ORIGINAL RESEARCH PAPER

ENT

KEY WORDS: Concha bullosa , Deviated nasal septum , CT scan paranasal sinus.

CT SCAN EVALUATION OF CONCHA BULLOSA AND ITS CORRELATION WITH DEVIATED NASAL SEPTUM – A PROSPECTIVE STUDY

Dr. Raphella Khan Senior Resident Dept OF ENT SKIMS MCH Bemina.

Dr. Nowsheen Hamdani Senior Resident Dept of ENT SKIMS MCH Bemina.

Dr. Ayaz Rehman* Assistant professor, Dept of ENT SKIMS MCH Bemina. *Corresponding Author

Dr. Asef A Wani Professor and HOD Dept of ENT SKIMS MCH Bemina.

ABSTRACT

Introduction : Osteomeatal unit is a functional unit of the anterior ethmoid complex representing the final common pathway for the drainage and ventilation of the frontal, maxillary and anterior ethmoid cells .Osteomeatal complex has become an area of active radiologic and pathophysiologic investigation with the development of endoscopic sinus surgery for inflammatory sinus disease. **Aim :**The aim of this study was to investigate the anatomical variation of the middle turbinate concha bullosa , incidence of concha bullosa and its correlation with nasal septal deviation. based on paranasal sinus imaging.**Materials and Methods :** A prospective study was performed in the Department of ENT and Head Neck Surgery over a period of 5 years, to determine the prevalence of Concha bullosa in patients who presented to our out patient department with symptoms of nasal obstruction, headache, post nasal drainage and facial pain , and underwent CT scan of Paranasal sinuses. We evaluated 462 CT images both coronal and axial planes with a 1-3-mm slice thickness. **Results :** Out of the CT scans studied of the nose and paranasal sinus of 462 patients, the prevalence of concha bullosa was 25.5 % (118) patients .Male predominance was seen with 63 (53.3%) patients and 55 (46.6%) female patients. Concha bullosa was bilateral in 21 (17.7%) patients, and unilateral in 76 (64.4 %) patients. Mixed or extensive type of concha bullosa was seen in 56 (47.4%) patients followed by 35 (29.7%) patients having lamellar type and 27 (22.9%) patients with bulbous type.Out of 118 cases of CB, 43 (36.4%) were on left side of which 29 (67.4%) patients showed deviation of the nasal septum to right and 33 (27.9%) were on right side of which 21 (63.3%) patients had a nasal septal deviation to left.**Conclusion :** We found that there is a strong relationship between the presence of unilateral or dominant Concha bullosa and contralateral nasal deviation.

INTRODUCTION

Osteomeatal unit is a functional unit of the anterior ethmoid complex representing the final common pathway for the drainage and ventilation of the frontal, maxillary and anterior ethmoid cells [1].Osteomeatal complex has become an area of active radiologic and pathophysiologic investigation with the development of endoscopic sinus surgery for inflammatory sinus disease. The concha bullosa should be addressed in patients with rhinosinusitis undergoing surgery, primarily because its removal improves visualization of the middle meatus. A concha bullosa (CB) represents the presence of air cell in the turbinates, and the middle turbinate (MT) concha bullosa is a common nasal cavity anatomical variation. Pneumatization of the middle turbinate happens due to variation in the ethmoidal air cell system development. The incidence rates for pneumatization of the MT is between 13 and 53.6%.[2,3,4,5,]The incidence of bilateral middle concha bullosa has been reported to vary between 45% and 61.5% [5,6,7].Concha bullosa is generally asymptomatic and diagnosed incidentally by computed tomography. Sometimes, an over-pneumatized middle turbinate can lead to nasal obstruction, contact headache, deviated nasal septum and chronic sinusitis. Concha bullosa can be unilateral or bilateral and can be classified into three types according to the site of pneumatization.Concha Bullosa is defined as lamellar, bulbous, or extensive/ mixed according to the classification developed by Bolger et al:

lamellar - pneumatization of the vertical lamella of the middle turbinate

bulbous - pneumatization of the bulbous segment of the middle turbinate; and

Extensive (mixed /total) - pneumatization of both the lamellar and bulbous segments[6]

When unilateral concha bullosa is present, nasal septum gets deviated with convexity to the opposite side so the air column between the concha bullosa and septum is maintained. The septum which is deviated to the opposite site may produce symptoms of obstruction.[8]

Aim:

The aim of this study was to investigate the anatomical variation of the MT concha bullosa , incidence of concha bullosa and its correlation with nasal septal deviation. based on paranasal sinus imaging.

MATERIALS AND METHODS

A prospective study was performed in the Department of ENT and Head Neck Surgery over a period of 5□ years, to determine the prevalence of Concha bullosa in patients who presented to our out patient department with symptoms of nasal obstruction, headache, post nasal drainage and facial pain , and underwent CT scan of Paranasal sinuses. We evaluated 462 CT images both coronal and axial planes with a 1-3-mm slice thickness.

The inclusion criterion was the presence of any type of pneumatization of the middle turbinate in CT images of the nose and paranasal sinuses. Patients with history of any nasal surgerywere excluded from this study.

Concha bullosa was categorised as present or absent, and in the case of the former, further defined as lamellar, bulbous, or extensive. Nasal septal deviationwas classified as being present or absent.The direction of the nasal septal deviation was defined by the convexity of the septal curvature.

RESULTS

Out of the 462 paranasal sinus CT scans studied of patients that presented with sinonasal symptoms , the prevalence of

concha bullosa was 25.5% (118) patients. Male predominance was seen with 63 (53.3%) patients and 55 (46.6%) female patients. (Table 1). Concha bullosa was unilateral in 76 (64.4 %) patients and bilateral in 21 (17.7%) patients (Fig 1,2,3)

Mixed or extensive type of concha bullosa was seen in 56 (47.4%) patients followed by 35 (29.7%) patients having lamellar type and 27 (22.9%) patients with bulbous type. (Fig 4,5,6). The distribution of anatomical variation of concha bullosa is shown in Table 2.

Out of 118 cases of CB, 43 (36.4%) were on left side of which 29 (67.4%) patients showed deviation of the nasal septum to right and 33 (27.9%) were on right side of which 21 (63.3%) patients had a nasal septal deviation to left.

Table 1 Summarises the prevalence, gender and age distribution, and laterality of Concha bullosa in the patient population examined.

Age in years	Male	Female	Right	Left	Bilateral
20-35	21	18	9	14	8
36-50	34	23	18	21	9
51-65	8	14	6	8	4
Total	63	55	33	43	21

Table 2: Anatomical variations of middle turbinate concha bullosa

Varieties	No.of Cases	%age
Lamellar	35	29.7
Bulbous	27	22.9
Mixed	56	47.4

Association between Unilateral Concha Bullosa and Nasal Septal Deviation

U/L Concha bullosa	No. of cases	NSD to Right	NSD to Left	% age
CB (L)	43	29	0	67.44
CB (R)	33	0	21	63.63

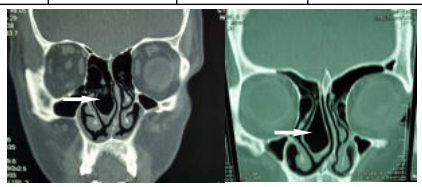

Fig 1,2. Coronal image of CT paranasal sinus shows unilateral (right) extensive/mixed type of Concha bullosa, with apparent deviation of nasal septum to the opposite side (left).

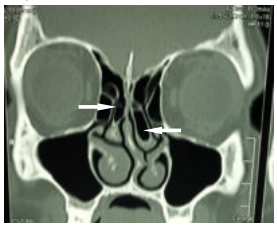

Fig 3. Coronal image of CT paranasal sinus shows Bilateral Concha bullosa. Right lamellar type and left bulbous type. Also bilateral inferior turbinate hypertrophy can be noted in the scan.

Fig 4 . Coronal section of CT Paranasal sinus depicts bilateral concha bullosa, Right side showing lamellar type and left extensive/ mixed type.

Fig 5 Coronal section of CT paranasal sinuses shows presence of Bilateral Concha bullosa. Right side extensive/mixed type and left Bulbous type.

Fig 6. Axial plane of CT paranasal sinuses shows unilateral bulbous type of concha bullosa .

DISCUSSION

14% to 15% of the population have a pneumatized middle turbinate, commonly referred to as a concha bullosa.[3,9-13] The CB becomes apparent after 7– 8 years of age and continues its development even after the period of adolescence.[5,14] The degree of pneumatization and the inflammatory changes that occur within the CB may correlate with the presentation and the severity of symptoms. Although mostly asymptomatic, overpneumatized turbinates may constitute mass effect and in these cases as a result of impaired ventilation and drainage of osteomeatal region it can lead to sinusitis.

Several theories have been proposed for its occurrence. Two different theories have been suggested on this issue by Stammberger [15]. According to the first theory, after the formation of septum deviation, the air flow pattern of nasal cavity and on the opposite side of the space provokes the development of CB. According to another theory, the CB and septal deviation are two different anomalies. It has been shown that anterior and posterior ethmoidal air cells are liable for pneumatization of CB roughly in 55% and 45% of the cases, respectively [5,6].

The prevalence of concha bullosa was found to be 25.5% in our study. In literature prevalence of concha bullosa reported in studies are 30% by Wani et.al, 31.7% by Raja et.al, 53.7% by Aramani et.al and Koo SK et al. [16,17,18]

In current study, the incidence of frequency of types of concha bullosa was determined as 47.4 % for extensive/ mixed conchae , 29.7% for lamellar Concha, and22.9% for bulbous concha. San et al. [19] in their study have reported frequency of concha bullosa types as 46.95% for extensive/ mixed conchae, 32.17% for bulbous concha, and 20.86% for lamellar Concha. Another study which was conducted by El- Anwar et.al reported as 20.9% for bulbous concha, 11.6% for lamellar Concha, and 8.1% for total conchae. [20]

The mean age (36.4 years) of this study's participants with concha bullosa was consistent with other studies on the same topic. [18,21].

The proportion of males was higher than that of females in our study which was consistent with a study conducted by Raja et al.[17]

NSD usually leads to unilateral nasal obstruction. Biconvex NSD and contralateral inferior concha hypertrophy can lead to bilateral nasal obstruction in patients with NSD.However, contralateral CB could also be the cause of this symptom. Keles et al reported that 76.5% of patients with bilateral nasal obstruction had NSD and contralateral CB.[22]

A study conducted by Erkan et al.[23] suggested that both NSD and CB might affect each other physically. Few studies in literature were found that sought to assess the correlation between NSD and the presence of middle turbinate pneumatization; however, a study by Kapusuz Gence et al. demonstrated a highly significant correlation between the presence of middle CB and a deviated septum on the contralateral side.[24] Our results were consistent with this study where in a significant correlation was seen between CB and deviated nasal septum, with 50 (65.78 %) patients of 76 patients with unilateral CB had nasal septal deviation to the opposite side.

It has been suggested that the abnormal space created in the nasal septum by the concave part may provide conditions suitable for pneumatization of the middle turbinate.[25] NSD was usually accompanied with a dominant large CB.[8,25]

The definitive treatment of concha bullosa is surgical. Although asymptomatic concha bullosa does not require treatment, concha bullosa cases that cause obstruction of the ostiomeatal complex and disease in the paranasal sinuses and those that cause only airway obstruction are treated by performing ESS. Resection of the lateral lamella of the middle concha is an effective procedure and the most commonly used surgical technique [26].

The difference between a hypertrophied turbinate and its pneumatization can be only distinguished by paranasal sinus CT.CT remains the preferred imaging technique for visualizing bony structures; provides detailed information about the middle turbinate, nasal, and paranasal structures. [3,27,28,29] and this allows the surgeon to anticipate points of safe entry into the lumen of CB.

CONCLUSION

We found that there is a strong relationship between the presence of unilateral or dominant Concha bullosa and contralateral Nasal septal deviation.

REFERENCES

1. Stammberger HR, Kennedy DW. Paranasal sinuses: anatomic terminology and nomenclature. The Anatomic Terminology Group. Ann Otol Rhinol Laryngol Suppl. 1995; 167: 7-16.
2. Joe J K, Ho S Y, Yanagisawa E. Documentation of variations in sinonasal anatomy by intraoperative nasal endoscopy Laryngoscope 2000 110(2 Pt 1):229–235.
3. Al-Sebeih K H, Bu-Abbas M H. Concha bullosa mucocele and mucopyocele: a series of 4 cases. Ear Nose Throat J. 2014;93(01):28–31
4. Lee J H, Hong S L, Roh H J, Cho K S. Concha bullosa mucocele with orbital invasion and secondary frontal sinusitis: a case report. BMC Res Notes. 2013;6(06):501
5. Unlü H H, Akyar S, Caylan R, Nalça Y. Concha bullosa. J Otolaryngol. 1994;23(01):23–27.
6. Bolger WE, Butzin CA, Parsons DS: Paranasal sinus bony anatomic variations and mucosal abnormalities: CT analysis for endoscopic sinus surgery. Laryngoscope. 1991, 101:56-64.
7. Tonai A, Baba S: Anatomic variations of the bone in sinonasal CT. Acta Otolaryngol Suppl. 1996, 525:9-13.
8. Stallman JS, Lobo JN, Som PM. The incidence of concha bullosa and its relationship to nasal septal deviation and paranasal sinus disease. Am J Neuroradiol. 2004; 25(9): 1613-8.
9. Lee JS, Ko IJ, Kang HD, Lee HS. Massive concha bullosa with secondary maxillary sinusitis. Clin Exp Otorhinolaryngol 1:221–223, 2008.
10. Cohen SD, Matthews BL. Large concha bullosa mucopyocele replacing the anterior ethmoid sinuses and contiguous with the frontal sinus. Ann Otol Rhinol Laryngol 117:15–17, 2008.
11. Ketenci I, Sahin MI, Vural A, Ünlü Y. Mucopyocele of the concha bullosa: A report of two cases. Erciyes Tıp Dergisi/Erciyes Med J 35:157–160, 2013.
12. Toledano A, Herraiz C, Mate A, et al. Mucocele of the middle turbinate: A case report. Otolaryngol Head Neck Surg 126:442–444, 2002.
13. Bahadir O, Imamoglu M, Bektas D. Massive concha bullosa pyocele with orbital extension. Auris Nasus Larynx 33:195–198, 2006.
14. Blaugrund, S.M. Nasal obstruction. The nasal septum and concha bullosa. Otolaryngol Clin North Am 1989; 22(2): 291–306.15.H.Stammberger, "Endoscopic and radiologic diagnosis," in Functional Endoscopic Sinus Surgery: The Messerklinger Technique, H. Stammberger, Ed., pp. 145–273, BC Decker, Philadelphia, Pa, USA, 1st edition, 1991.
16. Wani, Asif A et al. "CT scan evaluation of the anatomical variations of the osteomeatal complex." Indian journal of otolaryngology and head and neck surgery : official publication of the Association of Otolaryngologists of India vol. 61,3 (2009): 163-8.
17. Anatomical Variations of the Middle Turbinate Concha Bullosa and its Relationship with Chronic Sinusitis: A Prospective Radiologic StudyRaja Kalaiarasi, Venkataramanan Ramakrishnan, Santhosh Poyyamoli.Int Arch Otorhinolaryngol. 2018 Jul; 22(3): 297–302.
18. Aramani A, Karadi R N, Kumar S. A study of anatomical variations of osteomeatal complex in chronic rhinosinusitis patients—CT findings. J Clin Diagn Res. 2014;8(10):KC01–KC04.
19. San T, San S, Gürkan E, Erdo□an B (2014) Bilateral triple concha bullosa: a very rare anatomical variation of intranasal turbinates. Case Rep Otolaryngol 2014:851508
20. El-Anwar, M.W., Ali, A.H., Almolla, R.M. et al. Radiological middle turbinate variations and their relation to nasal septum deviation in asymptomatic adult. Egypt J Radiol Nucl Med 51, 104 (2020).
21. Stallman J S, Lobo J N, Som P M. The incidence of concha bullosa and its relationship to nasal septal deviation and paranasal sinus disease. AJNR Am J Neuroradiol. 2004;25(09):1613–1618.
22. Keles, B. , Öztürk, K. , Ünaldi, D. Is there any relationship between nasal septal deviation and concha bullosa? European Journal of General Medicine 2010; 7(4):359–64.
23. Erkan SO, Erkan ZA, Tuhanio□lu B, Hayto□lu S, Güney Z. The relationship between septal deviation and concha bullosa. Kulak Burun Bogaz Ihtis Derg. 2017;27:74–78.
24. Kapusuz Gencer Z, Ozkırı□ M, Okur A, Karaçavu□ S, Saydam L. The effect of nasal septal deviation on maxillary sinus volumes and development of maxillary sinusitis. Eur Arch Otorhinolaryngol. 2013;270:3069–3073
25. Sazgar AA, Massah J, Sadeghi M, Bagheri A, Rasool E. The incidence of concha bullosa and the correlation with nasal septal deviation. B-ENT. 2008;4:87–91.
26. Caughey RJ, Jameson MJ, Gross CW, Han JK: Anatomic risk factors for sinus disease: fact or fiction?. Am J Rhinol. 2005, 19: 334-339.
27. Yuca K, Kiris M, Kiroglu AF, et al. A case of concha pyocele (concha bullosa mucocele) mimicking intranasal mass. B-ENT 4:25–27, 2008.
28. Abdel-Aziz M. Mucopyocele of the concha bullosa presenting as a large nasal mass. J Craniofac Surg 22:1141–1142, 2011.
29. Shihada R, Luntz M. A concha bullosa mucopyocele manifesting as migraine headaches: A case report and literature review. Ear Nose Throat J 91:E16–E18, 2012.