

Research Article

Nasal anatomical and pathological variants in patients with antrochoanal polyps



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Abstract

objectives: is to study the relation between antrochoanal polyp formation and associated anatomical and pathological variants. **Patients and methods:** Our study included 80 patients divided equally into two groups (40 patients in each): patients with antrochoanal polyp group and control group including patients with unilateral maxillary sinusitis. Both groups were compared regarding pathological variants including the presence of retention cyst in contralateral maxillary sinus and the mucosal thickening and sclerosis in maxillary antrum. The comparison between both groups included anatomical variants as: deviated nasal septum, concha bullosa, paradoxical middle turbinate and uncinat process insertion. **Results:** the presence of retention cyst in the contralateral maxillary sinus was significantly higher in antrochoanal polyp group than the control group. Also the nasal septum deviation to opposite side was more in antrochoanal polyp group than control group. That was statistically significant. **Conclusion:** the origin of antrochoanal polyp is retention cyst that extends to nasal cavity due to pressure changes in the maxillary antrum. Changes in the air flow in the nasal cavity caused by deviated nasal septum in the side opposite to the deviation may be an important factor that caused antrochoanal polyp formation.

Keywords: Antrochoanal polyp, retention cyst, paranasal sinus, computed tomography.

Introduction

Antrochoanal polyps (ACP) are from the most common unilateral sinonasal benign lesions. They are edematous mucosa that start from the maxillary antrum. They pass from the ostium of the maxillary antrum and extend to the posterior nasal opening (choana)^[1]. The pathogenesis of ACP is still unknown. There are many theories explaining its pathogenesis. Some authors believe that maxillary sinus retention cysts are the origin of ACP^[2]. Others suggest that nasal allergies and inflammatory processes play an important role in formation of edematous mucosa that progress to form ACP^[3, 4]. Nasal anatomical and pathological variants have been suggested to be from the predisposing factors to ACPs. These anatomical variations may be the

cause of physical factors that lead to ACPs formation.

Materials and methods

This prospective study was conducted at our Otolaryngology department. The study was approved by the Institutional Review Board at our University. The study was registered in ClinicalTrials.gov ID: NCT05989919. In this study, all participants were informed about the research and signed informed consent before data collection.

The study participants were recruited from patients attending outpatient clinic.

During the period from December 2022 to August 2023, we selected 40 patients with

ACPs who had the following inclusion criteria: 1-radiologically diagnosed based on CT nose and PNS. 2-histopathologically diagnosed as ACP. The radiological diagnosis is based on seeing low attenuated soft tissue mass filling the maxillary antrum and extending through the middle meatus into the nasal cavity and directs towards the post nasal opening.

We excluded:

- 1- patients with history of maxillofacial trauma.
- 2- 2- patients who had previous nasal surgery.

To be more objective, a control group of 40 patients who had unilateral maxillary sinusitis.

We assessed multislice computed tomography (CT) nose and paranasal sinus images by Toshiba aquilion CT scanner. Axial and coronal 2.5mm cuts were obtained.

Both study and control groups were compared regarding anatomical and pathological variations in the nose. These variants include: deviated nasal septum, concha bullosa, paradoxical middle turbinate and uncinate process insertion (to lamina papyracea or roof of ethmoid or middle turbinate). We also compare between them according to presence of retention cyst in CT in contralateral side. We also evaluate the sclerosis on thickening of the bony wall of the paranasal sinus as an indication of chronic inflammation.

Statistical analysis

SPSS 24.0 program was used for statistical analysis. Averages and standard deviations were calculated. The Mann–Whitney and Chi-square tests were used for comparisons between the groups. The Pearson correlation tests was used to evaluate correlations. Statistical significance was set at ≤ 0.05 .

Results

The research included 80 cases divided into 2 groups: ACP group (40 cases) and control group (40 cases).

Table (1) shows the demographic data of the cases in each group. In ACP group, the mean age of subjects is 26.93 ± 11.92 years. There are 25 males and 15 females. While in control group, the mean is 27.78 ± 12.46 years. There are 24 males and 16 females. There is no significant difference in age or gender between both groups ($P=0.756$, 0.818 respectively).

The presence of retention cyst in the contralateral maxillary antrum was significantly higher in ACP group [15 cases (37.5%)] than in control group [3 cases (7.5%)] ($P=0.001$). **Figure (1,2).**

The presence of sinus wall thickening and sclerosis wasn't significantly different between ACP group and control group ($P=0.396$).

The difference between ACP group and control group regarding the presence of concha bullosa and paradoxical middle turbinate was found to be statistically insignificant ($P=0.456$, $P=0.629$ respectively).

There was no significant difference in the variation of superior uncinate insertion between the ACP group and control group either to lamina papyracea, or ethmoid roof or middle turbinate ($P=0.501$, 0.633 , 0.105 respectively). All of the previous results are shown in **table(2).**

When we compared both ACP group and control group in the presence of deviated septum as shown in **table(3)**, we found 22 (55%) cases with deviated nasal septum to opposite side of pathology in ACP group [**figure(3)**] and 8 (20%) cases in the control group and that was statistically significant ($P=0.001$). On the other hand, we found 8 (20%) cases with deviated nasal septum to same side of pathology in ACP group and 12 (30%) cases in the control group and that was statistically insignificant ($P=0.302$).

Table (1): demographic data

	Antrochoanal polyp group	control group	total	P value
age Mean±SD (Range)	26.93±11.92 (8-50)	27.78±12.46 (8-55)	27.35±12.12 (8-55)	0.756
males	25(62.5%)	24(60%)	49(61.2%)	0.818
females	15(37.5%)	16(40%)	31(38.8%)	

Table (2): Comparison of sinonasal anatomic and pathologic variations between the control group and ACP group.

	Antrochoanal polyp group	control group	P value
contralateral maxillary sinus retention cyst	15(37.5%)	3(7.5%)	0.001
contralateral maxillary sinus mucosal thickening	2(5%)	4(10%)	0.396
concha bullosa	3(7.5%)	5(12.5%)	0.456
paradoxical middle turbinate	3(7.5%)	4(10%)	0.692
uncinate insertion superiorly to lamina papyracea	23(57.5%)	20(50%)	0.501
uncinate insertion superiorly to ethmoid roof	14(35%)	12(30%)	0.633
uncinate insertion superiorly to middle turbinate	3(7.5%)	8(10%)	0.105

Table (3): Comparison of nasal septal deviation between the control group and ACP group.

	Antrochoanal polyp group	control group	P value
deviated nasal septum to same side of pathology	8(20%)	12(30%)	0.302
deviated nasal septum to opposite side of pathology	22(55%)	8(20%)	0.001



Figure (1): coronal CT nose and PNS showing left ACP and right retention cyst.

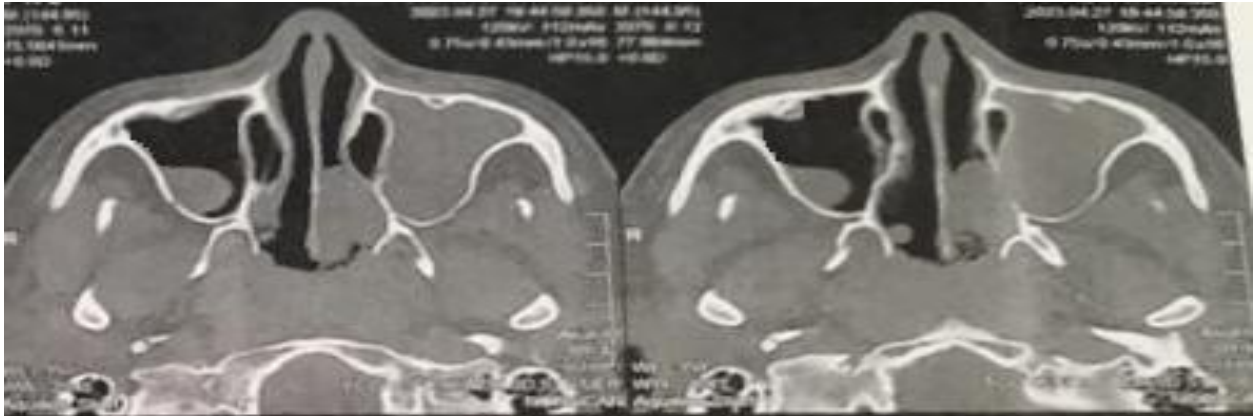


Figure (2): axial CT nose and PNS showing left ACP and right retention cyst.

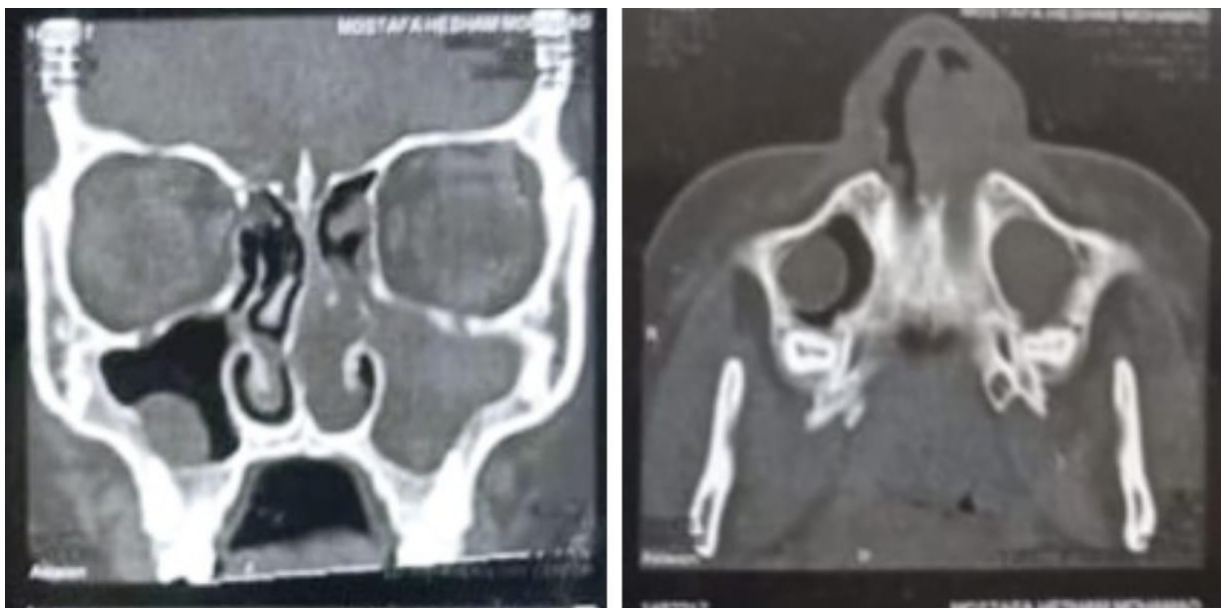


Figure (3): axial and coronal CT nose and PNS showing left ACP, right retention cyst and deviated nasal septum to right side.

Discussion

ACP has been known for a long period of time however, the pathophysiology of its formation and predisposing factors are still questionable. Many researches have been done to relate different factors to the formation of ACP.

In a research done by Berg et al., it was mentioned that retention cyst is the precursor of ACP. This theory was based on the histological similarity between ACP and the retention cyst^[2]. In our study, the presence of retention cyst in the contralateral maxillary antrum was significantly higher in ACP group than in control

group ($P=0.001$). This supports that ACP may have been a retention cyst originally.

Frosini et al., clarified this conversion according to Bernoulli theorem^[5]. It stated that the air flow passing within a narrow area increases in velocity and decreases in pressure. The flow of air during inspiration increases, and according to this theory the pressure decreases so the nasal walls collapse. During expiration, the air outlet from the maxillary ostium decreases, so the pressure in the maxillary antrum increases causing herniation of the polyp.

Presence of inflammation leads to narrowing of the maxillary ostium, thus aggravates the condition. Gursoy et al., suggested that chronic inflammation is an important factor that predisposes to ACP formation^[6]. He used the presence of sclerosis in the maxillary sinus as an indicator of chronic inflammation. In their study, there was a significant difference between ACP group and control group in the presence of sclerosis (P=0.001). However, in our study, the presence of sinus wall thickening and sclerosis wasn't significantly different between ACP group and control group.

When we compared the presence of nasal septal deviation between both groups in our research, we found 22 (55%) cases with deviated nasal septum to opposite side of pathology in ACP group [figure(2)] and 8 (20%) cases in the control group and that was statistically significant (P=0.001). In a study by Hekmatnia et al, the cases of ACP has a higher frequency of deviated nasal septum^[7]. Aydin et al. found that the nasal septum is deviated to the opposite side of ACP They suggested that this occurs with the same way as the compensatory hypertrophy of inferior turbinate in the side opposite to septal deviation^[8]. Elahi et al., said that ACP developed in the concave side of deviated nasal septum due to associated middle turbinate abnormalities on the side opposite to deviated septum^[9].

Unfortunately, we couldn't assess whether the formation of ACP lead to deviation of nasal septum to other side or the septum was deviated before the formation of ACP and affected air flow in the nasal cavity leading to ACP formation. This is due to the difficulties in monitoring the process of ACP formation from the start of the pathology.

Other anatomic variants including: paradoxical middle turbinate, concha bullosa and variation in superior insertion of uncinata was statistically insignificant when we compared ACP group and control group. This agrees with the study done by Gursoy et al.,^[6].

In this research, male : female ratio is 1.6: 1, other studies done by Aktaş et al., & Bozzo et al., showed higher incidence in males^[10, 11].

We need to make more studies about resistance of air flow in the nasal cavity and pressure changes by objective methods to support the results of our research.

Conclusion

Although ACP is a common unilateral maxillary sinus pathology, its pathophysiology is still unclear. Data analysis in our research supports that the origin of ACP is retention cyst that extends to nasal cavity due to pressure changes in the maxillary antrum. Changes in the air flow in the nasal cavity caused by deviated nasal septum in the side opposite to the deviation may be an important factor that caused ACP formation.

Ethical statement

The study was approved by the Institutional Review Board in faculty of medicine at our University. In this study, all participants were informed about the research and signed informed consent before data collection.

This material is the authors' own original work, which has not been previously published elsewhere. The paper is not currently being considered for publication elsewhere. The paper reflects the authors' own research and analysis in a truthful and complete manner. The results are appropriately placed in the context of prior and existing research. All sources used are properly disclosed (correct citation). All authors have been personally and actively involved in substantial work leading to the paper, and will take public responsibility for its content.

Conflict of interest statement: No potential conflict of interest relevant to this article was reported.

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References

- 1- Killian, G., The origin of choanal polypi. *The Lancet*, 1906. **168**(4324): p. 81-82.
- 2- Berg, O., et al., Origin of the choanal polyp. *Archives of otolaryngology-head & neck surgery*, 1988. **114**(11): p. 1270-1271.
- 3- Cook, P.R., et al., Antrochoanal polyposis: a review of 33 cases. *Ear, nose & throat journal*, 1993. **72**(6): p. 401-411.

- 4- Lee, T.-J. and S.-F. Huang, Endoscopic sinus surgery for antrochoanal polyps in children. *Otolaryngology—Head and Neck Surgery*, 2006. **135**(5): p. 688-692.
- 5- Frosini, P., G. Picarella, and E. De Campora, Antrochoanal polyp: analysis of 200 cases. *Acta Otorhinolaryngologica Italica*, 2009. **29**(1): p. 21.
- 6- Gursoy, M., et al., Anatomic variations associated with antrochoanal polyps. *Nigerian journal of clinical practice*, 2019. **22**(5): p. 603-608.
- 7- Hekmatnia, A., et al., Association of anatomic variations with antrochoanal polyps in paranasal sinus computed tomography scan. *Journal of Research in Medical Sciences: the Official Journal of Isfahan University of Medical Sciences*, 2017. **22**.
- 8- Aydın, S., et al., The analysis of the maxillary sinus volumes and the nasal septal deviation in patients with antrochoanal polyps. *European Archives of Oto-Rhino-Laryngology*, 2015. **272**(11): p. 3347-3352.
- 9- Elahi, M.M., S. Frenkiel, and N. Fageeh, Paraseptal structural changes and chronic sinus disease in relation to the deviated septum. *The Journal of otolaryngology*, 1997. **26**(4): p. 236-240.
- 10- Aktaş, D., et al., Antrochoanal polyps: analysis of 16 cases. *Rhinology*, 1998. **36**(2): p. 81-85.
- 11- Bozzo, C., et al., Endoscopic treatment of antrochoanal polyps. *European archives of oto-rhino-laryngology*, 2007. **264**: p. 145-150.