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Original Article

Study of Prevalence of Concha Bullosa, Nasal Septal Deviation and Sinusitis based on CT Findings

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Abstract:

The anatomical variations and pathological conditions of the sinonasal area can be easily identified using computed tomography (CT) scan. The study was done to observe the prevalence of concha bullosa (CB) and nasal septal deviation (DNS) in sinusitis patients. 135 CT scan of nose and paranasal (PNS) sinuses were taken and reviewed retrospectively for the presence of concha bullosa, nasal septal deviation and sinusitis in the department of Otolaryngology, Head and Neck Surgery, Border Guard Hospital*,* Dhaka *from March 2019 to January 2020. Out of 135 patients, CT scan of nose and PNS revealed 74.81% patients exhibited some sinus disease, 68.14% nasal septal deviation and 42.22% had concha bullosa. In this study, we have done a retrospective analysis of the CT scan of PNS in order to assess the prevalence CB, DNS and sinusitis.*

Key words: *Concha bullosa, Nasal septal deviation, Chronic sinusitis, Computed tomography scan.*

Introduction:

Concha bullosa (CB) is the pneumatization of the middle turbinate and is one of the anatomic variations of the paranasal region.[1] It can be either unilateral or bilateral and generally occurs together with a septal deviation to the contralateral side.[2,1] There are three types of CB according to the location of pneumatization; lamellar type (vertical lamella of the concha is pneumatized); bulbous type (bulbous segment is pneumatized) and extensive concha bullosa (both the lamellar and bulbous segments are pneumatized).[3,1] It is most commonly encountered in the middle concha, though can also be seen in superior and inferior concha. It might present unilaterally or bilaterally, very small or may attain a considerable size.[4] It is usually asymptomatic, but it sometimes can cause different sinonasal symptoms. The severity of symptoms is related to degree of pneumatization.[5] CT scan of the PNS has become a widely accepted tool for the

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diagnosis of anatomic abnormalities, location and severity of the disease.[6] CB is best diagnosed radiographically by CT scan; it appears as an air space of the midd.[7] Many patients with concha bullosa have been found to have co-existent deviation of the nasal septum and sinusitis.[8] In most guidelines, chronic sinusitis is defined by the presence of at least two out of four cardinal symptoms (facial pain/pressure, hyposmia/ anosmia, nasal drainage and nasal obstruction) for at least 12 consecutive weeks.[9] Relationship of concha bullosa with paranasal sinus disease continues to be debated [10]. It is suggested that the enlarged concha may compress or deviate the uncinate process against the lateral wall of the nasal cavity or compress the middle meatus and narrow the ethmoidal infundibulum, thereby causing ipsilateral maxillary sinus disease.[7] Similarly, the role of nasal septal deviation in the etiology of sinusitis remains unclear.[8] It has been suggested that when a concha bullosa is present, the nasal septum is deviated with a convexity to the opposite side, narrowing the middle meatus and therefore resulting in obstructed drainage of the ipsilateral maxillary, anterior ethmoid and frontal sinuses.[7] Herein we have done a retrospective analysis of the CT scan of PNS in order to assess the prevalence CB, DNS and sinusitis. This knowledge will be useful for future endoscopic surgeons in order to understand the pathogenesis of sinusitis and therefore avoid iatrogenic injury due to these common anatomical variations.

Materials and Methods:

The study was done retrospectively on the basis of radiology database for all paranasal sinus CT findings obtained from March 2019 to January 2020 at the department of Otolaryngology, Head and Neck Surgery, *Border Guard Hospital*, *Dhaka.* A total of 135 consecutive CT studies were identified. Adult patients irrespective of age, sex and socio-economic status with clinical diagnosis of chronic sinusitis who were advised CT scan as a part of routine management protocol were included in the study. Patients with the history of previous sinus surgery, benign or malignant sino-nasal tumor, facial trauma, having mucosal polyps, craniofacial anomalies, odontogenic sinusitis, acute rhinosinusitis, sinus malignancies and who were not willing to undergo necessary investigations were excluded from the study. The left and right sides of each of the frontal, ethmoid, sphenoid and maxillary sinuses were assessed separately for the presence of mucosal disease. This disease was evaluated as either being present or absent. A concha bullosa was defined as being present when more than 50% of the vertical height (measured from superior to inferior in the coronal plane) of the middle turbinate was pneumatized. A concha was subjectively assessed as being absent, small, moderate or large. Deviation of the nasal septum was subjectively assessed as being absent, mild, moderate or severe and the direction of deviation was described by the convexity of the septal curvature. The preservation or obliteration of the air channel between a concha and the nasal septum was also assessed.

Result:

Among the 135 patients, who were included in the study 79 (58.51%) were female and 56 (41.49%) were male with female to male ratio of 1.41: 1. Patients were aged between 19-72 years and the mean age was 32.45 years (Table-I).

Table-I :
Sex distribution of the patients

Total	Female	Male
135	79 (58.51%)	56 (41.49%)

Of all 135 patients, CT Nose and PNS revealed 101 (74.81%) had some sinus disease, 92 (68.14%) had nasal septal deviation and 57 (42.22%) had concha bullosa (Table- II).

Table II :
Distribution of sinus disease, nasal septal deviation and concha bullosa

Sinus disease	Nasal septal deviation	Concha bullosa
101 (74.81%)	92 (68.14%)	57 (42.22%)

Of the 135 patients, 57 (42.22%) had concha bullosa, among them who had concha bullosa 34 (59.64%) patients had unilateral concha and 23 (40.35%) had bilateral concha (Table-IV).

Table III :
Types of concha bullosa

Unilateral	Bilateral
34 (59.64%)	23 (40.35%)

Among the patients, who (92) had nasal septal deviation, convexity to the right side were found in 44 (47.82%) cases, convexity to the left side were found in 38(41.30%) cases and only 10 (10.86%) cases had biconvex nasal septal deviation (Table-IV).

Table IV :
Types of nasal septal deviation (n=92)

Convexity to right	Convexity to left	Biconvex
44 (47.82%)	38(41.30%)	10 (10.86%)

Out of 57 patients, with concha bullosa, 39 (68.42%) had nasal septal deviation and 18 (31.57%) patients had no septal deviation. Among the 78 patient without concha, 43 (55.12%) had nasal septal deviation and the rest 35 (44.87%) had no nasal septal deviation (Table-V).

Out of the 92 patients who had nasal septal deviation, 70 (76.08 %) suffered from some kinds of sinus diseases and out of the rest 45 without septal deviation 32 (71.11%) had some sinus disease (Table-VI).

Out of the 57 patients who had concha bullosa, 41 (71.92%) had sinus diseases and 16 (28.07%) had no sinus disease. Among the rest 78 patients without concha bullosa 60 (76.92%) had sinus diseases and the rest 18 (23.07%) had no sinus diseases (Table-VII).

Table V :
Nasal Septal Deviation with or without concha

With concha bullosa (n=57)		Without concha bullosa (n=78)	
Had septal deviation	No septal deviation	Had septal deviation	No septal deviation
39 (68.42%)	18 (31.57%)	43 (55.12%)	35 (44.87%)

Table VI :
Relationship of sinus diseases and nasal septal deviation

Septal deviation (N=92)		Without septal deviation (n= 43)	
Had sinus disease	No sinus disease	Had sinusdisease	No sinus disease
70 (76.08 %)	22 (23.91%)	31 (72.09%)	12 (27.90%)

Table VII :
Relationship of sinus diseases and concha

With concha (N=57)		Without concha (N=78)	
Sinus disease	No sinus disease	Sinus disease	No sinus disease
41 (71.92%)	16 (28.07%)	60 (76.92%)	18 (23.07%)

Discussion:

There is great interest among otorhino-laryngologists and researchers in the exploration of the anatomy of paranasal region, its variations and correlation of these variants with CRS.[11] In the present study we found 79 (58.51%) female patients and 56 (41.49%) male patients. Females were more than males. In a study, done by Kucyba³a I *et al*. in 2017 found 58.4% females and 41.6% male patient.[12] In another study, done by Kyle D. smith *et al*. from Omaha, USA also found 43.6% male patients and 56.3% females.[13]

In the present study, out of 135 patients, CT Nose and PNS revealed 101 (74.81%) had some sinus disease, 92 (68.14%) had nasal septal deviation and 57 (42.22%) had concha bullosa. In another study done by Fatma Homoud Al Anazy from Bahrain in 2011 found CB in 37.3%, sinus disease in 80.1% patients and 64.6% had deviated nasal septum.[7] We also observed that out of 57 patients with CB, 34 (59.64%) patients had unilateral concha and 23 (40.35%) had bilateral concha (Table-III). In a study from Istanbul, Turky by Turhan San *et.al*. found concha bullosa in 55.5% of patients with allergic rhinitis patient. Among them 28% had unilateral and 72% had bilateral CB.[5] In our study we found more patients with unilateral CB, but in their study they found bilateral CB is more than unilateral CB. In another study done by Raja Kalaiarasi, at the Department of ENT and Head Neck Surgery, Puducherry, India. Out of the 202 patients studied, CB was found in 31.7% patients. Among them 54.7% patients had bilateral CB and 45.3% patient had unilateral CB.[14] Regarding Nasal septal deviation, among the 92 (68.14%) patients with DNS, convexity to the right side were found in 44 (47.82%) cases, convexity to the left side were found in 38 (41.30%) cases and only 10 (10.86%) cases had biconvex nasal septal deviation. Fatma Homoud Al Anazy from Bahrain in 2011 also found 64.6% patient had DNS. The side to which DNS was deviated was not recorded in all 160 patients, but of those who were recorded 31 (48%) were deviated to the right, 18 (28%) were deviated to the left and 15 (24%) were S shaped.[7] Though, we only observe the prevalence and did not analyze to find out the correlation between CB, DNS and sinusitis in this study. It can be noted that some authors suggested that CB could predispose sinusitis; while others concluded that there is no correlation between CB and sinusitis similarly, results of some studies have suggested that there was an association between DNS and the presence of CB, but some study results found no association between these two**.** But this association of cause is not clear yet.[11,7] Krishnan ASJ and Shoba K found no significant association statistically between concha bullosa and chronic sinusitis.[3] In another study by T E S Vincent and B S Gendeh said that CB and DNS are coincidental variations. They could not found any association between DNS and CB with the development and pathogenesis of sinusitis.[15] However, Hatipoglu *et al.* found that there was an association between the degree of deviation and the presence of sinusitis.[16] In another study, Ozdemir Sevine *et a*l. (2013) found that the incidence of CB was higher in individuals with septal deviation.[17] Smrity Rupa Borah Dutta *et al.* (2015) also found correlation between CB and DNS, but no relationship between CB and sinusitis.[18]

Conclusion:

Sinonasal anatomical variations are common findings in patients with chronic sinusitis. There is a continious debate regarding the relationship of CB with DNS and sinusitis. Larger studies are required to

gather knowledge on sinonasal anatomical variations. This will provide information for the ENT surgeon to avoid the unwanted complications or to avoid recurrence of symptoms if certain anatomical variations are not treated adequately.

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