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PREVALENCE OF ETHMOIDAL INFRAORBITAL CELLS IN PANORAMIC RADIOGRAPHY

Oral Medicine

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ABSTRACT

Aim: Ethmoidal infraorbital (Haller's) cells are extensions of ethmoid air cells into the areas of the orbit and maxillary sinus. Presence of these cells with or without disease can narrow the ethmoid infundibulum or ostium of maxillary antrum and result in persistent rhinosinusitis, recurrent sinusitis, and other clinical symptoms, so their detection in panoramic radiographs can be useful in diagnosis of the origin of these problems. A description of Haller's cells on these radiographs may prove vital in enumerating the differential diagnosis for patients afflicted with intractable orofacial pain and reduce the risk of untoward intraoperative complications during endonasal procedures. The clinical significance of these entities and the lack of noteworthy research initiated this study with an aim to determine the prevalence and scrutinize the characteristics of Haller's cells on panoramic radiographs.

Materials and Methods: In this descriptive cross-sectional study, 300 panoramic radiographs were examined for ethmoidal infraorbital cells. A diagnostic criteria 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: A total of 300 subjects were included in the study of which 183 were males whereas 117 were females. The prevalence of ethmoidal infraorbital cells was 24% (27.9% for males and 17.9% for females. Bilateral and unilateral ethmoidal infraorbital cells were present in equal no. of subjects.

Conclusion: This study has attempted to explore the characteristics of Haller's cells on panoramic radiographs. Although CT-Scan has been accepted as a method for identifying this landmark, it appears that panoramic radiography can also be used for this purpose as a simpler and cheaper method for detection of Haller's cells.

KEYWORDS

Ethmoidal infraorbital cells, Haller's cells, Panoramic radiography, Orofacial pain

Introduction

Haller's cells, first described by the Swiss anatomist Albert von Haller in 1765, also known as maxillo ethmoidal or orbito ethmoidal cells are defined as air cells situated beneath the ethmoid bulla along the roof of the maxillary sinus and the most inferior portion of the lamina papyracea, including cells located within the ethmoid infundi bulum.[1,2,3] Haller's cells arise in individuals with pneumatisation of the lateral crus.[4] This structure is related to certain conditions like sinusitis, headache and mucocele. These cells can be observed in various radiographs that are able to reveal maxillary sinus radiographically.[5-7]

In addition to distressing orofacial pain and numerous pathologies Haller's cells can also restrict access to the maxillary sinus or the anterior ethmoidal cells during endonasal procedures, making it difficult for the surgeon to be aware of such variations that may incline the patient to increased risk of intraoperative complications.[4,8] The clinical importance of these entities initiated this study with an aim to determine the prevalence and characteristics of Haller's cells on panoramic radiographs.

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.[7] 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.[9] CT scans generally used for imaging of the maxillary cells but Panoramic radiography also reveals ethmoidal infraorbital cells to a greater extent. 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.[10,11]

The presence of Haller's cells in the images was evaluated by two orofacial radiologists. 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[10].

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.

Materials and Methods

In this study, 300 panoramic radiographs of patients older than 18 years who reported to the Indira Gandhi Government Dental College Jammu were assessed. The study group comprised of healthy adults of both genders with an age range of 18–60 years. They were selected by simple random sampling. Patients with a history of trauma and/or surgery involving the maxillofacial region, systemic diseases affecting growth and development, or clinical and/or radiographic evidence of developmental anomalies/pathologies affecting the maxillofacial region were excluded from the study.

These radiographs were exposed by Planmeca OPG machine and were viewed using Planmeca Romexis software. The radiographs obtained were serially interpreted for the presence of Haller's cells.

Data were analyzed by using SPSS 11descriptive statistical methods and Pearson's Chi-square Test.

Results

In this study, 300 panoramic radiographs of patients with the age range of 18 to 60 years old were evaluated. 183 males (61%) and 117 females (39%) enrolled in the study. Haller's cells were detected in 72 (24%) of evaluated samples.

Among these 72 samples, in 19 subjects (26.4%) Haller's cells were present on the left side, in 17 (23.6%) subjects on the right side whereas 36 subjects (50%) showed bilateral Haller's cells.

Among the 72 subjects with Haller's cells, in 49 the cells were unilateral unilocular (68.05%), whereas in 15 (20.83%) they were bilateral unilocular and in 8 (11.11%) they were of a bilateral mixed pattern, i.e. both unilocular and multilocular patterns were noted on the right and left side.

No significant difference was noticed between unilateral and bilateral presence of Haller's cells in different age groups. Bilateral Haller's cells were significantly more prevalent in males than females. (Table 1and 2)

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

Gender	Number	Haller's cell (n)	Unilateral (n)	Bilateral (n)	Prevalence
Male	183	51	19	22	27.9
Female	117	21	17	14	17.9
Total	300	72	36	36	24

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

Age (years)	Number	Haller's cell(n)	Unilateral (n)	Bilateral (n)	Prevalence (%)
< 30	83	27	13	16	32.5
31-40	139	33	15	11	23.7
41-60	78	12	8	9	15.4
Total	300	72	36	36	24

DISCUSSION:

On a panoramic radiograph, infraorbital ethmoid cells can be confirmed by their location, that is, well-defined radiolucency situated medial to the inferior orbital canal. As visualized on reformatted panoramic radiograph generated from a CT examination, infraorbital ethmoid cells are located lateral to nasolacrimal canal. On CT examination, the diagnosis of infraorbital ethmoid cells is made if the air cells are present along the roof of maxillary sinus, below the ethmoid bulla, or on the inferior most part of lamina papyracea.[12] Because ethmoid bulla and lamina papyracea are not detected on a panoramic radiograph, above mentioned criteria was developed for identifying infraorbital ethmoid.

The aim of this study was to define the prevalence of Haller's cells on panoramic radiographs. The difference in the prevalence of unilateral (n = 36) and bilateral (n = 36) Haller's cells was not significant, so was the difference between the presence of Haller's cells in the left and right sides.

Ahmad et al[10] and Raina et al[11] evaluated the prevalence of Haller's cells by using panoramic radiographs. Ahmad et al[10] observed Haller's cells in 60 out of 173 evaluated samples (38.2%). 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[11] 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%.[13-18] Among these studies Stack pole et al[13] (34.4%), Tonai et al[17] (38.9%) and Maru et al [19] (36.1%) have approximately reported results in the range of our study.

The distribution of Haller's cells with respect to gender was not statistically significant. This is consistent with the results of a CT imaging study on Haller's cells by Basic et al[1] who reported no difference in prevalence of Haller's cells between males and females. No statistically significant differences were noted in the occurrence of Haller's cells on the right and left side. In the study by Ahmad et al[10] an almost equal distribution of Haller's cells was found on the right and left sides.

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. Detection of Haller's cells in various studies has been performed by using different definitions which can be a reason for resultant differences.[20] Therefore, Caversaccio et al[21] 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.

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. Since the ethmoidal Bulla or lamina papyracea cannot be observed in radiographs so we used the criteria of Ahmad et al[10] 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. 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.[10] Such anatomic limitation can cause constant Rhino sinusitis[22]. Anatomic obstruction of the infundibulum with the presence of huge Haller's cells can cause blockage in the transmission of fluids.

Alkire and Bhattacharyya[23] 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. Sebrechts et al[24] acknowledged Haller cell inflammation can be as a potential reason of orbital unilateral edema.

On the other hand, some studies suggested that the presence of Haller's cells automatically doesn`t predispose an individual to the sinus disease.[25,26] Ahmad et al also did not report any symptoms of these diseases.[11] 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, limited research has been done to compare panoramic radiography and CT scan for detection of Haller's cells. It is recommended that studies be conducted to compare the ability CT Scan and Panoromic radiography for detection of this landmark. Further studies employing advanced imaging modalities would aid in justifying our findings and provide a more precise description of these less explored entities.

References

1. Basic N, Basic V, Jukic T, Basic M, Jelic M, 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, Jaberi J, Sampair C, Kuba RK. Prevalence of infraorbital ethmoid (Haller's cells) on panoramic radiographs. Oral Surg Oral Med Oral Pathol Oral Radiol Oral Endod 2006; 101: 658–661.
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. Lang J. Clinical anatomy of nose, nasal cavity and paranasal sinuses:a basis for diagnosis and surgery. New York, NY: Thieme; 1989.
5. 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.
6. Luxenberger W, Anderhuber W, Stammberger H. Mucocele in an orbitoethmoidal (Haller's) cell (accidentally combined with acute contralateral dacryocystitis). Rhinology 1999;37:37-9.
7. Wanamaker HH. Role of Haller's cell in headache and sinus disease: a case report. Otolaryngol Head Neck Surg 1996;114: 324-7.
8. 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.
9. Rice DH, schaefer SD. Endoscopic paranasal sinus surgery. 3th ed. philadephia: Walsworth publishing Co. 2004. Chp 1:26.

10. Ahmad M, Khurana N, Jaberi J, Sampair C, Kuba RK. Prevalence of infraorbitalethmoid (Haller's) cells on panoramic radiographs. Oral Surg Oral Med Oral PatholOral RadiolEndod. 2006;101(5):658-61.
11. Raina A, Guledgud MV, Patil K. Infraorbitalethmoid (Haller's) cells: apanoramic radiographic study. DentomaxillofacRadiol. 2012;41(4):305-8.
12. 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.
Kayalioglu G, Oyar O, Govsa F. Nasal cavity and paranasal sinus bony variations: a computed tomographic study. Rhinology 2000; 38:108-13.
13. Stackpole SA, Edelstein DR. The anatomic relevance of the Haller cell in sinusitis. Am J Rhinol 1997;11:219-23.
14. Earwaker J. Anatomic variants in sinonasal CT. Radiographics 1993;13:381-415.
15. Milczuk HA, Dalley RW, Wessbacher FW, Richardson MA. Nasal and paranasal sinus anomalies in children with chronic sinusitis. Laryngoscope 1993;103:247-52.
16. Tatli MM, San I, Karaoglanoglu M. Paranasal sinus computed tomographic findings of children with chronic cough. Int J PediatrOtorhinolaryngol 2001;60:213-7.
17. Tonai A, Baba S. Anatomic variations of the bone in sinonasal CT. ActaOtolaryngolSuppl 1996;525:9-13.
18. Zinreich SJ, Kennedy DW, Rosenbaum AE, Gayler BW, Kumar AJ, Stammberger H. Paranasal sinuses: CT imaging requirements for endoscopic surgery. Radiology 1987;163:769-75.
19. Maru YK, Gupta V. Anatomic variations of the bone in sinonasal C.T. Indian JOtolaryngol Head Neck Surg. 2001;53(2):123-8.
20. Arslan H, Aydinlioğlu A, Bozkurt M, EgeliE.Anatomic variations of the paranasal sinuses: CT examination for endoscopic sinus surgery.AurisNasus Larynx. 1999;26(1):39-48.
21. Caversaccio M, Boschung U, Mudry A. Historical review of Haller's cells. AnnAnat. 2011;193(3):185-90.
22. Braun H, Stammberger H. Pneumatization of turbinates. Laryngoscope 2003;113:668-72.
23. Alkire BC, Bhattacharyya N. An assessment of sinonasal anatomic variantspotentially associated with recurrent acute rhinosinusitis. Laryngoscope. 2010;120(3):631-4.
24. Sebrechts H, Vlaminck S, Casselman J. Orbital edema resulting from Haller's cell pathology: 3 case reports and review of literature. ActaOtorhinolaryngol Belg. 2000;54(1):39-43.
25. 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.
26. Yanagisawa E, Citardi MJ. Endoscopic view of the infraorbitalethmoid cell (Haller cell). Ear Nose Throat J 1996;75:406-7.