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The radiological study of Ethmoidal infraorbital (Haller's) cells among adult Sudanese Subjects

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Abstract *: Ethmoidal infraorbital (Haller's) cells are extensions of ethmoidal air cells into the areas of the orbit and maxillary sinus. They 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 the infundibulum. Ethmoidal Infraorbital cells may be visualized by a variety of imaging methods that show a view of the maxillary sinus. This study aimed to determine the prevalence of ethmoidal infraorbital cell on CT scan in Sudanese population and to compare them statistically with available data worldwide. The study population involved 29 males (47.5%) and 32 females (52.5 %) with a mean age of 37 years. They were explored in the radio-diagnostic department of Ribat University Teaching Hospital, Khartoum- Sudan in the period from March to September 2015. Patients were scanned on slice collimation of 1mm thickness with slice thickness of 4 mm. CT scans were reviewed in axial, coronal, and sagittal planes in bony windows and reported the results in data sheet. Statistical analysis was performed using SPSS, and compared with previous results on similar studies. Haller's cells were present bilaterally in 7 cases (11.5%), unilaterally in 17 cases (27.8%) and were completely absent in 37 cases (60.7%). Determination of these variations aids in providing a better surgical orientation and avoiding or minimizing the possible complications.*

Keywords : *Computed tomography scans, Ethmoidal infraorbital cells, Haller's cells, Paranasal sinuses.*

I. Introduction

CT is extremely useful in the preoperative planning and in postoperative control in cases of endonasal interventions for providing important details on the normal anatomy and its variants. [1,2] Certain anatomical variations are thought to be predisposing factors for the development of sinus diseases and thus it becomes necessary for the radiologist to be aware of these variations, especially if the patient is a candidate for functional endoscopic sinus surgery (FESS).[3] The anatomy of nasal cavity and paranasal sinuses(PNS) differ significantly from patient to patient; certain distinct variations are found most frequently among the general population.[4] The presence of anatomical variations must be noted in order to attain a full understanding of the individual patient as well as to develop an accurate diagnosis.[5,6]

Haller's cells are extramural ethmoidal cells that pneumatize inferiorly to the orbital floor, extending from the ethmoid labyrinth, below the ethmoid bulla, towards the interior of the maxillary sinus.[7] They were named by Haller in 1765, and known by other names such as orbitoethmoidal and maxilloethmoidal cells.[8] Haller's cells can be produced by chronic or recurrent sinusitis associated with continuing headache, without any clear signs during examinations such as nasal endoscopy.[8] In addition to distressing orofacial pain and sinusitis, numerous pathologies and symptoms associated with this entity include nasal obstruction, impaired nasal breathing, headache, chronic cough and mucoceles.[9,10,11] Haller's cells may become enlarged and cause obstruction of the posterior aspect of the ethmoidal infundibulum and ostium of the maxillary sinus leading to maxillary sinusitis. [10, 12]

This study aimed to determine the prevalence of the Ethmoidal infraorbital (Haller's) cells on CT scan in Sudanese population according to location, sex and age and to compare them statistically with available data worldwide.

II. Methods

This was an observational analytical cross-sectional study of adult Sudanese subjects depending on their age and sex. The study was conducted to determine the prevalence of clinically significant anatomical variations of the ethmoidal sinuses at radio-diagnostic department of Ribat University Teaching Hospital, Khartoum- Sudan. Patients with congenital deformities, previous surgery, trauma or malignancy of the nose, paranasal sinuses or maxillofacial region were excluded from the study.

The study variables were age, sex and prevalence of the Haller's cell. Presence of specific anatomical variations was also recorded (Agger nasi cell, Onodi cell, Supra-orbital cells, Concha Bullosa and Paradoxical middle turbinate). Patients were scanned on slice collimation of 1mm thickness with slice thickness of 4 mm.

The name, age, and sex were recorded. CT scans were reviewed in axial, coronal, and sagittal planes in bony windows and reported the results on a data sheet.

Statistical analysis was performed using SPSS, and compared with previous results of similar studies.

III. Results

A total of 61 patients were enrolled in this study. There were 29 males (47.5%) and 32 females (52.5%). (Table 1). The age of the subjects ranged from 10-85 yrs with 60.7% between 21-50 yrs. Haller's cells were present bilaterally in 7 cases (11.5%), unilaterally in 17 cases (27.8%) and were completely absent in 37 cases (60.7%), (Table 2). Haller's cell were found bilaterally in 4 males (13.8%), while present unilaterally in 6 males (20.7%) and absent in 19 males (65.5%), (Table 3). They were found bilaterally in 3 females (9.4%), while present unilaterally in 5 females (15.6%) and absent in 24 females (75.0%), (Table 4). Regarding the age, the Haller's cells were found bilaterally in 3 cases in (21-30) yrs and 2 cases in (10-20, 51- 60) yrs age groups. They were present unilaterally in 5 cases (21-30) yrs, 4 cases in (10-20, 41-50) yrs, 3 cases in (31- 40) yrs and 1 case in (61-70) yrs, while there were no Haller's cells found in (71-80 and 81-90) age groups, (Table 5). Haller's cells are best visualized on coronal images (Fig 1).

Table (1): Distribution of gender (Male, Female) among the study group

Gender	Frequency	Percent
Male	29	47.5
Female	32	52.5
Total	61	100

Table (2): Presence of Haller's cells (IOC) among the study group

Pattern	Frequency	Percent
Bilaterally	7	11.5
Unilaterally	17	27.8
Absent	37	60.7
Total	61	100

Table (3): The Haller's cell (IOC) pattern in males

Pattern	Frequency	Percent
Bilaterally	4	13.8
Unilaterally	6	20.7
Absent	19	65.5
Total	29	100.0

Table (4): The Haller's cells (IOC) pattern in females

Pattern	Frequency	Percent
Bilaterally	3	9.4
Unilaterally	5	15.6
Absent	24	75.0
Total	32	100.0

Table (5): The correlation between age groups and pattern of the Haller's cells (IOC)

Age groups	Pattern	Frequency	Percent
10-20	Bilaterally	2	3.3
	Unilaterally	4	6.6
	Absent	7	11.5
21-30	Bilaterally	3	4.9
	Unilaterally	5	8.2
	Absent	7	11.5
31-40	Bilaterally	0	0
	Unilaterally	3	4.9
	Absent	4	6.6
41-50	Bilaterally	0	0
	Unilaterally	4	6.6
	Absent	11	18.0
51-60	Bilaterally	2	3.3
	Unilaterally	0	0
	Absent	5	8.2

61-70	Bilaterally Unilaterally Absent	0 1 1	0 1.6 1.6
71-80	Bilaterally Unilaterally Absent	0 0 1	0 0 1.6
80+	Bilaterally Unilaterally Absent	0 0 1	0 0 1.6
Total		61	100

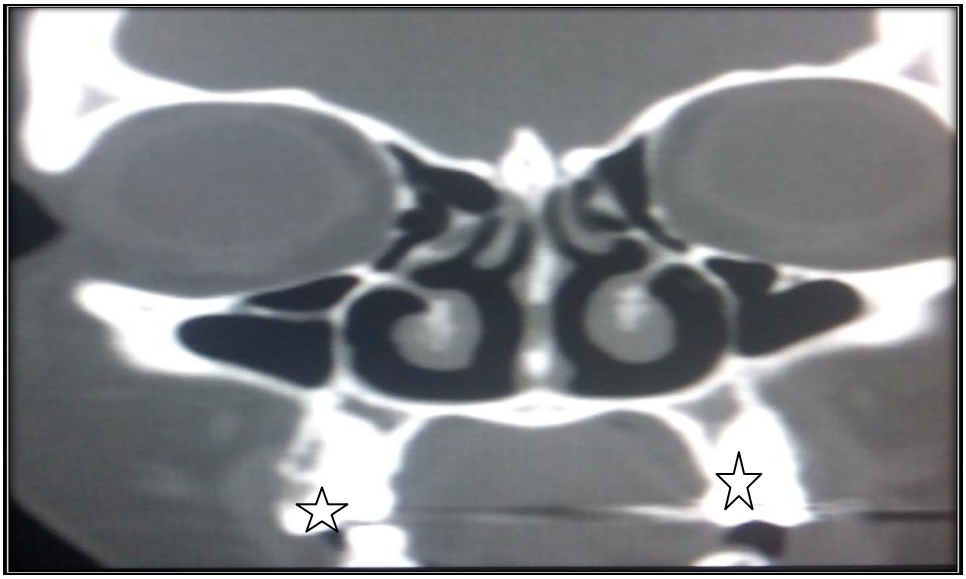

Figure (1): Coronal CT shows bilateral Haller's cells (IOC) (stars)

IV. Discussion

Haller's cells are anatomical variations in the development of the nose and paranasal sinuses, they have been held responsible for patient's symptoms and are thus clinically significant. [13,14] 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.[15]

Prevalence of Haller cells in our study was (39.4%). They observed bilaterally in 7 cases (11.5%), unilaterally in 17 (27.9%) and they were absent in 37 (60.7%). It is nearly similar to the prevalence which was reported by Ahmad et al (38.2%), [14] Tonai and Baba (36%), [16] and Maru (36%). [17] High prevalence was noted by Bolger et al as (45.1%). [18] Lower prevalence of Haller's cell has been reported by Mohammad and Abd El-Monem as (8%) [19] and (1%) by Liu et al.[20] 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.[14] Stammberger and Wolf considered the existence of these cells as a predisposing cause for recurrent maxillary sinusitis.[21] Sebrechts et al. [22] acknowledged Haller cell inflammation can be as a potential reason of orbital unilateral edema and can be as a main reason of it.

V. Conclusion

The development and refinement of computerized tomography (CT) imaging has allowed detailed assessment of each individual's paranasal sinus anatomy, thus providing a map that allows the surgeons to operate safely. [23] Anatomical variations in ethmoidal sinuses are common in the Sudanese patients. The Haller's cells are important to identify because they have several anatomical relationships to adjacent structures.

Haller's cells were noted in (39.4%) of the cases examined in the present study using CT PNS. Detection of Haller's cells may also forewarn the surgeons prior to endonasal procedures, thus preventing any untoward intraoperative complications. Our study did not find any gender or age variations in Haller's cells distribution. Further CT evaluation of patients with definite sinusitis is strongly recommended to investigate the association between Haller's cells and maxillary or ethmoid sinusitis. Detection of Haller's cells can provide important information for differential diagnosis of orofacial pain with sinus origin.

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