International Journal of Otorhinolaryngology and Head and Neck Surgery
Munjal M et al. Int J Otorhinolaryngol Head Neck Surg. 2020 Jun;6(6):1041-1043
http://www.ijorl.com
pISSN 2454-5929 | eISSN 2454-5937

DOI: http://dx.doi.org/10.18203/issn.2454-5929.ijohns20202201

Original Research Article

Onodi cells and endoscopic sinus surgery

Manish Munjal[1]*, Suneet Bhatia[1], Porshia Rishi[1], Nitika Tuli[1], Harjinder Singh[1], Shivam Talwar[1], Salony Sharma[1], Shubham Munjal[2]

[1]Department of ENT, [2]Department of Anatomy, Dayanand Medical College, Ludhiana, Punjab, India

Received: 21 February 2020
Revised: 10 April 2020
Accepted: 28 April 2020

***Correspondence:**
Dr. Manish Munjal,
E-mail: manishmunjaldr@yahoo.com

ABSTRACT

Background: The optic nerve is susceptible to injury during endoscopic surgical intervention in the sphenoethmoidal region.
Methods: This was a retrospective analysis of 157 axial computed tomography sections through the sphenoid sinus of randomly selected cases from the departments of Otorhinolaryngology and Neurosurgery, Dayanand Medical College and Hospital, Ludhiana was undertaken during the period 2002 to 2004.
Results: A computed tomographic study of the Onodi cells, of this region was carried out in 157 axial scans. The incidence of Onodi cells was 12.10% with predominance of left sided and indirect type of cells in our study.
Conclusions: Thorough pre-operative evaluation of sphenoethmoidal region optic nerve and extent of pathology is essential to avoid the irreversible complication of optic nerve injury.

Keywords: Onodi cell, Axial section, Left

INTRODUCTION

The rhinologist in his formative years when he is initiated into endoscopic surgery, is hesitant to venture superiorly and laterally lest he might cause a cerebrospinal leak or visual loss, therefore he leaves behind pathology at these sites and with consequent recurrence at a later date.

The cerebrospinal leak can be managed but the visual loss is likely to become irreversible. Therefore, a thorough know how of the anatomy of the posterior ethmoids and sphenoid is essential.

Onodi cells also called the sphenoethmoidal cells are a rare entity. They are the lateral and posterior extensions of posterior ethmoidal cells into the sphenoid sinus and are encountered in 11% of patients by Lang.[1] Those who have undertaken optic nerve decompression must have noticed the thick bone covering the optic nerve at the sphenoethmoidal region, which has to be meticulously drilled off.

The optic nerve thus is injured in endoscopic sinus surgery only if there is extensive pneumatization of the sphenoethmoidal region in the vicinity of the optic nerve and the bone is quite thin.

METHODS

This was a retrospective analysis of axial computed tomography sections through the sphenoid sinus of randomly selected cases (n=157) from the departments of Otorhinolaryngology and Neurosurgery, Dayanand Medical College and Hospital, Ludhiana was undertaken during the period 2002 to 2004.

In axial section, Onodi cells were looked for in particular.

Inclusion criteria

Randomly selected computed tomography sections in the axial plane were taken up for study.

Exclusion criteria

Computed tomography sections showing pathologies in the posterior ethmoids and sphenoid where it was difficult to discern the Onodi cell were excluded.

Figure 1: Axial section shows Onodi cell on the right side.

Figure 2: Coronal section shows Onodi cell on left side.

All statistical calculations were done using Statistical Package of Social Sciences (SPSS) 17 version statistical program for Microsoft Windows (SPSS Inc. Released 2008. SPSS statistic for windows, version 17.0, Chicago). Ethical approval of the study was taken from the Institutional Ethics Committee.

RESULTS

Onodi cells could be identified in 12.10% of the 157 axial scans examined. They were found mostly on the left side (73.68% of total).

Table 1: Incidence of Onodi cells (n=157).

Side	No of cases	%
Right	5	57.89
Left	8	73.68
Bilateral	6	31.58
Total	19	12.10

Table 2: Type of Onodi cells (n=19).

Type	No. of cases	%
Indirect	19	100
Direct positive	0	-
Direct negative	0	-

Out of the 157 cases, 19 were found to have Onodi cells. The incidence of indirect type of Onodi cells were found to be highest (100%) while none of the direct negative type or positive type were seen in our study.

Table 3: Presence of Onodi cells in axial section (n=30).

Side	No. of cases	%
Right	1	66.66
Left	2	83.33
Bilateral	3	50
Total	6	20

Onodi cells could be identified in 20.0% cases of these most 83.33% were found on the left side. Bilateral cases were included in calculation of individual side values. All cells detected were of indirect type.

DISCUSSION

The cells named after Onodi, often come into an intimate spatial relationship to the optic nerve. The nerve may appear prominently on the lateral wall of an Onodi cell, and may infact be surrounded by these cells. The internal carotid artery may also impinge into the lateral wall of posterior ethmoid cells. One must be particularly aware of the possible existence of the Onodi cells. If they are extensively pneumatized and the bone overlying the bulges of optic nerve and internal carotid artery is extremely thin or dehiscent, the danger of iatrogenic injury to them is increased manifold.

Onodi cells are usually pyramidal, with the base of the pyramid facing anteriorly. They are the posterior ethmoid cells that extend beyond the sphenoid as much as 1.5 cm beyond its anterior wall by Stammberger et al.[2]

The relationship of the Onodi cells to the optic nerve can be divided into three groups, depending on the annulus of Zinn to the ethmoids, a critical landmark where these two structures come in contact. These groups are indirect

when the ethmoid sinus terminates anterior to the annulus of Zinn, direct Onodi +ve when the ethmoid sinus extends posterior to the annulus of Zinn with a visible optic nerve bulge into the ethmoids and direct Onodi –ve when the ethmoid sinus extends posterior to the annulus of Zinn but without a visible optic nerve bulge into the ethmoids.

Patients with direct Onodi relationship are at more risk for injury during surgery.

Thanaviratananich et al, in a cadaveric study found the prevalence of Onodi cells to be about 60% in the population of Thailand.[3] Measurements of the minimum amount of bone thickness between each Onodi cell and optic nerve ranged from 0.03 to 0.54 mm (median: 0.08). The study demonstrated that the prevalence reported was as great as that of another gross anatomic dissection performed in Asia and much higher than the rates generally reported in Western Countries. The incidence of Onodi cells is high in Asians.

In our study Onodi cells could be identified in 12.10% of the 157 axial scans examined. They were found mostly on the left side (73.68% of total) and were of the indirect type. Arslan et al reported the prevalence of Onodi cells to be 12% in a computed tomography scan study of 200 patients from the Turkish population.[4]

Kainz et al reported the presence of Onodi cells in 42% of all cases in an endoscopic cadaveric study, in Germany.[5] Basak et al documented that the existence of Onodi cells in Turkish children was significantly smaller as compared to the adults.[6]

Elwany et al found the incidence of Onodi cells was 7.5%.[7] In 5.3%, they were bilateral. In 2.1%, the optic nerve made a clear impression in the wall of the cell but the bony covering of the nerve was intact.

These cells were found in 9-12% of the material of Langet al.[1] However, Tan et al reported them in 32% of Asian cadavers.[8]

Axial plane study of sphenoid sinus provides adequate information of certain areas particularly the sphenoethmoidal recess and Onodi cells. In case Onodi cells are present, the anterior wall of the sphenoid sinuses may not be the posterior wall of posterior ethmoid air cells.

Driben et al analyzed the reliability of computed tomography in the detection of Onodi cells and documented that the computed tomography identified these cells in 7% of sphenoethmoidal complexes, however anatomic dissection found the same in 39% complexes in the American population.[9]

Axial cuts at lower or mid ethmoid level delineate the Onodi cells, sphenoethmoidal recess and ostium of sphenoid sinuses. Other structures demonstrated by axial sections are extent of pneumatization, relationship of optic nerve and the internal carotid art

Posterior coronal cuts at level of posterior ethmoidal artery show the superior turbinate and meatus, sphenoethmoidal recess and Onodi cells (if present).

CONCLUSION

Thorough pre-operative evaluation of sphenoethmoidal region optic nerve and extent of pathology is essential to avoid the irreversible complication of optic nerve injury.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Lang J, Bressel S, Pahnke J. The sphenoid sinus, clinical anatomy of approaches to the pituitary region. Gegenbaurs Morphologisches Johrbuch. 1988;134(3):291-307.
2. Stammberger H, Hawke M. Essentials of Endoscopic Sinus Surgery. Mosby, St. Louis; 1993.
3. Thanaviratananich S, Chaisiwamongkol K, Kraitrakul S, Tangsawad W. The prevalence of an Onodi cell in adult Thai cadavers. Ear Nose Throat J. 2003;82(3):200-4.
4. Arslan H, Aydinlioglu 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.
5. Kainz J, Stammberger H. Danger areas of the posterior nasal base: anatomical, histological and endoscopic findings. Laryngorhinotologie. 1991;70(9):479-86.
6. Basak S, Akdilli A, Karaman CZ, Kunt T. Assessment of some important anatomical variation and dangerous areas of the paranasal sinuses by computed tomography in children. Int. J. Pediatr Otolaryngol. 2000;55(2):81-9.
7. Elwany S, Elsaeid I, Thabet H. Endoscopic anatomy of the sphenoid sinus. J Laryngol Otol. 1999;113:122-6.
8. Tan HK, Ong YK, Teo MS, Fook-Chong SM. The development of sphenoid sinus in Asian children. Int J Pediatr Otorhinolaryngol. 2003;67(12):1295-302.
9. Driben JS, Bolger WE, Robles HA, Cable B, Zinreich SJ. The reliability of computerised tomographic detection of Onodi (sphenoethmoidal) cell. Am J Rhinol. 199812(92):105-11.

Cite this article as: Munjal M, Bhatia S, Rishi P, Tuli N, Singh H, Talwar S, et al. Onodi cells and endoscopic sinus surgery. Int J Otorhinolaryngol Head Neck Surg 2020;6:1041-3.