

# ANATOMIC VARIATIONS OF PARANASAL SINUSES IN PATIENTS WITH CHRONIC SINUSITIS AND THEIR CORRELATION WITH CT SCAN STAGING

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**Abstract-** The presence of anatomic variations of paranasal sinuses must be noted in order to attain a full understanding and accurate diagnosis of chronic sinusitis. The frequency of anatomic variations in chronic sinusitis is different in various studies. The purpose of this study is to assess the frequency of anatomic variations in chronic sinusitis patients admitted to Otolaryngology ward of Shahid Sadoughi hospital in the year 2004 and underwent functional endoscopic sinus surgery. Based on preoperative paranasal sinus CT scan the extent of patients diseases on a scale of 0-IV and the presence of anatomic variations was determined. A total of 120 patients were included. We found Agger Nasi cells in 43(36%), Haller cells in 5 (4.17%) conchae bullosa in 15(12.5%), paradoxical middle turbinate in 2 (1.67%) and septal deviation in 54 patients (45%). Patients with Agger Nasi (P.value : 0.015) and conchae bullosa (P.Value : 0.024) demonstrated significantly higher scores on sinus CT scan compared with patients without Agger Nasi cells and conchae bullosa respectively. Three months postoperatively we observed significantly less resolution of nasal congestion (P.Value : 0.006) in patients with septal deviation than patients without it. No significant difference was seen among patients with and without other anatomic variations with regard to resolution of rhinorrhea and nasal congestion three months postoperatively.

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**Key Words :** Paranasal sinuse , chronic sinusitis, CT Scan staging

## INTRODUCTION

Although the anatomy of nasal cavity and paranasal sinuses differ significantly from patient to patient, certain distinct variations are found most frequently among the general population. The presence of anatomic variations must be noted in

order to attain a full understanding of the individual patient as well as to develop an accurate diagnosis (1,2). The purpose of this study was to assess the frequency of anatomic variation of nasal cavity and paranasal sinuses in patients older than 16 years old with chronic sinusitis refractory to medical therapy who are candidates for functional endoscopic sinus surgery. Reported frequency of anatomic variations in patient with chronic sinusitis is as follow: Agger Nasi cellss in 15% , Haller cells in 7% , conchae bullosa in 30% , paradoxical middle turbinate in 24% and septal deviation in 21% of patients (3).Endoscopic surgery of the chronic sinusitis needs an accurate evaluation of disease and paranasal

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anatomic variations. After identification of these variations, functional endoscopic sinus surgery with usually minimal invasive operations can provide dramatic relief of chronic sinusitis symptoms (4)

Some claim that the mere presence of anatomic variations causes narrowing or obstruction of the osteomeatal channels, thereby hampering the normal airflow and mucociliary clearance of the sinuses while others contend that whether an anatomic variation is a factor in development of chronic sinusitis depends on its size, location or the amount of mucosal contact caused by the variation (2,5).

## MATERIALS AND METHODS

From January to November 2004, patients (older than 16 years) with chronic sinusitis with symptoms such as purulent rhinorrhea, nasal congestion, headache, facial pain or pressure and cough persisting beyond rhinorrhea and congestion persisting beyond 12 weeks who had not demonstrated symptom resolution despite 3-6 weeks antibiotic therapy, intranasal or systemic steroids, decongestants and nasal saline irrigation were included in the study. All patients without subjective relief of symptoms underwent examination of nose and middle meatus with 30- degree telescope to obtain clinical information regarding presence of purulent secretions and polypoid mucosa in the middle meatus and those with positive findings underwent coronal CT scan of paranasal sinuses in preparation for operation. A total of 120 patients (79 male and 41 female) aged 17 to 79 years (mean age of 34.46) with chronic sinusitis were admitted to Otolaryngology ward of Shahid Sadoughi hospital and underwent functional endoscopic sinus surgery in the operating room. The extent of patient disease on a scale of 0-IV (sinus CT staging system) (6) and

presence of anatomic variations such as Agger Nasi cells, Haller cells, conchae bullosa, paradoxical middle turbinate and nasal septal deviation were determined based on paranasal sinus coronal CT scan and intraoperative findings.

Stage I: All unilateral disease or anatomic abnormality

Stage II: Bilateral disease limited to ethmoid or maxillary sinus.

Stage III: Bilateral disease with involvement of at least one sphenoid or frontal sinus.

Stage IV: Pansinusitis

Three months postoperatively all patients were evaluated for resolution of rhinorrhea and nasal congestion. Resolution of rhinorrhea was determined by anterior rhinoscopy and oral examination for presence of posterior nasal drip. The degree of congestion relief (slight, relative and complete) was based on patients own description of nasal patency compared with preoperative state and examination of nasal airflow with a piece of cotton.

## RESULTS

A total of 120 patients were enrolled in the study. We found Agger Nasi cells in 43(36%), Haller cells in 5(4.17%), conchae bullosa in 15(12.5%), paradoxical middle turbinate in 2(1.67%) and nasal septal deviation in 54 patients (45%).

According to paranasal sinus CT scan and operative findings we noticed stage I, II, III and IV in 9,24,50 and 37 patients respectively.

Patients with Agger Nasi ( $p= 0.015$ ) and conchae bullosa ( $p= 0.024$ ) demonstrated significantly higher scores on sinus CT scan compared with patients without Agger Nasi and conchae bullosa respectively (Table 1 and 2).

**Table.1.** The frequency of Agger Nasi cells in chronic sinusitis according to sinus CT staging

Agger Nasi		Stage				Total
		I	II	III	IV	
No	Count	9	17	25	26	77
	Percent	11.7%	22.1%	32.5%	33.8%	100%
Yes	Count	0	7	25	11	43
	Percent	0%	16.3	58.1%	25.6%	100%
Total	Count	9	24	50	37	120
	Percent	7.5%	20.0%	41.7%	30.8%	100%

$p = 0.015$

**Table 2.** The frequency of conchae bullosa in chronic sinusitis according to sinus CT staging

Conchae Bullosa		Stage				Total
		I	II	III	IV	
No	Count	9	23	43	30	105
	Percent	8.6%	27%	35.8%	28.6%	100%
Yes	Count	0	1	7	7	15
	Percent	0%	6.7%	46.7%	46.7%	100%
Total	Count	9	24	50	37	120
	Percent	7.5%	20.0%	41.7%	30.8%	100%

p = 0.024

No significant difference was seen among patients with and without Haller cells, paradoxical middle turbinate and nasal septal deviation with regard to sinus CT staging system.

Three months postoperatively, we observed significantly less resolution of nasal congestion in patients with nasal septal deviation (p= 0.006) than patients without septal deviation (Table 3).

No significant difference was seen among patients with and without Agger Nasi cells, conchae bullosa and paradoxical middle turbinate with regard to postoperative resolution of nasal congestion.

Postoperative resolution of rhinorrhea was not significantly different among patients with and without the five abovementioned anatomic variations.

## DISCUSSION

In this study the frequency of anatomic variations of paranasal sinuses in a group of Iranian patients with chronic sinusitis is determined.

Our findings correspond with results of other studies (2,7,8) with regard to frequency of Agger Nasi cells, Haller cells and septal deviation but the frequency of conchae bullosa and paradoxical middle turbinate in our patients was less.

Some authors define concha bullosa as any degree of middle turbinate pneumatization (2) but in our study it was defined as pneumatization of both vertical lamellar and inferior bulbous portions of middle turbinate with obstruction of middle meatus which explains for its frequency of 12.5% in our patients compared with frequency of 35%(9), 30% (10) and 28% (11) in other studies.

Lloyd reported that obtaining an accurate image of paradoxically curved middle turbinate was related to the level of the coronal CT scan. Some patients in his study showed paradoxical curves anteriorly and normal curves posteriorly (2).

The abovementioned statement explains for low frequency of paradoxical middle turbinate in our patients with inadequate anterior coronal cuts in paranasal sinus CT scan.

**Table 3.** The frequency of septal deviation in chronic sinusitis according to postoperative resolution of nasal congestion

Septal deviation		Postoperative resolution of nasal congestion			Total
		Slight	Relative	Complete	
No	Count	0	11	55	66
	Percent	0%	16.7%	83.3%	100%
Yes	Count	1	22	31	54
	Percent	1.9%	40.7%	57.4%	100%
Total	Count	1	33	86	120
	Percent	0.8%	27.5%	71.7%	100%

p = 0.006

## Anatomic variations of paranasal sinuses

Table 1 and 2 demonstrate significantly higher scores (stage III and IV) in patients with Agger Nasi and Concha bullosa which signifies their role in frontal sinus obstruction and obstruction of middle meatus and infundibulum respectively (12,13).

Three months postoperatively, less resolution of nasal congestion was seen significantly in patients with septal deviation, so we recommend performing septoplasty in combination with functional endoscopic sinus surgery.

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