reason for this lower rates of prevalence when compared to cadaver studies [2]. Anterior Stafne prevalence was found to be 0.005%, whereas posterior Stafne prevalence was 0.081% according to Sisman et al. [23]. In this study, the authors found 0.09%
prevalence rate for the occurrence of the SBC, and this result is compatible with previous reports.

Due to their asymptomatic nature, most of the cases are incidentally discovered in the routine radiographic evaluation. However, there are a few reports which have been represented with pain in the region of SBC [24,25]. Turkoglu and Orhan [8] reported a case presented with pain located in anterior mandible, but they also emphasized that the pain was related to the deep caries lesion in the neighboring tooth. In this presented retrospective analysis, none of the patients had any complaints such as pain, swelling, or infection, etc. All of the cases in this report were incidental discoveries on a routine panoramic radiographic evaluation.

Even though numerous theories have been attempted to explain the etiology of the SBC, its etiology still remains controversial. Stafne [1] suggested that defects were developmental and occurred congenitally due to hypoplasia of the mandible. The youngest patient who had been reported in the literature was 11-year-old [26]. This theory was not accepted by some authors because it does not explain why the lesions do not occur in childhood. In the present study, we have detected the ages of patients with SBC as 21 years and above. Another theory mentions the pressure of salivary gland to the lingual cortex of the mandible. The local pressure of salivary glands to the mandible delays development. According to this theory, the submandibular gland is related with the posterior defects while the sublingual gland is related with the anterior defects [2-4].

Minowa et al. [12,13] claimed that acquired vascular lesions may be one of the possible causes of bone depression and pain. They have also reported that the facial artery and its branches can become tortuous owing to hypertension as an explanation. They also reported that the incidence of hypertension increases with age and also increases the incidence of SBC. In our retrospective study, only 2 patients had hypertension in their records. However, there was no way to know whether or not hypertension caused SBC or defect was caused by some other reason. According to our point of view, further studies should be done to clarify the question marks about this topic.

Because of the SBC is thought to be a normal anatomical variant rather than a pathological condition, surgical procedures are not necessary for the treatment neither for anterior nor for a posterior variant. In general, the management of SBC should be a conservative approach by radiological follow-up. Surgical procedures or biopsy should be performed only in atypical cases or suspected lesions. Only if remarkable changes were seen on routine radiographic follow-up shows then surgical intervention could be applied [2,11]. In the present study, after 1-year clinical and radiologic follow-up, there were no pathological changes.

Especially, anterior variant of SBC mimics odontogenic pathology. The posterior variant of SBC has relatively specific appearance. The differential diagnosis of SBC should be done with several pathologies such as odontogenic cystic lesions, fibrous dysplasia, vascular malformations, ameloblastoma, giant cell granuloma, odontogenic keratocyst, aneurysmal bone cyst, cosmetic granuloma, benign salivary gland tumors, neurogenic tumors, myxoma, multiple myeloma, and metastatic diseases [2,8,10,23,27].

In most cases, diagnosis of SBC is easier because of its specific characteristic appearance on radiography. They are usually diagnosed on conventional plain films such as intraoral dental radiographs, plain films of head and neck region and orthopantomograms. These imaging modalities are often obtaining sufficient information for diagnosis. However when the lesions are atypical, then the advanced diagnostic imaging modalities such as computed tomography (CT), cone-beam CT (CBCT), magnetic resonance imaging (MRI), and sialography are required for differential diagnosis. Although CT has some disadvantages such as high radiation exposure and possible allergic reaction against contrast ingredients, CT evaluation is useful for identifying soft tissue. Most CT evaluations of SBC have shown salivary tissue, fat and soft tissue [3,4].

Some authors also advocate that CT should be supported by the other imaging methods such as MRI [27] and sialography [8]. Because of some limitations and disadvantages of CT, MRI is suggested as the primary diagnostic method for SBC. MR imaging provides adequate information about SBC even without any intravenous contrast material and exposing the patient to radiation. Its major disadvantages are the high cost and the field distortion artifacts from dental materials; however, it has been recommended by many authors [27]. Sialography is also suggested as a diagnostic method, but it is also mentioned as an uncomfortable procedure and highly difficult to be tolerated by the patient. It obtains positive results only if glandular tissue exists in the cavity, but there are case reports of surgically proven SBC with negative sialogram results. Sialography exposes the patient to ionizing radiation and also can be difficult to perform [28]. Thus, it has been rarely used to diagnose SBC.

In the last decade, it has been created a major revolution on imaging technology with the development of CBCT by which the CT evaluation is useful for identifying soft tissue. Most CT evaluations of SBC have shown salivary tissue, fat and soft tissue [3,4].

CONCLUSION

The diagnosis of SBC could be easily made by a practitioner due to its asymptomatic nature and specific appearance on routine plain radiographs. Improve of practitioners’ knowledge about this lesion will prevent the potential misdiagnosis of the defect. Only atypical or suspicious lesions should be evaluated with advanced non-invasive radiological techniques such as CT or magnetic resonance studies. As a result, it will be possible to avoid unnecessary invasive surgical procedures.
REFERENCES