Retrospective computed tomography prevalence of Onodi cells among adults in Jeddah, Saudi Arabia: Age and gender difference

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Abstract

Background: The Onodi (spheno-ethmoidal) cells are the posterior-most ethmoid air cells that lie superior to the sphenoid sinus and are an important anatomical variant due to the intimate spatial relationship with the optic nerve and internal carotid artery.

Objectives: Estimation of the incidence of Onodi cells among Saudi patients in King Abdulaziz Medical City, Jeddah, Saudi Arabia.

Subjects and methods: Retrospectively, a random sample of CT-scans of the para-nasal sinuses done between January 1st 2011 to December 31st 2012 were reviewed.

Results: The study included 450 patients. Their age ranged between 18 and 65 years with a mean of 40.3±12.8 years. Male patients represent almost half of the participants (50.2%). the prevalence of Onodi cells among patients who underwent CT PNS was 14.4%. Unilateral Onodi cell cases represent 83.1% of them while bilateral cases were reported among 16.9% of cases. Onodi cells were more reported among female opposed to male patients (16.5% versus 12.5%) especially unilateral type (14.7% versus 9.4%). However, this difference was not statistically significant (p=0. 16). Unilateral Onodi cells were more significaly reported among older patients.

Conclusion: Onodi cells were noted in 14.4% of the cases examined in the present study. All CT-scans should be evaluated carefully and surgeries planned accordingly, due to anatomical variations around vital structures in the paranasal sinus area.

Keywords: Onodi cells; Prevalence; adults; Saudi Arabia

Running title: Onodi cells among adults

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Introduction

Endoscopic sinus surgery is widely used for the management of rhinosinusitis and nasal polyps. With a nasal endoscope, the surgeon can see the operative field, lateral nasal wall, and paranasal sinuses more clearly than is possible with the conventional headlight- and-speculum surgical technique.[1] Nevertheless, major orbital and intracranial complications of endoscopic sinus surgery have been reported. [2-6] The sphenoethmoid or Onodi cell is the most posterior of the posterior ethmoid cells, pneumatizing far laterally and to some degree superiorly to the sphenoid sinus.[7] As a result of its location the optic nerve, and less commonly, the internal carotid artery, are very closely related with as little as 0.03mm (median 0.08mm) of bone separating them.[8]

Computed Tomography (CT) scanning of paranasal sinuses provides valuable information in assessing extent of disease and fine detailed anatomy prior to endoscopic sinus surgery. [9]

In this article, we describe our random sample of patients underwent CT paranasal sinuses to determine the prevalence of Onodi cells according to location, sex and age.

Subjects and methods

Retrospectively, a random sample of reports of CT PNS (para-nasal sinuses) scan done between January 1st 2011 to December 31st 2012 were reviewed by senior resident in Radiology department, National Guard hospital in Jeddah, KSA to search for prevalence of Onodi cells or Sphenoethmoid Cells. Four hundred and fifty reports were identified. A systematic random sampling technique was adopted for selection of reports (every 4^{th} report was selected). Approval of the National Guard Research and Ethics committee has been obtained prior to study conduction.

Statistical analysis

The data were entered to the SPSS software, version 20. To describe the qualitative variables, the frequency and percentage were used as the descriptive index and to describe the quantitative variables, mean and standard deviation (SD) were used. To find the difference between categorical variables, chi square test was used. To test for the difference of the means of continuous variables between two groups, student`s t-test was applies while one-way analysis of variance (ANOVA) test with post-hoc least significance test (LSD) were utilized in case of comparison of means of continuous variables of more than two groups. The P value less than 0.05 was considered as significant.

Results

The study included 450 patients. Their age ranged between 18 and 65 years with a mean of 40.3±12.8 years. Male patients represent almost half of the participants (50.2%) as illustrated in Figure 1.

It is obvious from Figure 2 that the prevalence of Onodi cells among patients who underwent CT PNS was 14.4%. Unilateral onodi cell cases represent 83.1% of them while bilateral cases were reported among 16.9% of cases (Figure 3).

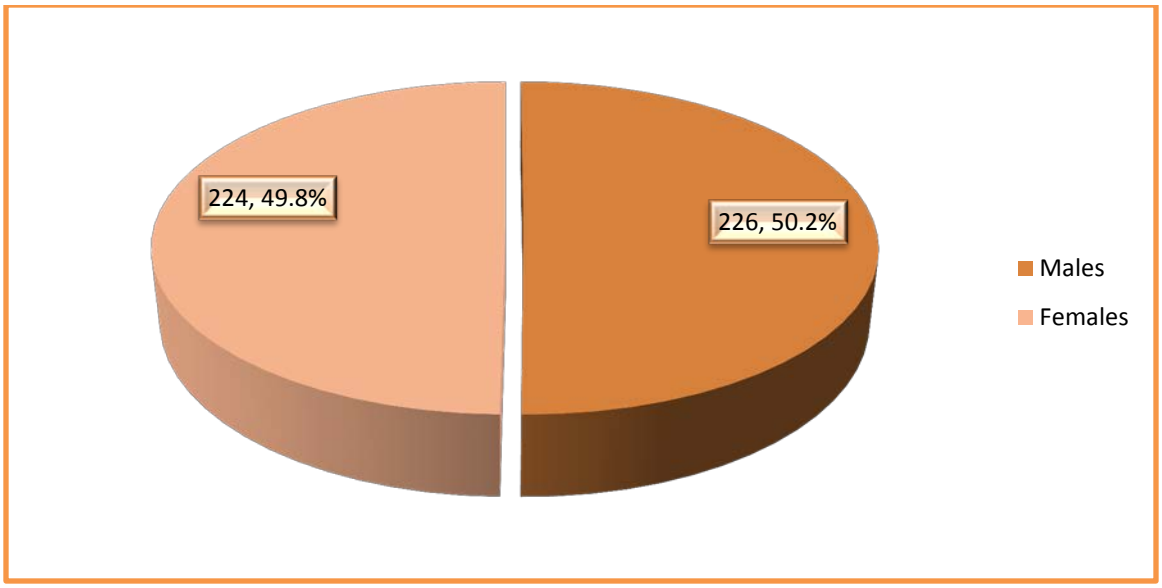

Figure 1: Gender distribution of patients, National Guard hospital, Jeddah, KSA.

As demonstrated in figure 4, Onodi cells were more reported on right side compared to left side (10% versus 6.9%). However, this difference was not statistically significant.

The prevalence on the right side was slightly higher in female patients compared to male patients (10.3% versus 9.7%). However, this difference was not statistically significant, p=0.85 (Figure 5). Similarly, the prevalence on the left side was higher among female patients compared to male patients (8.0% versus 5.8%). However, this difference was not statistically significant, p=0.34 (Figure 6). Overall as illustrated in Table 1, Odoni cells were more reported among female opposed to male patients (16.5% versus 12.5%) especially unilateral type (14.7% versus 9.4%). However, this difference was not statistically significant (p=0. 16).

Regarding patient`s age, Onodi cells (either left or right) was not significantly associated with patient`s age as illustrated in Table 2. On the other hand, unilateral Onodi cells were more significaly reported among older patients (43.63) than bilateral Onodi cells (33.91) and patients with no Onodi cells (39.97) (Figure 7 and Table 3).

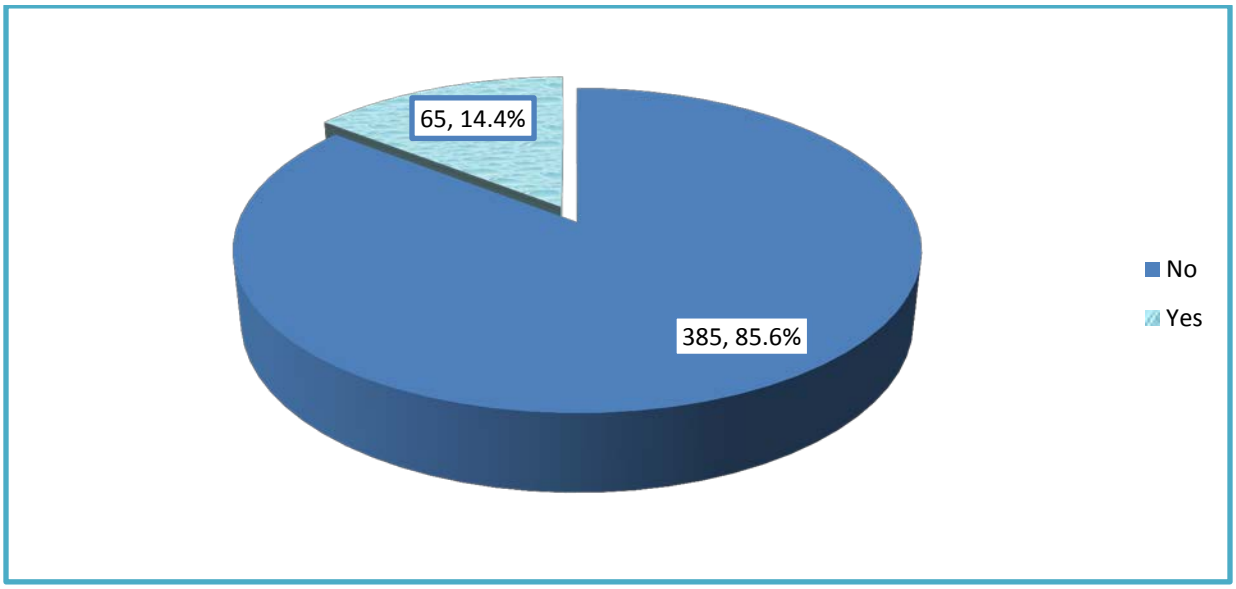

Figure 2: Prevalence of Onodi cells, National Guard hospital, Jeddah, KSA.

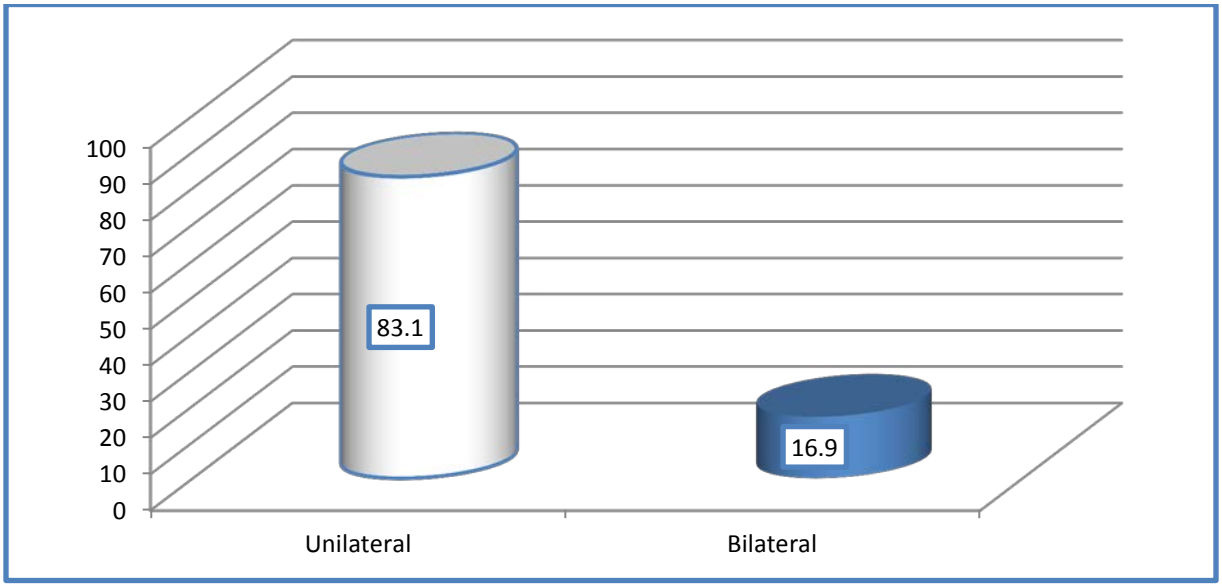

Figure 3: Distribution of onodi cells according to its location.

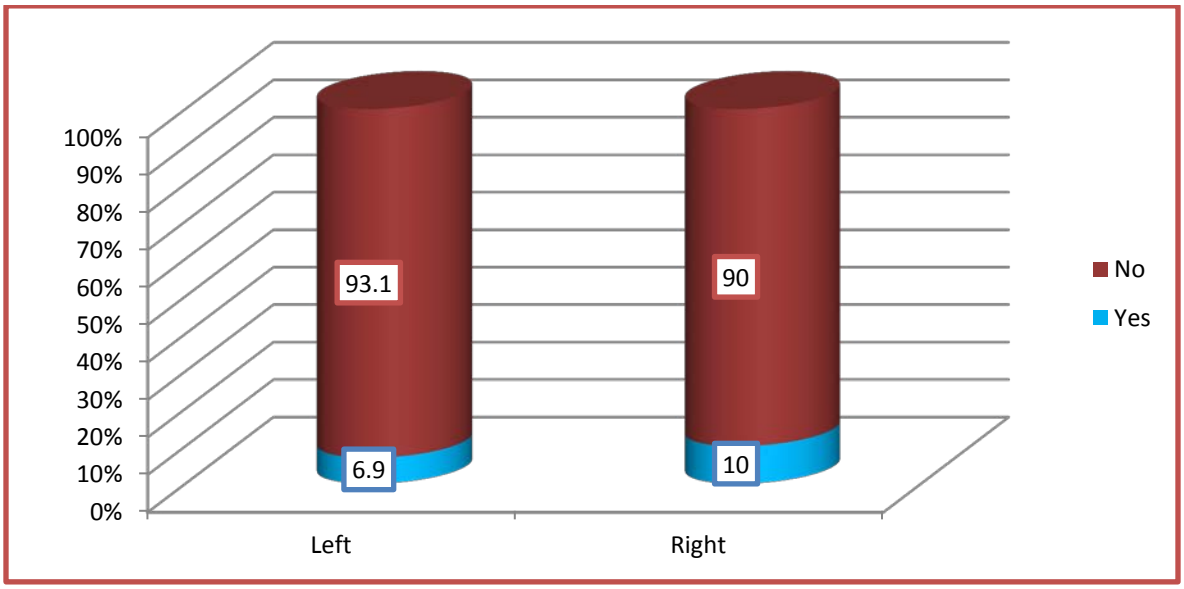

Figure 4: Distribution of Onodi cells according to its site.

Table 1: Distribution of Onodi cells according to site and patient`s gender

	Males N=224 N (%)	**Females N=224 N (%)**	**p-value***
No	196 (87.5)	187 (83.6)	**0.16**
Unilateral	21 (9.4)	33 (14.7)	
Bilateral	7 (3.1)	4 (1.8)	

* Chi-square test

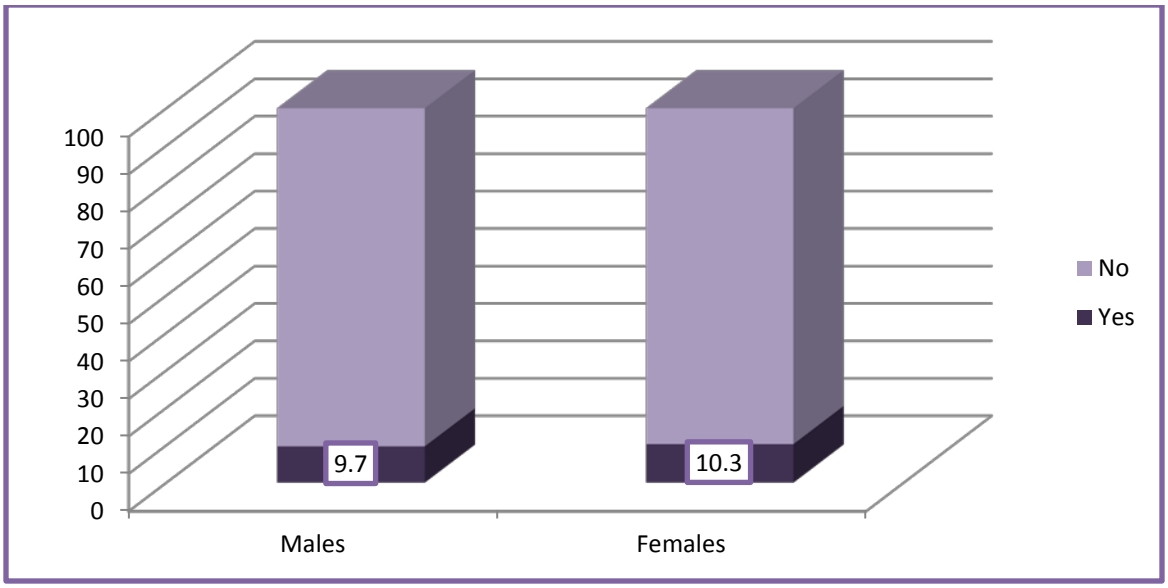

Figure 5: Prevalence of Onodi cells (right side) among adult patients, National Guard hospital, Jeddah, KSA according to their gender.

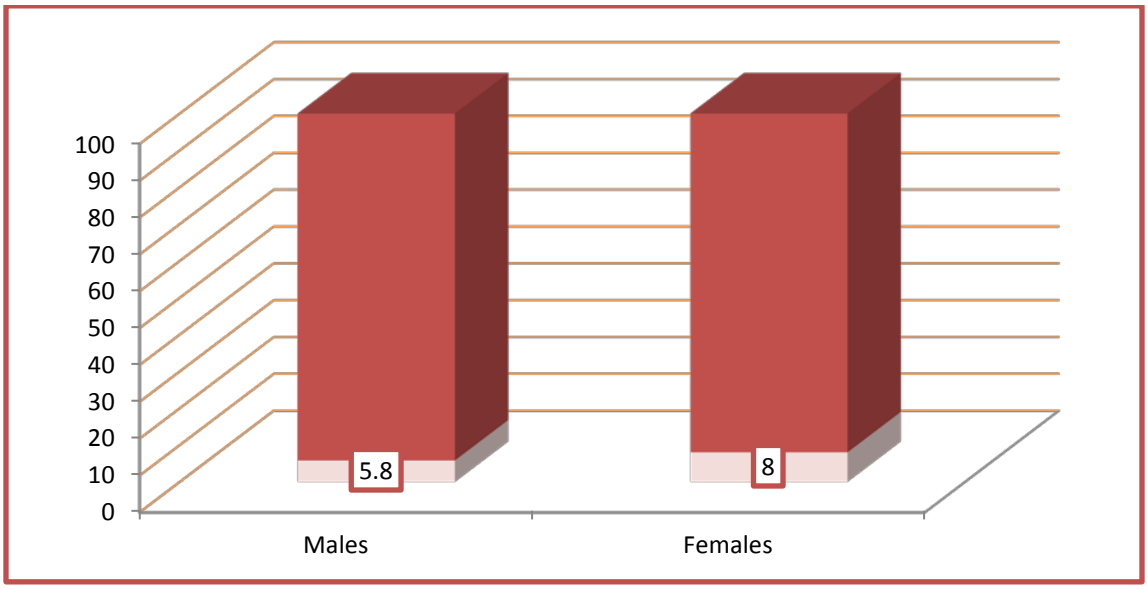

Figure 6: Prevalence of Onodi cells (left side) among adult patients, National Guard hospital, Jeddah, KSA according to their gender.

Table 2: Distribution of Onodi cells according to site and patient`s age

	NO Mean (SD)	Yes Mean (SD)	(p-value)
Onodi-Right	40.31 (12.77)	40.64 (13.30)	(0.869)
Onodi-Left	40.29 (12.73)	41.06 (14.00)	(0.752)

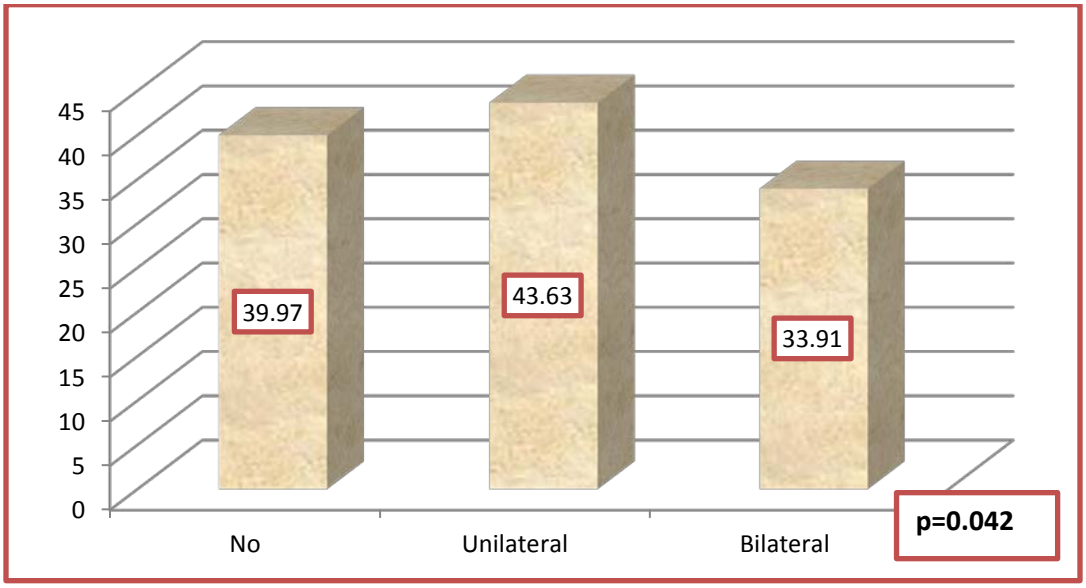

Figure 7: Association between patient`s age and Onodi cells either right or left.

Table 3:Multiple comparison of age between compared groups of patients using Least significance test (LSD)

	Unilateral	Bilateral
No	0.048	0.120
Unilateral		0.021

Discussion

Sinus surgery patients who have an onodi cell are at increased risk for optic nerve injury if the surgeon is not aware of the onodi cell`s presence.[1] Studies performed to determine the prevalence of Onodi cells in the population have used a variety of analytical methods; consequently, their results vary widely. Habal, et al[10] and Manicalco and Habal[11]found a prevalence of 25% using transorbital dissection, and Kainz and Stammberger reported a 42% prevalence using endoscopic dissection.[12] Driben et al [13] showed that coronal CT scans identified sphenoethmoid cells in 3 of 41 (7%) of their patient population. However, anatomic dissection identified onoid cells in 16 of 41 (39%) of the subjects. In the current study using Ct scanning, we reported a prevalence of 14.4%. These variations might be attributable to the followings; different operational definitions of an Onodi cell, different sampling techniques, racial factors, and differences in examination methods (endoscopic or gross anatomic dissection or computed tomography “CT”).

With respect to examination methods, nasal endoscopy should be more sensitive than CT in identifying an Onodi cell because the optic canal can be magnified and visualized directly. [13]

In fact, authors who have used an endoscope to look for an Onodi cell have consistently found higher prevalence rates than those who used CT, as in our study and in a Study conducted by Aibara et al[14] in Japan who based their prevalence study on CT of live subjects rather than gross anatomic dissection of cadaver specimens, and they found a prevalence of only 7%.

Onodi cells are of clinical significance for three main reasond. First, Onodi cell sinusitis mau cause visual symptoms because of the intimate relationship between the Onodi cell and the optic nerve. Second, at endoscopy, the Onodi cell can easily be mistaken for the sphenoid sinus. Third, the Onodi cell increases the risk of injury to the optic nerve and internal carotid artery. [15, 16]

In accordance with Shin, et al,[8] our study did not show statistically significant difference in prevalence between male and female patients or right- and left- sided cells.

In conclusion, Onodi cells were noted in 14.4% of the cases examined in the present study using CT PNS. Once found present, the type of the Onodi cell should determine the direction of the approach to the septum between the posterior ethmoid cell and the sphenoid sinus and the choice of instrument.

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