

Haller's Cells on Panoramic Radiograph- A Retrospective Analysis

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Abstract

Objectives: Haller's cells (Infraorbital ethmoid cell) are the anterior ethmoid cells that project along the medial roof of the maxillary sinus and the most inferior portion of the lamina papyracea. Haller's cells can cause obstruction of the ethmoid infundibulum and lead to maxillary sinusitis, retention cyst formation and headache. The aim of this study was to determine the prevalence of Haller's cells on panoramic radiographs.

Materials and Methods: In this retrospective study, 2000 panoramic radiographs were examined for infraorbital ethmoidal cells. Diagnostic criterion given by Ahmad, *et al.* was used to identify ethmoidal infraorbital cells on panoramic radiographs. The data collected was analyzed using chi square test.

Results: Haller's cells were noted in 277 patients, accounting for a prevalence of 13.85%. Of these patients, 83.75% showed unilateral prevalence while in 16.25% there was a bilateral distribution. Prevalence of unilateral type of Haller's cells was statistically significant.

Conclusion: Recognition of the anatomical variants in paranasal sinuses studies may be useful for assisting the physician in the management of patients with sinusopathies. Panoramic radiographs can also be one of the modality for identifying this landmark.

Keywords: Haller's Cells; Infraorbital Ethmoidal Cells; Panoramic Radiograph

Introduction

Human body is a complex yet beautiful mansion created by God which has been designed to meet various day to day activities. Every structure in it is a wonder and since ages many discoverers had found the warmth in expedition of various anatomical structures. Haller's cells are one such discovery which came into light with the efforts of a Swiss anatomist, Albert von Haller in 1743 [1] and were named after him. Although they are anatomical variants in the development of maxilla and paranasal sinuses, they are held responsible for various patient symptoms and are thus clinically significant. These are also denominated as orbitoethmoidal cells or maxillo-ethmoidal cells. But, the name infraorbital ethmoid cell is recommended because it delineate the location and origin of the entity [2].

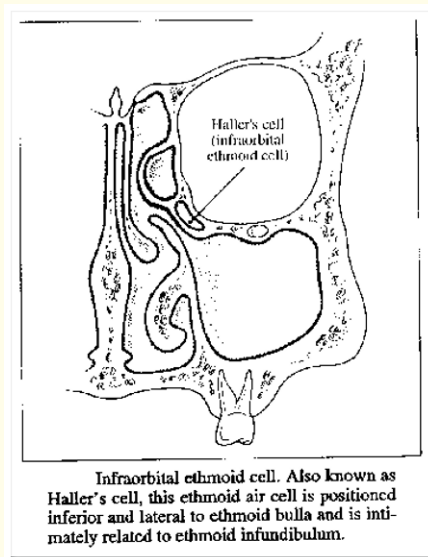


Figure 1

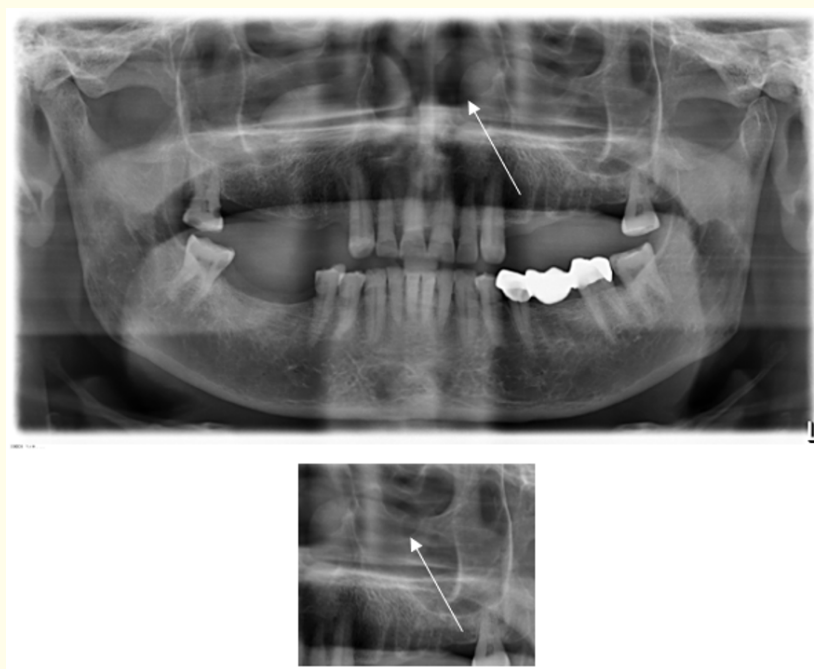


Figure 2: Unilateral haller's cell on left side.

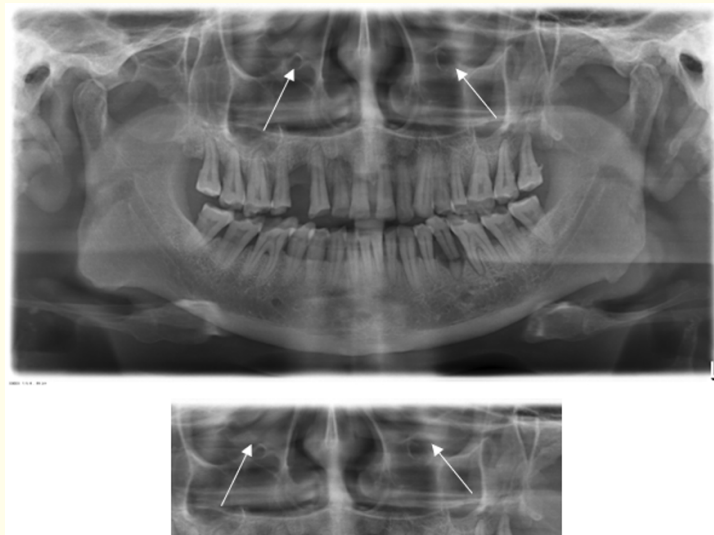


Figure 3: Bilateral haller's cell.

The actual description was done in 18th century and their pathological influence had been realized in 20th century [1]. They had alarmed the science people mainly the dentists, ENT surgeons and ophthalmologists. Many pathologies and symptoms are proved to be associated with this entity like nasal obstruction, impaired nasal breathing, headache, chronic cough and mucocoeles, involvement of orbit, and their ability to push the natural osteum of maxillary sinus downwards and anteriorly causing difficulties during surgery and they may lead to inadvertent entry into orbit [3-6,8-10]. The main consideration for dentists is its ability to cause sinusitis symptoms and orofacial pain [5]. Taking into consideration the fore mentioned complications of these Haller's cells and their implications in giving differential diagnosis to chronic orofacial pain, a study was conducted to enhance the significant role of panoramic radiographs in detection of these Haller's cells.

Materials and Methods

A retrospective review on orthopantomographs was done at Sibar Institute of Dental Sciences. Study data comprised of 2000 patients of both genders (1005 males and 995 females) with an age range of 18 - 70 years who had visited the hospital from May 2013 to August 2013. All the patients had an orthopantomograph as a part of their routine dental investigations. All the patients were categorized into 3 age groups (i.e 18 - 30 yrs, 31 - 50 yrs, 51 - 70 yrs). Digital radiographs were taken using ORTHOPHOS XG5 panoramic x-ray unit from Sirona. Radiographs which depicted trauma involving maxillofacial region, completely edentulous radiographs, and with the evidence of growth defects in the orofacial region were excluded from the study. The radiographs obtained were interpreted for the presence of Haller's cells by two observers blindfolded of each other's results.

The identification of Haller's cells was done based on four criteria that previously had been used in a study by Ahmad., *et al* [3].

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.

Results obtained were subjected to statistical analysis (chi-square test).

Results

Of the 2000 patients, Haller's cells were found in 277 patients. The overall prevalence was 13.85% (Table 1) and the total count of the Haller's cells in these 277 patients was 322. Among the 277 patients with Haller's cells, the cells occurred unilaterally in 232 (83.75%) patients and bilaterally in 45 (16.25%) patients. Haller's cells occurring unilaterally was statistically significant ($p < 0.005$).

Absent	1723	86.15%
Present	277	13.85%
Total	2000	100%

Table 1: Prevalence of Haller's Cells.

Among the unilateral Haller's cells, the cells in 121 (52.15%) patients were present on the right side and the cells in 111 (47.85%) patients were present on the left side (Table 2). Of the radiographs detected with the presence of Haller's cells, 127 (15.11%) were patients aged 18 - 30 years, 101 (13.76%) were patients aged 31 - 50 years and 49 (11.50%) were patients aged 51 - 70 years (Table 3). Among the 277 patients with Haller's cells, 135 (13.43%) were male and 142 (14.27%) were female (Table 4). Prevalence of Haller's cells with respect to age ($p = 0.212$) and gender ($P = 0.587$) was not statistically significant.

Unilateral	232 (83.75%)
Unilateral left	111 (47.85%)
Unilateral right	121 (52.15%)
Bilateral	45 (16.25%)

Table 2: Distribution of Haller's Cells.

Chi square test = 252, Degree of freedom=1, $P < 0.005$ (highly significant).

18-30 yrs (840)	127 (15.11%)
31-50 yrs (734)	101 (13.76%)
51-70 yrs (426)	49 (11.50%)

Table 3: Distribution of Haller's Cells with Respect to Age.

Chi square test = 3.11, Degree of freedom = 2, $P = 0.212$ (not significant).

Males (1005)	135 (13.43%)
Females (995)	142 (14.27%)

Table 4: Distribution of Haller's Cells with Respect to Gender.

Chi square test = 0.295, Degree of freedom = 1, $P = 0.587$ (not significant).

Discussion

Haller's cells are pneumatized cells that project along the medial roof of the maxillary sinus and the most inferior portion of the lamina papyracea [11]. They are also designated as infraorbital, maxillo-ethmoidal or orbito-ethmoidal cells. During the development of ethmoid labyrinth, two main groups of normal variants: the intramural and extramural ethmoid cells will be formed. Extramural ethmoidal cells comprise of Agger nasi cells, Frontal cells, Supraorbital ethmoid cells, Haller and Onodi cells. These are the structures that develop protruding externally to the ethmoid labyrinth. This group is comprised of Agger nasi cells, Frontal cells, Supraorbital ethmoid cells, Haller and Onodi cells [12]. They make up the posterior and superior wall of the ethmoid infundibulum and extend into the floor of the orbit and superior aspect of the maxillary sinus. Whereas, intramural ethmoid cells are intimately related to the ethmoid labyrinth, portrayed by the frontal bulla cells, suprabullar cells, and ethmoid bulla. Appreciation of these structures is important because of their adjacency with the main drainage pathways of the paranasal sinuses [12]. Few of these cells may scale down the mucociliary clearance thus predisposing to inflammatory process within the sinuses. Haller's cell is one such anatomical structure which can predispose to sinusitis [10] or it might block the sinus drainage pathway leading to sinus malventilation, vacuum headache, and pressure headache [6]. So a study was undertaken on Haller's cells by using one of the routine dental investigative procedure i.e panoramic radiography.

In the present study prevalence of Haller's cells was 13.85%. Whereas studies done on Haller's cells using panoramic radiograph showed a varied prevalence compared to our study (38.2%, 16% and 23.61%) by Ahmad., *et al.* and Raina., *et al.*, Nedunchezian K., *et al.* respectively [3,4,15]. This difference could be due to varied sample size, disparity while visualizing Haller's cells in radiograph. In the review of literature many studies were carried out on Haller's cells using CT scan and had shown a varied prevalence of 4.7 - 45.1% [12,20]. Our study showed a percentage that falls within this range.

In the current study out of 277 radiographs with Haller's cells, 232 were shown with the presence of Haller's cells unilaterally and the rest 45 were bilateral and they proved to be statistically significant ($p < 0.005$). Our results were in accordance with a study done by Raina., *et al.* and Jitender solank., *et al.*, who stated that there was significance difference in prevalence of unilateral and bilateral Haller's cells [4,14]. However some investigators don't show significant variation between unilateral and bilateral prevalence of Haller's cells (Ahmad., *et al.* and Khayam., *et al.*) [3,5]. This could be because of sample population, clear delineation of Haller's cell and technique of radiographic procedure.

No statistical significant variation was seen in distribution of unilateral Haller's cells on right and left side, which was supported by Raina., *et al.* and Ahmad., *et al.* [3,4].

In the current study prevalence of Haller's cells between the age groups was 15.11% (18 - 30 yrs), 13.76% (31 - 50 yrs), 11.50% (51 - 70 yrs) and distribution between these age groups was not statistically significant. Our study was supported by Raina., *et al.*, Khayam., *et al.* and Chaudhari., *et al.* who showed no significant prevalence of haller's cells with respect to age [4,5,16].

Although gender was taken into consideration by many researches our study proved to have no significant correlation between male and female radiographs which is supported by Raina., *et al.* on OPG and Basic., *et al.*, who had done CT imaging study on haller's cells [4,17].

Literature showed many studies on Haller's cells using CT scan, as it is considered as the choice in the evaluation of uncomplicated paranasal sinuses inflammatory processes and in preoperative planning before endonasal interventions for giving better details on normal anatomy.

CBCT is one of the recent technology that has been also used to evaluate haller cells. A study was done by Mathew R., *et al.* for detection of haller cells using CBCT with prevalence rate of 60% [18]. In another study by Pallavi Kamdi., *et al.* prevalence of haller cells in cbct was 49% [19].

Besides many advantages CT, CBCT have limitations such as more radiation exposure to the patients and are expensive²¹. Haller's cells can be missed on coronal CT depending on window settings [7].

In our study we used panoramic radiography to identify haller cells as it is the routine dental investigation with minimal cost and less radiation exposure.

Conclusion

The role of dental panoramic radiograph in detection of various systemic diseases has already been proved. Our study supported its role to move a step forward in identifying Haller's cells. Early detection of Haller's cells can be helpful in prevention of complications of various endonasal procedures and thereby redeeming patents suffering. However panoramic radiography is not considered as a gold standard for identification [1] but can be used as an adjuvant along with other modalities.

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