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RESEARCH ARTICLE

Ct Study Of Sphenoethmoid (Onodi) Cell And Its Clinical Importance

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Abstract

Sphenoethmoid cell is the posterior most ethmoid air cell & depending on the degree of the pneumatization, the optic nerve canal and the carotid artery may bulge into it. **Objective**: To find out prevalence of sphenoethmoid cells and to discuss its clinical importance. **Materials and Methods**: A retrospective analysis is performed on CT scans of head & neck region of patients visiting Radio-diagnosis Department of Era's Lucknow Medical College. **Results**: Prevalence of sphenoethmoid cells is found to be higher than previously reported in literature. Understanding of sphenoethmoid cell is important to avoid fatal injury to the optic nerve and carotid arteries. It is essential to identify the presence of these cells prior to endoscopic sinus surgery in order to avoid complications.

The sphenoethmoid cell is the most posterior ethmoid air cell that pneumatizes superiorly / superolateral to the sphenoid sinus. These cells are also known as Onodi cells, as they are first described by Hungarian laryngologist Adolfo Onodi in 1903.[1,2] The optic nerve and carotid artery may be exposed in a sphenoethmoid (Onodi) cell. This is clinically significant because the sphenoid sinus is located medially and inferiorly to the most posterior cell of the posterior ethmoid complex. In the presence of a sphenoethmoid cell, therefore, great care should be taken during surgery not to injure the optic nerve or carotid artery in the posterolateral part of the posterior ethmoid cell. [3] Careful interpretation of computed tomographic (CT) scans before the operation may help to prevent fatal damage to the optic nerve during sinus surgery. The best orientation for identifying the sphenoethmoid cell is on the axial images, where the course of the ON can be followed past the orbital apex and judged in relation to the posterior ethmoid and sphenoid sinuses**.[**1,2] Since this cell is intimately related to the optic nerve, the anatomic variant is considered clinically significant. The optic nerve is placed at risk during sinus surgery, and lesions of sphenoethmoid cell may cause visual symptoms.

Presence of these cells could be investigated via the endoscopic method, gross anatomical dissection or using Computed Tomography (CT) scans.[4] The study of anatomical variation by CT-scans has become reliable and non-invasive method in the diagnosis of anatomical variations of paranasal sinuses. It also serves as a road map in surgical planning to prevent surgical complications. This study aims to describe the prevalence of sphenoethmoid cells among the north Indian population by studying the CT-scans of paranasal sinuses.

Materials and Methods

CT scans of 100 consecutive patients, who came to Department of Radiology in Era's Lucknow Medical College, Lucknow for scanning of head and neck region, were retrospectively reviewed in this study. The patients were selected depending on the following Inclusion/Exclusion criteria.

Inclusion Criteria:

1. Patients>12years
2. Patients who came for CT scan of head & neck region

Exclusion Criteria:

1. History of previous sinus surgery
2. History of malignancy of sinonasal region
3. History of facial trauma

Radiological investigations were performed by a Siemens Somatotom Emo system (Germany). Both coronal and axial views in bony windows of all CT scan films were assessed using Picture Archiving Communication System (PACS) software. For direct coronal scanning, the patients were placed prone on the scanner table, with the chin hyper extended. The scanner gantry was angled perpendicular to the hard palate. Scanning was performed as contiguous 5-mm-thick images from the anterior wall of the frontal sinus to the posterior wall of the sphenoid sinus. Axial sections were taken with the patient in supine position; plane of data acquisition was parallel to hard palate.

Observation

A total of 56 males and 44 females were studied. The age range was from 18-73 years , with the mean age of 42. Out of 100 CT scans 31 were noted to have Onodi cells. Of these patients, 11 were females and 20 were males. The involvement of Onodi cell was found bilateral in 13 cases, right and left involvement was in 8 and 9 cases respectively. A central Onodi cell was found in 1 case.

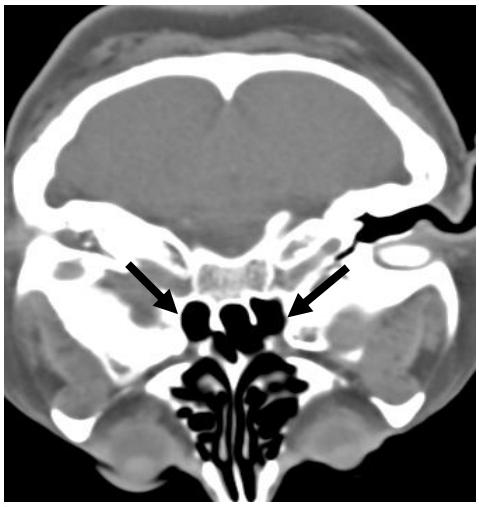

fig 1: axial scan showing bilateral onodi cell (arrow)

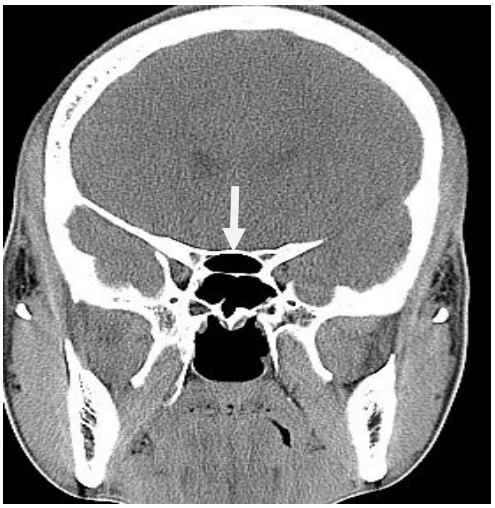

Fig 2: Coronal scan showing central onodi cell (arrow)

Discussion

There is wide range of prevalence (7-24%) of sphenoethmoid cell in CT studies as reported in literature.[5,6,7,8,9,10] Yeoh and Tan (1996) demonstrated a prevalence of 51% in Singapore population, in a cadaveric endoscopic study [11].

Table:1 **Comparision of CT studies demonstrating Onodi cells**

Study on CT scans	Prevalence of Onodi Cell in %
Arslan (Turkey)	8%
Weinberger (US)	12%
Driben (US)	7%
Perez Penas (Spain)	11%
Allan Keast(Polynesian NZ)	11%
Allan Keast (Europian NZ)	24%

The detection rate of the spheno-ethmoid cell with CT appears to be lower than with cadaver dissection. According to Driben et al. (1998) the fact that CT studies and cadaver dissections yield different incidences of sphenoethmoid cell can be attributed to limitations of the CT scanning protocol [2]. There are also difficulties related to how a sphenoethmoid cell is defined. Two primary definitions of Onodi cells have been presented in the literature. The first defines them as the most posterior ethmoid cells, being superolateral to the sphenoid sinus and closely associated with the optic nerve. Another, description defines onodi cells as posterior ethmoid cells extending into the sphenoid bone, situated either adjacent to or impinging upon the optic nerve (ON) [1, 2]. With CT scanning at the normal settings, wall separating the ethmoid sinus from the sphenoid sinus is not well visualized due to the fact that this wall is located in the coronal plane. Another condition is bulging of the optic nerve in sphenoethmoid cell. There are no definite criteria for this definition. It is open to the discretion of the observer. This may be a reason for the wide range of prevalence of sphenoethmoid cell. In a recent study, Shin et al (2011) analyzed 162 preoperative CT's and intra-operative endoscopic findings and demonstrated the incidence of onodi cells on pre-operative CT to be 32.3% & 33.3 % during trans-sphenoidal surgery, thus illustrating good correlation between CT and intra-operative findings[12]. The present study has noted 31% prevalence of sphenoethmoid (Onodi) cells in North Indian population with no male/female preponderance. Result of this study is similar to the result of study done by Shin et al.

It is important for surgeons performing sinus surgery, trans-sphenoidal pituitary operations or other skull-base surgeries, to have a clear understanding of the anatomic relationships that exist between posterior ethmoid cells, the sphenoid sinus, and their neighboring structures. The Onodi cell has considerable clinical significance. The Onodi cell may be poorly aerated and drained, leading to stasis of secretions and recurrent infections. Onodi cell sinusitis may cause visual symptoms because of the proximity of this cell to the optic nerve; a mucocele or pyocele in an Onodi cell can compress the optic nerve, causing retrobulbar optic neuropathy, optic neuritis, and vision loss. The Onodi cell may also be mistaken for the sphenoid sinus, resulting in incomplete functional endoscopic sinus surgery in a patient with sphenoid sinus disease. Because Onodi cells may also interfere with exposure of the edge of the sellar floor, Onodi cells should be removed for full exposure and allow complete tumour resection in the sellar and parasellar regions. The presence of an Onodi cell can also increase the risk of injury to the optic nerve and Internal carotid artery because of their close anatomic relationship.

Conclusion:

The prevalence of sphenoethmoid cell observed in present study is found to be more frequent than commonly appreciated. The high prevalence demonstrates that these cells should be looked for in CT-scans of patients going for endoscopic nasal surgeries.This will help the surgeon to recognize anatomical and pathological variants, in order to reduce the risk of complications while achieving an adequate surgery.Pathological characteristics of Onodi cell lesions are required to be clarified in future studies.

REFERENCES:

1. Stamberger HR, Kennedy DW. Paranasal sinuses : Anatomic Terminology and Nomenclature. The Anatomic Terminology Group. Ann Otl Rhinol Laryngol Suppl 1995;167:7-16.

2. Driben J S, Bolger W E, Robles H A, Cable B, Zinreich S J. The reliability of computerized tomographic detection of the Onodi (sphenoethmoid) cell. Am. J. Rhinol 1998;12:105–111.

3. Birsen U, Gulsah B, Yasemin K B, Funda B and Emel A. Risky anatomic variations of sphenoid sinus for surgery. Surgical and Radiologic Anatomy 2006;28(2):195-201.

4. Seung-Kyu Chung, Hyo Yeol Kim, Seong-Won Yoon, Incidence and Types of Sphenoethmoid Cell in Patients with Chronic Paranasal Sinusitis J Rhinol 52, 1998.

5. Perez-Pinas I, Sabate J, Carmona A et al. Anatomical variations in the human paranasal sinus region studied by CT. J Anat 2000;197:221-7.

6. Nitinavakarn et al. Anatomical Variations of the Lateral Nasal Wall and Paranasal Sinuses: A CT Study for Endoscopic Sinus Surgery (ESS) in Thai Patients. J Med Assoc Thai 2005; 88(6): 763-8.

7. Arslan H, Aydinlioglu A, Bozkurt M, Egeli E. Anatomic variations of theparanasal sinuses: CT examination for endoscopic sinus surgery. Auris Nasus Larynx 1999;26:39-48.

8. Weinberger DG, Anand VK, Al-Rawi M et al. Am I Rhinol Surgical anatomy and variations of the Onodi cell. 1996;10:365-70.

9. Aibara R, Kawakita S, Yumoto E, Yanagihara N. Relationship of Onodi cell to optic neuritis–radiological natomy on coronal CT scanning.Nippon Iibiinkoka Gakkai Kaiho 1997;100:663-70.

10. Allan Keast, Sofie Yelavich, Patrick Dawes, Brett Lyons. Anatomical variations of the paranasal sinuses in Polynesian and New Zealand European computerized tomography scans. Otolaryngology–Head and Neck Surgery (2008) 139, 216-221.

11. Yeoh KH, Tan KK. Surgical anatomy and variations of the Onodi cell. Am J Rhinol 1996; 10:365-70.

12. Shin et al.The onodi cell;an obstacle to sellar lesions with trans-sphenoidal approach.Otolaryngol head neck surg.2011:145:1040-1042.