The prevalence of ethmoidal infraorbital cells in panoramic radiography

Ehsan Khayam[1], Amir Mohamad Mahabadi[2], Fatemeh Ezoddini[3], Mohamad Ali Golestani[4], Zeinab Hamzeheil[5], Malihe Moeini[6], Seyed Hossein Razavi[7*]

1. Assistant professor, Department of Oral and Maxillofacial Radiology, Faculty of Dentistry, Shahid Sadoughi University of Medical Sciences, Yazd, Iran.
2. DDS, Yazd, Iran.
3. Professor, Department of Oral and Maxillofacial Radiology, Faculty of Dentistry, Shahid Sadoughi University of Medical Sciences, Yazd, Iran.
4. DDS, Yazd, Iran.
5. under graduate dentistry student, Yazd, Iran.
6. Resident of oral and maxillofacial radiology, DDS, Faculty of Dentistry, Shahid Sadoughi University of Medical Sciences, Yazd, Iran.
7. Resident of oral and maxillofacial radiology, DDS, Faculty of Dentistry, Shahid Sadoughi University of Medical Sciences, Yazd, Iran (**Corresponding author**).

Corresponding author:
Email: mlh_moeini@yahoo.com
Mob: (+98)9357923929
Tel: (+98)3518227285
Address: Iran – Yazd – Daheie Fajr Blv – Faculty of Dentistry

Abstract

Aim: Ethmoidal infraorbital (***Haller's***) cells are extensions of ethmoid air cells into the areas of the orbit and maxillary sinus. Ethmoidal Infraorbital cells may be visualized by a variety of imaging methods that show a view of the maxillary sinus. CT scan is commonly used for imaging of ethmoidal infraorbital cells and they may be seen when present on panoramic radiographs. The aim of this study was to determine the prevalence of ethmoidal infraorbital cells on panoramic radiographs.

Materials and Methods: In this descriptive cross-sectional study, 200 panoramic radiographs were examined for ethmoidal infraorbital cells. A diagnostic criterion was used to identify ethmoidal infraorbital cells on panoramic radiographs. The data were analyzed by using SPSS software, descriptive statistical methods and chi square test.

Results: Among 200 panoramic radiographs, 95 and 105 were from males and females respectively. The prevalence of ethmoidal infraorbital cells was 32.5% (32.6% for males and 32.4% for females.65 Bilateral ethmoidal infraorbital cells were present in34 radiographs (52.3%), and 31 images (47.7%) had unilateral ethmoidal infraorbital cells. There were no statistical significant differences in the prevalence of Haller's cells regarding gender, age and side of presence cells (Pv > 0.05).

Conclusions: The prevalence of Haller's cells on panoramic radiographs was within the range of its prevalence on CT and panoramic examinations that reported by others. However, although CT-Scan has been accepted as a method for identifying this Landmark, it appears that panoramic radiography can be used for this purpose as well.

Key words: Ethmoidal infraorbital cells, Haller's cells, panoramic radiography

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Introduction

Ethmoidal infraorbitalcells (Haller's cells) are located on the maxillary sinus roof, near and above the ostium of maxillary sinus at the inferior wall of the orbit and lateral border of infundibulum [(1)]. They were named by Albert von Haller in 1765. These cells were known by other names such as orbitoethmoidal and maxilloethmoidal cells. This structure is related to such symptoms and diseases as sinusitis, headache and mucocele. These cells can be observed in various radiographs that are able to display maxillary sinus [(2-4)].

Haller's cells can be created by chronic or recurrent sinusitis associated with continuing headache without any clear signs during examinations such as nasal endoscopy[(4)]. These cells are located in the infra-medial orbital rim and hyperpneumatization of the many lead to out flow disorder of maxillary sinus that can play as a primary factor for ethmoiditis or an

increased probability of eye injury during endoscopic ethmoidectomy[5]. CT scans generally used for imaging of the maxillary cells [6]. Panoramic radiography almost shows ethmoidal infraorbital cells. Some studies have evaluated the prevalence of these structures on panoramic radiography and their results showed that the prevalence of these cells is similar to the results of evaluating investigations by CT scan [7, 8].

The presence of Haller's cells in the images was evaluated by two orofacial radiology assistants by using photoshop software (Photoshop CS5 extended, Adobe Systems; Mountain View, CA). In the viewing of images density was not changed but the magnitude was changed.

The presence of Haller's cells was confirmed by four criteria that previously had been used in Ahmad et al's study [7].

1) Well-defined round, oval, or tear-drop shaped radiolucency, single or multiple, unilocular or multilocular, with a smooth border, which may or may not appear corticated.

2) Located medial to infraorbital foramen.

3) All or most of the border of the entity in the panoramic section is visible.

4) The inferior border of the orbit lacks cortication or remains indistinguishable in areas superimposed by this entity.

The aim of our study was to determine the prevalence of ethmoidal infraorbital cells on panoramic radiography. If the obtained results based on CT-scan are not preferable than panoramic radiography, so can be used of this simpler and cheaper method for detection of Haller's cells. Diagnosis of this anatomic variation by dentists is very important because it can cause sinusitis symptoms or orofacial pain.

Materials and Methods

In this descriptive cross-sectional study, we assessed 200 panoramic radiographs of patients older than 18 years old who were referred to the dental school of Shahid Sadoughi University of Medical Sciences, Yazd, Iran in 2010.

These radiographs were exposed by Planmeca EC proline apparatus (prostyleintra, Finland) and were fixed by processor apparatus (Velopex, UK). Suitable radiographs regarding the patient's position, fixation condition, density and contrast, with visible orbital cavity outlines were selected. Gender was defined by documenting data. Data were analyzed by using SPSS 11descriptive statistical methods and Pearson's Chi-square Test.

Results

In this study, 200 panoramic radiographs of patients with the age range of 18 to 80 years old with the mean age of 40.5±14 years were evaluated. 95 males (47.5%) and 105 females (52/5%) enrolled in the study.

Haller's cells were detected in 65 (%32) of evaluated samples (CI=95%).

Among the 65 of evaluated samples, Haller`s cells were detected in 26-39% with confidence interval 95%.

Among these 65 samples, in 18 subjects (27.7%) Haller's cells were present on the left side, in13 subjects on the right side (20%), and 34 subjects (52.3%) showed bilateral Haller's cells.

Among all samples, there was not a significant difference between the frequency of unilateral (n = 31) and bilateral (n = 34) cases (Pv = 0.71).There was no significant difference as well in the presence of Haller's cells in the left (n = 52) and right (n = 47) sides among the 99 detected cells (Pv = 0.615).

The prevalence of Haller's cells was not significantly different regarding gender (Pv = 0.97) (Table 1) and age (Pv = 0.783) (Table 2).

There was no significant difference between unilateral and bilateral presence of Haller's cells in different age groups (Pv = 0.969).Bilateral Haller's cells were significantly more prevalent in females than males (Pv = 0.008).

Table1. The prevalence of Haller's cells based on gender

Gender	Number	Haller's cell (n)	Unilateral (n)	Bilateral (n)	Prevalence
Male	105	34	10	24	32.4
Female	95	31	21	10	32.6
Total	200	65	31	34	32.5

Table2. The prevalence of Haller's cells based on age

Age (years)	Number	Haller's cell(n)	Unilateral (n)	Bilateral (n)	Prevalence (%)
< 30	59	21	9	12	35.6
31-50	99	30	15	15	30.3
51-70	42	14	7	7	33.3
Total	200	65	31	34	32.5

Discussion

Haller's cells are an anatomic entity that are located in the infra medial orbital rim and can affect some sinus diseases [(5)]. The aim of this study was to define the prevalence of Haller's cells on panoramic radiographs. In this study, in65 samples out of 200 evaluated panoramic radiographs, 99 Haller's cells were detected. The difference in the prevalence of unilateral (n = 31) and bilateral (n = 34) Haller's cells was not significant (Pv = 0.17), so was the difference between the presence of Haller's cells in the left (n = 52) and right (n = 47) sides (Pv = 0.615).

There was no significant difference in the prevalence of Haller's cells regarding age and gender.

Ahmad et al [7] and Raina et al [8] evaluated the prevalence of Haller's cells by using panoramic radiographs. Ahmad et al [7] observed Haller's cells in 60 out of 173 evaluated samples (38.2%) that this result was in the range of our results. They didn't observe a significant difference between the bilateral and the unilateral presence of cells on the left and right sides such as our study.

In Raina et al's study [8]16% of 600 subjects showed Haller's cells and the difference between unilateral and bilateral cells was significant. The results of this study about the prevalence of cases with Haller's cells, and unilateral and bilateral presence of cells were different with our results.

Various studies have defined the prevalence of Haller's cells by using CT-scan with different results from 4.7%to 45.1% [2, 4, 6, 9, 10-16]. Among these studies Stack pole et al. [11] (34.4%), Tonai et al. [15] (38.9%) and Maru et al. [17] (36.1%) have approximately reported results in the range of our study.

Of course, comparison of the results of these studies is very difficult because of differences in diagnostic criteria and diversity between observers, and due to this fact that Haller's cells as an anatomic variation may have several of the prevalence in different populations. In addition method of CT-scan can affect the results. Detection of Haller's cells in various studies has been performed by using different definitions that can be a reason for resultant differences [18]. Therefore, Caversaccio et al [1] suggested that Haller's cells should be defined as an anterior ethmoidal cells, localized in the infraorbital region, hollowing out the maxillary bone and originating from the ethmoid labyrinth; the most inferior ones should be defined as Haller`s cells that the use of this definition can cause more exact determination of the Haller's cells prevalence in future studies [1].

In CT-scan, these cells were observed as air cells located along the roof of maxillary sinus under ethmoidal bulla or on the inferior part of the lamina papyracea [2] .Since the ethmoidal Bulla or lamina papyracea cannot be observed in radiographs so we used the criteria of Ahmad et al [7] that an anatomical entity which can be seen in this region is the infraorbital recess, an extension of the maxillary sinus. This recess occupies a medial space as well as lateral to the infraorbital canal [19]. One of the used criteria was only an anatomical view on the medial side of the canal.

The results of several studies emphasize to the clinical importance of Haller`s cells because even if infraorbital ethmoid cells are not diseased, their presence may narrow the ethmoid infundibulum or the ostium of the maxillary sinus [7].

Such anatomic limitation can cause constant Rhino sinusitis [20]. Anatomic obstruction of the infundibulum with the presence of huge Haller's cells can cause blockage in the transmission of fluids.

Alkire and Bhattacharyya [21] evaluated the effects of septum deviation, chonchae bullusa and Haller's cells on the occurrence of acute rhinosinusitis, and their results showed that just obstruction caused by Haller's cells can lead to the disease. Also are view article reported the headache related to Haller's cells [22].and also have been said that Haller cells may also cause sinus disease such as mucocele (3).

Sebrechts et al [23] acknowledged Haller cell inflammation can be as a potential reason of orbital unilateral edema [4] and can be as a main reason of it [3].

On the other hand, some studies suggested that the presence of Haller's cells automatically doesn`t predispose an individual to the sinus disease [2, 24]. Ahmad et al also did not report any symptoms of these diseases [7].In our study exclusively radiographic evidence has been studied and pathological problems and symptoms associated with these cells has not been evaluated.

Conclusion

Infraorbital cells are common anatomic landmarks on panoramic radiography that detection of their presence can provide important information for differential diagnosis of orofacial pain with sinus origin. As our knowledge till now, no study has compared panoramic radiography and CT scan for detection of Haller's cells. Since the Haller's cell is abnormal anatomic variation, there was no indication to perform CT-scan for subjects. However, due to the high prevalence of Haller's cells in studies that used CT-scan (which results were similar to the studies that used panoramic radiography) and also according to the high radiation and cost of CT-scan it cannot be exactly said that CT-scan is the best method for detection of this cells. It is recommended that studies be conducted to compare the ability of these two methods for detection of this landmark.

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