

Frequency of Sinonasal Anatomic Variations Without Mucosal Disease

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Abstract

Objective: To investigate the importance of sinonasal anatomic variations in the etiology of sinusitis by observing the frequency using a paranasal sinus computed tomography (CT) scan.

Material and Methods: The CT scans of patients who were admitted to our clinic with a complaint of nasal obstruction between November 2013 and February 2016 and underwent paranasal sinus CT scan were examined. In total, 118 patients without sinonasal mucosal disease were included in the study. The frequency of anatomic variations were assessed by examining the paranasal sinus CT.

Results: The anatomical variations of patients without sinonasal mucosal disease determined by CT scan on the coronal and axial planes were agger nasi cells (54.2%), concha bullosa (46.6%), accessory ostium (28.8%), Haller cells (19.4%), paradoxical middle turbinate (19.4%), and uncinat process pneumatization (7.6%).

Conclusion: We found that the frequency of anatomic variations without sinonasal mucosal disease was similar to the rates of sinusitis with mucosal disease in literature. We conclude that anatomical variations alone contribute to the pathophysiology of the disease in the presence of associated factors rather than causing sinusitis.

Keywords: Sinusitis, paranasal sinus, tomography

INTRODUCTION

Anatomical variations in the nasal cavity and paranasal sinus are considered to contribute to recurrent sinusitis (1). Although some authors argue that the presence of variations alone plays a role in the etiology of sinusitis, others argue the reverse (2). Even though the presence of agger nasi cells constricts the frontal recess region, Haller cells may block the maxillary sinus ostium. Concha bullosa is an anatomic variation that narrows the middle meatus entrance and can impair the drainage of frontal, maxillary, and anterior ethmoidal cells. The paradoxical concha is thought to play a role in the etiology of sinusitis by narrowing the middle meatus and compressing the infundibulum. Uncinate process pneumatization is likely to impair the ventilation and drainage of the sinus by narrowing the infundibulum (1). It can play a role in the pathophysiology of maxillary sinus by causing the return of the secretion drained from the natural ostium into the sinus, and this is called the accessory ostium recirculation phenomenon. The aim of this study was to determine the frequency of anatomic variations in patients without sinonasal mucosal disease and to monitor the significance of these variations in the etiology of sinusitis.

MATERIAL AND METHODS

This study was planned as a retrospective study. Ethics Committee approval (E-17-1500) was obtained for the study from Ankara Numune Training and Research Hospital. Written informed consent was obtained from patients who participated in this study. The paranasal sinus computed tomography (CT) scans of the patients who applied to our outpatient clinic between November 2013 and February 2016 with a complaint of nasal obstruction were examined. Axial and coronal sections were obtained. Patients with sinonasal mucosal disease were excluded from the study. The frequency of anatomic variations was determined by examining the paranasal sinus CT scans of the patients without mucosal disease.

RESULTS

Of the 118 patients who were included in the study, 83 were males (70.3%) and 35 (29.7%) were females. The age range of the patients varied between 16 and 63 years (mean age: 31.6 years). The incidence of anatomical variations and rate of bilateral involvement are shown in the Table 1.

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DISCUSSION

Agger nasi cells is defined as part of the lateral nasal wall, which is located immediately at the anterior of the adhesion site of the middle concha, and is evaluated with the anterior ethmoidal cells because it is often pneumatized (Figure 1) (3). The agger nasi cells forms the anterior border of the frontal recess and may play a role in the pathophysiology of the frontal sinusitis by narrowing the frontal sinus drainage because of advanced pneumatization. Ünlü et al. (4) reported that they found agger nasi cells at a rate of 50% in patients with chronic sinusitis. Kaygusuz et al. (5) reported that they found the rate of agger nasi cells as 64.6% in study group who have chronic sinusitis and 55.8% in control group who have not chronic sinusitis and they did not find any statistical significant difference between groups. Shpilberg et al. (6) found the rate of agger nasi cells as 82.8% in patients with significant sinonasal disease and 83.8% with minimal sinonasal disease. They found that the difference between the two groups was statistically insignificant. The ratio of agger nasi cells without sinonasal mucosal disease was 54.2% and 64% of them were bilateral.

Any pneumatization in the middle concha is called as concha bullosa (Figure 2) (7). If the lamella of concha is pneumatized, it is called as lamel-

lar concha bullosa. However, what is known as concha bullosa is rather the pneumatization of the bulbous part, which is at the inferior of the concha. There are arguments with regard to the idea that concha bullosa creates a predisposition toward sinusitis. Several opinions suggest that concha bullosa leads to recurrent sinusitis by narrowing the infundibulum because of the compression of the uncinete process. Loftus et al. (8) reported that they found concha bullosa at a rate of 53.8% in their study in which they retrospectively evaluated 26 patients with recurrent acute rhinosinusitis and they did not find any correlation between disease severity and presence of concha bullosa. Javadrashid et al. (9) did not find the

Table 1. The frequency of anatomical variations in patients

Anatomical variation	Frequency (n/%)	Bilateralism rate (%)
Agger nasi cells	64/54.2	64
Concha bullosa	55/46.6	69
Accessory ostium	34/28.8	35.2
Paradoxical middle concha	23/19.4	39.1
Haller cells	23/19.4	47.8
Uncinate pneumatization	9/7.6	22.2

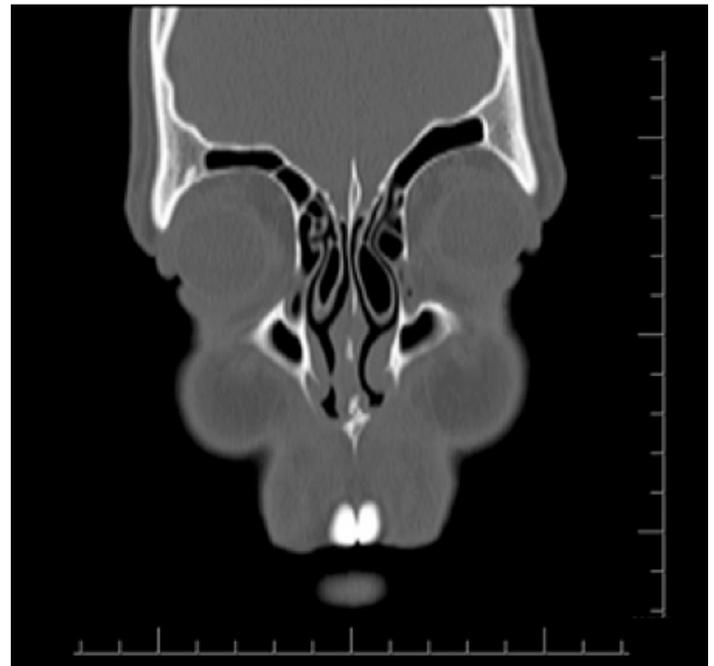


Figure 2. Concha bullosa

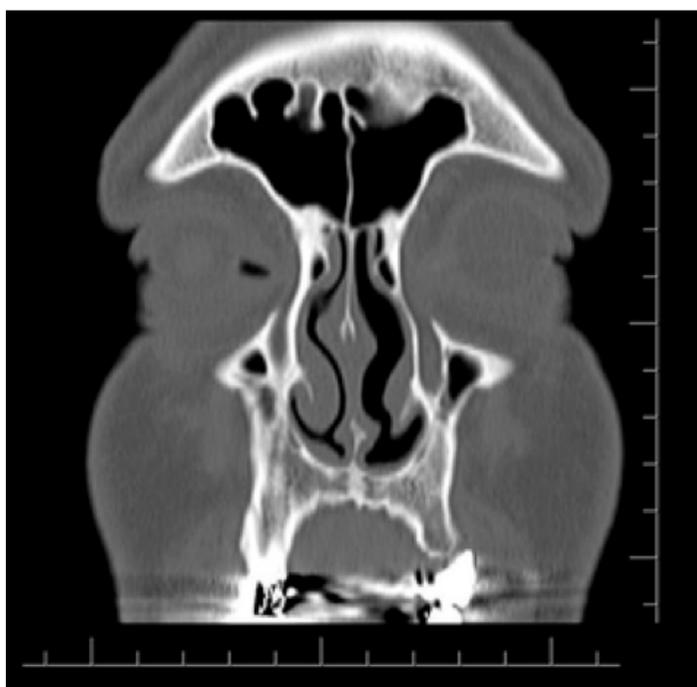


Figure 1. Agger nasi cells



Figure 3. Accessory maxillary ostium

relationship between concha bullosa and sinusitis statistically significant in the study they conducted with 206 patients with sinonasal symptoms. Tiwari et al. (10) stated that they encountered concha bullosa in 76.4% of 85 chronic sinusitis patients who they prospectively examined. We found concha bullosa in 55 patients (46.6%) in our study and 38 of them (69%) were bilateral.

Accessory maxillary ostium is an anatomic variation, which is called anterior and posterior fontanel, and is thought to occur because of the perforation of the mucosa-covered formations existing along the medial wall of the maxillary sinus (Figure 3). It is likely that the accessory maxillary ostium may cause chronic maxillary sinus disease by causing the mucus drained from the natural ostium to enter into the maxillary sinus again (11). Yücel et al. (12) reported that they detected accessory maxillary ostium in the paranasal sinus CT of 10 (14.2%) of the 70 patients who have sinonasal disease symptoms, however one of them had sinonasal mucosal disease, 9 patients had not sinonasal mucosal disease. Danese et al. (13) examined the paranasal sinus CT of 112 patients with recurrent, persistent, or chronic sinusitis and stated that they found no correlation between accessory maxillary ostium and sinonasal mucosal disease. In our study, we found accessory maxillary ostium in 34 patients (28.8%) and 12 of them (35.2%) were bilateral.

The middle concha that is convex toward the lateral side suggests the paradoxical middle concha. It is possible that the paradoxical middle concha plays a role in the pathophysiology of sinusitis by narrowing the middle meatus and compressing the infundibulum. Kaygusuz et al. (5) found paradoxical middle concha at a rate of 13.8% in patients with chronic sinusitis. Tiwari et al. (10) reported paradoxical middle concha in 9% of the patients with the symptoms of chronic sinusitis. In our study, we found paradoxical middle concha in 23 patients (19.4%) and 39.1% of them were bilateral.

The Haller cells is defined as an ethmoid cell located at the lateral side of the ethmoid region along the inferior of the orbital base (3). Although they can arise from the posterior ethmoid cells, they are often derived from the anterior ethmoid cells and are closely related to the infundibulum (1). It is suggested that they can contribute to the narrowing of the infundibulum and the formation of recurrent sinusitis by affecting the adjacent maxillary sinus ostium (14). Alkire et al. (15) found Haller cells in 39.9% of patients with recurrent acute rhinosinusitis with a statistically significant difference compared with the nonrhinosinusitis control group. Kim et al. (16) found the ratio of Haller cells to be 34.5% in a study conducted with 113 children with chronic sinusitis, and they reported no statistically significant association between Haller cells and ipsilateral maxillary sinusitis. Bolger et al. (17) showed that the difference in the incidence of Haller cells was not statistically significant in their study compared with the patients with recurrent maxillary sinusitis and asymptomatic patients. In our study, we found Haller cells in 23 patients (19.4%) and 47.8% of them were bilateral.

Pneumatization of the uncinate process is likely to impair the sinus ventilation and drainage by narrowing the infundibulum (1). Kaygusuz et al. (5) detected uncinate pneumatization in 4.9% of patients with chronic sinusitis and found no statistical difference compared with the control group. Azila et al. (18) found the rate of the incidence of uncinate process pneumatization in patients with chronic sinusitis as 3.3% and specified that this ratio was the same as that of the control group. In our study, we found uncinate process pneumatization at a rate of 7.6% and 22.2% of the cases were bilateral.

CONCLUSION

The anatomic variations of the sinonasal region are considered responsible for the pathophysiology of recurrent acute and chronic sinusitis. We found that the frequency of anatomic variations not associated with sinonasal mucosal disease was similar to that found in patients with sinusitis in literature. From this point of view, we concluded that anatomic variations may play a role in the pathophysiology in the presence of accompanying factors, such as the pneumatization grade and size of the variations, rather than the fact that the presence of anatomic variations alone increases the predisposition to sinusitis.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Ankara Numune Training and Research Hospital (E-17-1500).

Informed Consent: Written informed consent was obtained from patients who participated in this study.

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