



## CHARACTERISTICS OF INFRAORBITAL ETHMOID (HALLER'S) CELLS – A PANORAMIC RADIOGRAPHIC STUDY

**Dr Mohit Sharma**

Lecturer Department Of Oral Medicine and Radiology KMC Dental College and Hospital Kathmandu – 21266 Nepal - Corresponding author

**Dr Vivek Bikram Thapa**

MDS, Lecturer Department Of Orthodontics KMC Dental College and Hospital Kathmandu – 21266 Nepal

**Dr Deepesh Bikram Thapa**

MDS ,Lecturer Department Of Periodontics and oral Implantology KMC Dental College and Hospital Kathmandu – 21266 Nepal

### ABSTRACT

**Objectives:** Haller's cells or infraorbital ethmoid cells represent the ethmoidal pneumatization of the superior aspect of the maxillary sinus and floor of the orbit. The clinical importance of these prompted this study with an objective to reveal the occurrence and characteristics of Haller's cells on panoramic radiographs.

**Methods:** The study group consisted of 250 healthy adult subjects of any gender in the age range of 18-60 years. Panoramic radiograph was taken and inferred for the occurrence of Haller's cells for each patient. The data collected was submitted for statistical analysis: Frequencies/percentages, Descriptive Statistics, Chi-square test and Cross tabulation (contingency table analysis) to obtain the results.

**Results:** Haller's cells were seen in 42 subjects accounting for a prevalence of 16.8%. Of these, 71.4% were unilateral while 28.5% bilateral. Most of the cells were round or ovoid in shape. Unilocular type of Haller's cells seen unilaterally was statistically significant.

**Conclusions:** This study has endeavored to discover the characteristics of Haller's cells on panoramic radiographs. A depiction of Haller's cells on these radiographs may prove vital in enumerating the differential diagnosis for patients afflicted with intractable oro-facial pain and reduce the risk of untoward intraoperative complications during endonasal procedures.

**KEYWORDS :** Haller's cells, oro-facial pain, panoramic radiographs, Infraorbital ethmoid air cells

### INTRODUCTION

Haller's cells are described as air cells located below the ethmoid bulla beside the roof of the maxillary sinus and most inferior portion of the lamina papyracea, also containing air cells situated within the ethmoid infundibulum.<sup>1</sup> Haller's cells first defined by the Swiss Anatomist Albert von Haller in 1765 and are also acknowledged as maxillo-ethmoidal or orbito-ethmoidal cells.<sup>2,3</sup> Haller's cells are noted in individuals with pneumatization of the lateral crus.<sup>4</sup>

Although anatomic variations in the evolution of the nose and paranasal sinuses, they have been held accountable for patient's symptoms and are thus clinically significant.<sup>1,2</sup> Besides, disquieting oro-facial pain and sinusitis, various pathologies and symptoms connected with this structure include nasal obstruction, impaired nasal breathing, headache, chronic cough, and mucocoeles.<sup>2,3,5,6,7,8</sup> Haller's cells can also limit entrance to the maxillary sinus or the anterior ethmoidal cells during endonasal procedures making it vital for the surgeon to be attentive of such variations that may dispose the patient to higher risk of intraoperative complications.<sup>4,5</sup>

Infraorbital ethmoid cells have been depicted as distinct round, oval, or tear-drop shaped radiolucency (single or multiple), unilocular or multilocular, with a well defined border with or without cortication, situated medial to the infraorbital foramen according to a solitary panoramic radiographic study.<sup>2</sup> The clinical importance of these entities and the absence of significant research instigated this study with a purpose to determine the incidence and analyze the features of Haller's cells on panoramic radiographs.

### MATERIALS AND METHODOLOGY

The sample encompassed 250 healthy adult subjects of any gender in the age groups of 18 to 60 years included by simple random sampling. Subjects with past history of trauma and/or surgery in the maxillofacial region, systemic diseases disturbing growth and development, clinical and/or radiographic indication of developmental anomalies/pathologies involving the maxillofacial region were omitted from the sample. The Institutional ethical clearance was acquired prior to the conduct of the study. One panoramic radiograph (Planmeca ProMax ,Helsinki, Finland, under similar

conditions- 80 Kvp,12 mA,18 s) for each of the study subject was made following clinical examination. The radiographs acquired were serially inferred for the presence of Haller's cells under ideal viewing conditions. The appreciation of the same was made if an anatomic variation satisfied the criteria suggested by Ahmad et al.<sup>2</sup> The interpretations regarding Haller's cells were noted in the subjects' particular proformas. The collected data was tabulated and put to statistical analysis namely Frequencies/percentages, Descriptive Statistics, Chi-square test and Cross tabulation (contingency table analysis) using SPSS for windows to obtain the results.

### RESULTS

Out of total 250 study subjects, 115 were males and 135 were females.

Of the 250 study subjects, Haller's cells were noted in 42 subjects. The overall occurrence of Haller's cells was 16.8%. The overall mean age of subjects with Haller's cells was 28.1 years. The overall mean age of male subjects and female subjects with Haller's cells was 27.9 years and 30.87 years respectively. Of the 42 cases with Haller's cells, 17 (24.2%) were found in subjects between 18 to 30 years, 15 (15%) between 31 to 45 years and 10 (12.5%) in subjects between 46 to 60 years. Amongst the 42 cases with Haller's cells, 20 (17.4%) were in males and 22 (16.3%) were noted in females.(Table 1, 2)

Of the 42 cases with Haller's cells, 30 (71.4%) occurred unilaterally and 12 (28.5%) occurred bilaterally.

Amongst the 42 cases of Haller's cells, 30 were unilateral unilocular (71.4%), 10 (23.8%) were bilateral unilocular and 2 (4.7%) were of a bilateral mixed pattern i.e. both unilocular and multilocular patterns were noted on the right and left side.(Table 3)

Majority of the Haller's cells (41 i.e. 97.91%) were round or ovoid in shape with only one case illustrating a tear drop shape. (figure 1, 2)

The interrelationship between age, gender and side were found to be non-significant. Unilocular type of Haller' cells occurring unilaterally were statistically significant.

**DISCUSSION**

A wide range of studies highlight the clinical significance of Haller's cells because even if infraorbital ethmoid cells are not diseased, their occurrence may constrict the ethmoid infundibulum or the ostium of the maxillary sinus<sup>2</sup>. Such anatomic limitation can lead recurrent/chronic Rhino sinusitis<sup>9</sup>. Anatomic blockade of the infundibulum with large Haller's cells can cause obstruction in the conduction of fluids. Sebrechts et al<sup>10</sup> accredited Haller cell inflammation as a possible reason of unilateral orbital edema. The comparison of the results of different studies on haller cells is very difficult because of dissimilarities in diagnostic criteria and diversity between observers, and because of this fact that Haller's cells as an anatomic variation have unlike prevalence in different populations. Different definitions were used for detection of haller cells in different studies this can be a reason for the resultant differences<sup>13</sup>.

In contrast, various studies advocated that the presence of Haller's cells automatically doesn't predispose an individual to the sinus disease<sup>14</sup>. Ahmad et al also did not relate any symptoms of these diseases<sup>7</sup>. In the present study, radiographic evidence has solely been studied and pathological problems and symptoms related with these cells have not been assessed.

A wide range of prevalence (4.7 to 45.1%) of infraorbital ethmoid cells using CT images has been reported in literature.<sup>1,2,5,7,9,10,11,12,13</sup> Although our study scrutinized panoramic radiographs, the prevalence (16.8%) falls within the range of these past studies. A much higher prevalence of 38.2% has been cited according to the sole panoramic radiographic study on Haller's cells conducted by Ahmad et al in 2006.<sup>2</sup> This disparity could have resulted from variations in the populations studied, sample sizes and the subjective judgment pertaining to the presence or absence of Haller's cells.

Amongst the 42 cases of Haller's cells, a substantial number i.e. 17 (64.6%) were found in subjects between 18 to 30 years. These findings are in harmony with the study done by M Kantarci et al.<sup>5</sup> A male: female ratio of 1:1.1 for the presence of Haller's cells was noted. The distribution of Haller's cells with respect to gender was found to be statistically non-significant. This is consistent with the results of CT imaging study on Haller's cells by Basic et al who have reported no difference in prevalence of Haller's cells between men and women.<sup>1</sup>

Unilateral occurrence of Haller's cells was found to be statistically significant. This is consistent with the previous studies where Haller's cells were seen in maximum number of cases unilaterally than bilaterally.<sup>2,5,9,11</sup> The presence of bilateral Haller's cells varies from 26% to 50%.<sup>9</sup> According to our study 23.8% of the cells were present bilaterally. Study population, cell definition, and scanning technique probably account for this variation.

No statistically significant differences were noted in the occurrence of Haller's cells on the right and left side. Ahmad et al, stated an almost equal distribution of Haller's cells on the right and left sides.<sup>2</sup>

Unilocular type of Haller's cells occurring unilaterally was highly significant. Also most of the Haller's cells were round or ovoid in shape with very few cases depicting a tear drop shape. The types, number and shape of Haller's cells has not been determined in the past.

In conclusion, this study specifies that panoramic radiographs are a reliable source for the depiction and delineation of Haller's cells in significant number of cases. The present study explored the variations of Haller's cells with respect to age and gender, type, number, and shape which has scarcely been documented in the past. Such a description of the infraorbital ethmoid (Haller's) cells may help in clear identification of these entities and aid in charting out the differential diagnosis for patients suffering from intractable oro-facial pain thereby avoiding other expensive and invasive

diagnostic modalities. Detection of Haller's cells may also forewarn the surgeons prior to endonasal procedures thus preventing any untoward intraoperative complications. Further studies employing advanced imaging modalities would aid in justifying our findings and provide a more precise description of these less explored entities.

**Table I: Distribution of Haller's cells with respect to age**

<b>18-30 years (70)</b>	<b>24.2%</b>
<b>31-45 years (100)</b>	<b>15%</b>
<b>46-60 years (80)</b>	<b>12.9%</b>
<b>Contingency coefficient value 0.073, P = 0.200 (&gt; 0.05)</b>	

**Table II: Distribution of Haller's cells with respect to gender**

<b>Male (115)</b>	<b>17.4%</b>
<b>Female (135)</b>	<b>16.3%</b>
<b>Contingency coefficient value 0.040, P = 0.320 (&gt; 0.05)</b>	

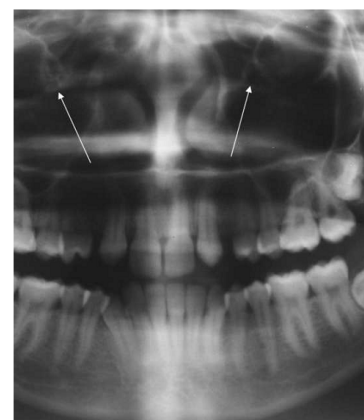
**Table III: Distribution of Haller's cells with respect to type**

<b>Unilocular (Unilateral)</b>	<b>30 (71.4%)</b>
<b>Unilocular (Bilateral)</b>	<b>10 (23.8 %)</b>
<b>Unilocular and Multilocular (Mixed pattern: Bilateral)</b>	<b>02 (4.7 %)</b>

**Figure 1: Cropped panoramic radiograph showing unilateral (R) unilocular Haller's cell**



**Figure 2: Cropped panoramic radiograph showing bilateral Haller's cell**



**REFERENCES**

1. Basic N, Basic V, Jukic T, Basic M, Jelic M and Hat J. Computed tomographic imaging to determine the frequency of anatomical variations in pneumatization of the ethmoid

- bone, *Eur Arch Otorhinolaryngol* (1999) 256:69-71.
2. Ahmad M , Khurana N, Jaber J, Sampair C and Kuba RK, Prevalence of infraorbital ethmoid (Haller's cells) on panoramic radiographs. *Oral Surg Oral Med Oral Pathol Oral Radiol Oral Endod* 2006;101:658-61.
  3. Yanagisawa E, Marotta JC, Yanagisawa K. Endoscopic View of a mucocele in an infraorbital ethmoid cell (Haller cell), *Ear Nose Throat J* 2001;80:364-368.
  4. Johannes Lang, Clinical anatomy of nose, nasal cavity and paranasal sinuses: A basis for diagnosis and surgery, Thieme, 1989:70.
  5. Kantarci M, Karasen RM, Alper F, Onbas O, Okur A, Karaman A. Remarkable anatomic variations in paranasal sinus region and their clinical importance. *Eur J Radiol* 2004;50:296-302.
  6. Braun H, Stammberger H. Pneumatization of turbinates. *Laryngoscope* 2003;113:668-72.
  7. Tatli MM, San I, Karaoglanoglu M. Paranasal sinus computed tomographic findings of children with chronic cough. *Int J Pediatr Otorhinolaryngol* 2001, 60:213-217.
  8. Holinger LD, Sanders A D. Chronic cough in infants and children: An update. *Laryngoscope*, 101: June 1991, 596-605.
  9. Braun H, Stammberger H. Pneumatization of turbinates. *Laryngoscope* 2003;113:668-72.
  10. Sebrechts H, Vlamincq S, Casselman J. Orbital edema resulting from Haller's cell pathology: 3 case reports and review of literature. *Acta Otorhinolaryngol Belg*. 2000;54(1):39-43.
  11. Luxenberger W, Anderhuber W, Stammberger H. Mucocele in an orbitoethmoidal (Haller's) cell (accidentally combined with acute contralateral dacryocystitis). *Rhinology* 1999;37:37-9.
  12. Arslan H, Aydinlioğlu A, Bozkurt M, Egeli E. Anatomic variations of the paranasal sinuses: CT examination for endoscopic sinus surgery. *Auris Nasus Larynx*. 1999;26(1):39-48.
  13. Bolger WE, Butzin CA, Parsons DS. Paranasal sinus bony anatomic variations and mucosal abnormalities: CT analysis for endoscopic sinus surgery. *Laryngoscope* 1991;101:56-64.