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The relationship between maxillary sinus retention cysts and nasal septum

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Ethics Committee Approval
This study was approved by Yozgat Bozok University Clinical Research Ethics Committee, on 24.02.2021 with the decision number 2017-KAEK-189_2021.02.24_04.
All procedures in this study involving human participants were performed in accordance with the 1964 Helsinki Declaration and its later amendments.

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Abstract

Background/Aim: The etiology of retention cysts of the maxillary sinuses (RCMs) and their relationship with the nasal septum is not fully elucidated. This study aimed to investigate the relationship between RCMs and the nasal septum.
Methods: In this retrospective cohort study, computed tomography (CT) images of 208 patients who underwent paranasal sinus CT (PNsCT) imaging in our otolaryngology clinic in 2020 were scanned retrospectively. The demographic characteristics of the patients were accessed through the hospital's electronic data recording system. The ages, genders, RCMs, and nasal septum statuses of all cases were noted.
Results: RCM was significantly related to nasal septum deviation (NSD) to the right (P=0.001), while it was not related to NSD to the left (P=0.5). When the nasal septum was in the midline, the risk of developing RCMs was significantly reduced (P=0.007). The direction of septum deviation and the presence of RCMs were significantly related. Right NSD was an independent risk factor for the development of RCMs and increased the risk by 2.2-fold (P=0.002).
Conclusion: RCMs, while thought to be asymptomatic and regress spontaneously, should be followed due to the possibility of transformation to antrochoanal polyp (ACP), and surgery should be considered, especially in symptomatic cases.

Keywords: Maxillary sinus, Retention cysts, Septum deviation, Etiology

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Introduction

Retention cysts of the maxillary sinuses (RCMs) occur because of seromucinous glands' ductal obstruction in the sinus mucosa. Accumulating mucus causes cystic dilatation of the gland [1]. The prevalence of RCMs ranges from 3.2 to 35.6 % [2]. They are radiographically smooth-surfaced, round-shaped masses with radiopaque appearances, which develop from the sinus wall, and mostly, from the sinus floor [3].

In the literature, spontaneous regression and disappearance rates of RCMs are reported between 17.6 and 38%, and RCMs are generally believed to be self-limiting [3]. They are mostly asymptomatic and detected incidentally. However, recent studies report that RCMs are associated with various symptoms such as nasal and postnasal discharge, nasal congestion, facial pain, and headache. The etiology of RCMs has not been fully elucidated. [4].

Nasal septal deviation (NSD) is one of the main causes of upper airway obstruction [5]. NSD can cause sinus pathologies by narrowing the middle meatus [6]. In addition, NSD can affect the mucociliary activity and cause sinusoidal infections [7]. The prevalence of NSD ranges between 13.1-89.7 % in recent studies [8, 9]. In our opinion, narrowing of the nasal passage by NSD may prevent proper airflow, disrupt sinus drainage, and cause retention cyst formation.

This study aimed to investigate the relationship between RCMs and the nasal septum by evaluating the computed tomography (CT) images of patients who underwent paranasal sinus computed tomography (PNS/CT).

Materials and methods

The CT images of 208 patients who visited the otolaryngology clinic of a tertiary hospital in 2020 and underwent PNS/CT for any reason were retrospectively scanned. This study was approved by Yozgat Bozok University Clinical Research Ethics Committee on 24.02.2021 with the decision number 2017-KAEK-189_2021.02.24_04 and conducted per the Helsinki Declaration. Informed consent was obtained from all individuals included in the study.

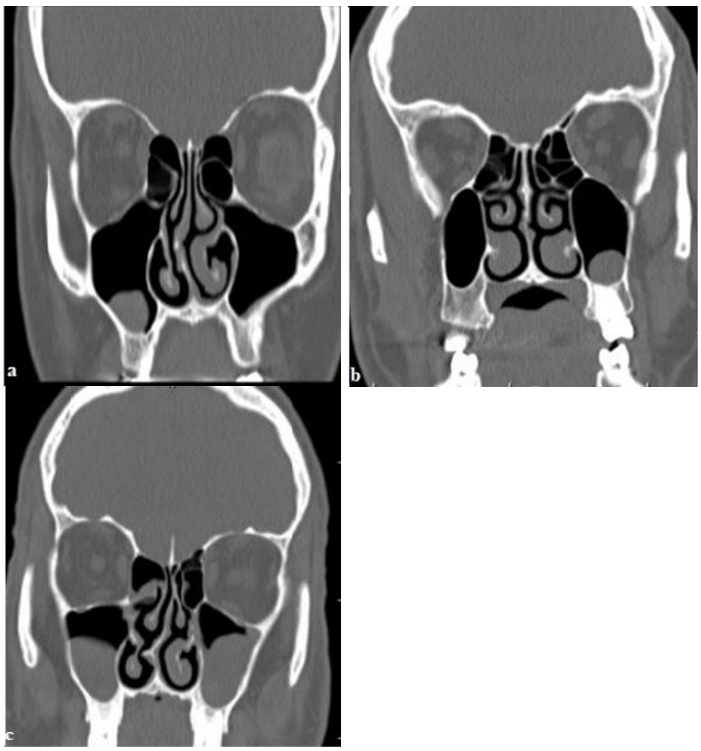
Patients with previous septal or sinus surgery, immunodeficiency, cystic fibrosis, nasal polyposis, a nasal mass, and acute or chronic sinusitis were excluded from the study. All CT images of the remaining patients obtained between 01.01.2020-31.12.2020 were included. The demographic characteristics of the patients were accessed through the hospital's electronic data recording system. Ages, genders, RCMs, and nasal septum statuses of all cases were noted.

The presence of retention cysts in the left and right maxillary sinuses and the direction of NSD were evaluated separately. The relationship between the direction of NSD and RCMs was investigated. Figure 1 shows RCMs with different nasal septa.

Statistical analysis

Statistical Package for the Social Sciences (version 22.0, IBM Inc., Chicago, IL, USA) software was used for statistical analysis. Continuous data were shown as mean (standard deviation) and categorical data as n (%). The Chi-square test was used to evaluate categorical data between groups. Logistic regression was used to determine the risk ratio. A *P*-value of <0.05 was considered statistically significant.

Figure 1: Paranasal sinus computed tomography views of maxillary sinus and nasal septum. (a) The nasal septum is deviated to right and retention cyst is found on the floor of the right maxillary sinus. (b) The nasal septum is in the midline and retention cyst is on the floor of the left maxillary sinus. (c) The nasal septum is deviated to right and retention cysts are found on the floors of bilateral maxillary sinuses.



Results

There were 119 (57.2%) males and 89 (42.8%) females in our patient group. There was no significant difference between the genders in terms of the presence of RCMs (*P*=0.087) (Table 1). The mean age of the patients was 38.07 (14.15) years. RCMs were detected in 72 (34.6%) of the CT images. The nasal septum was in the midline in 19, deviated to the right in 35, and deviated to the left in 18 patients. RCMs were on the right side in 28 (38.9%), on the left side in 19 (26.4%), and bilateral in 25 (34.7%) cases (Table 2). RCM was significantly related to NSD to the right (*P*=0.001), while it was not related to NSD to the left (*P*=0.5). When the nasal septum was in the midline, the risk of developing RCMs was significantly reduced (*P*=0.007) (Table 3). Right NSD was an independent risk factor for the development of RCMs and increased the risk by 2.29-fold (*P*=0.002) (Table 4).

Table 1: Distribution of RCMs by gender

		Gender		
		M	F	*P*-value
RCMs	Negative	72	64	0.087
		60.5%	71.9%	
	Positive	47	25	
		39.5%	28.1%	
Total		119	89	
		100.0%	100.0%	

RCMs: Retention Cysts of the Maxillary sinuses

Table 2: Patients' RCMs and NSD distribution frequency

	NSD right side		NSD left side		Septum into the midline	
RCMs	n	%	n	%	n	%
Right	11	15.3	10	13.9	7	9.7
Left	12	16.7	2	2.8	5	6.9
Bilateral	12	16.7	6	8.3	7	9.7

RCMs: Retention Cysts of the Maxillary sinuses, NSD: Nasal Septal Deviation

Table 3: Relationship between RCMs and NSD

		RCMs -	RCMs +	*P*-value
NSD Left Side	Negative	96	54	
		70.6%	75.0%	0.500
	Positive	40	18	
		29.4%	25.0%	
NSD Right Side	Negative	102	37	
		75.0%	51.4%	0.001
	Positive	34	35	
		25.0%	48.6%	
Nasal Septum into midline	Negative	74	53	
		54.4%	73.6%	0.007
	Positive	62	19	
		45.6%	26.4%	

RCMs: Retention Cysts of the Maxillary sinuses, NSD: Nasal Septal Deviation

Table 4: Regression analysis of independent risk factors in RCMs

Nasal septum	*P*-value	Relative risk	95% Confidence Interval	
			Lower	Upper
NSD right side	0.026	2.288	1.103	4.745
Into midline	0.320	0.681	0.319	1.452
NSD left side	0.500	0.800	0.418	1.530

RCMs: Retention Cysts of the Maxillary sinuses, NSD: Nasal Septal Deviation

Discussion

RCM is generally thought to be a self-limiting disease and the spontaneous regression and disappearance rates of RCMs range between 17.6 and 38% in the literature [3]. Wang et al. [3] followed 40 patients with RCMs for an average of 60 months to report that the retention cyst decreased in size or disappeared in 50% and increased in size in 27.8%. Therefore, they suggested that if the cysts did not show a significant change in size over 48 months, they would remain the same size over the long term. They suggested that in the absence of associated complications, a "wait and see" approach may be an appropriate management strategy for retention cysts.

The etiology of RCMs has not been fully elucidated. It has been stated that sinusitis, allergic rhinitis, barotrauma, and dental disease can cause the development of MSRKs [4]. Previous studies report that 18%-83.5% of patients with retention cysts have a history of allergies and 10 to 66.7% have sinusitis [10, 11]. Wang et al. [3] reported that 22.5% of these patients had a history of allergic rhinitis and 20 % were diagnosed with sinusitis.

Climate, humidity, and altitude are also stated among the etiological factors for RCMs. In their study conducted in two centers with different climatic, humidity, and altitude conditions, Omezli et al. examined 17,659 panoramic graphs and found that the prevalence of RCMs was 1.6% at high humidity and low altitudes, while it was 0.4% at low humidity and high altitudes. Based on these results, they suggested that the probability of developing RCMs significantly increased in high humidity and low altitude [12]. Contrarily, Gürsoy et al. [13] investigated the etiology of antrochoanal polyp (ACP) and found a significantly higher prevalence of retention cysts in the ACP group. The lack of a histological difference between maxillary sinus retention cysts and the cystic part of the ACP within the maxillary sinus supports the hypothesis that retention cysts may be precursor lesions of ACPs [14]. Berg et al. [14] stated that chronic inflammation may cause occlusion of small seromucinous glands on the mucosal surface and that retention cysts formed as a result of this occlusion may be responsible for the formation of ACP. This hypothesis is based on the shared histological features of cystic ACP and retention cysts. Frosini et al. [15] explained the conversion of retention cyst to ACP using Bernoulli's theorem. These studies, which show the possibility of RCM transformation into ACP despite the possibility of spontaneous regression, indicate that more attention should be paid to RCMs clinically.

Recent studies report that RCMs may cause symptoms such as nasal and postnasal discharge, nasal congestion, facial pain, and headache [11, 16]. In the study of Busaba and Kieff [16], all patients with RCMs reported facial pain or pressure in the sinus area. Similarly, a headache was reported by 63% of patients in the study of Hadar et al. [11] on symptomatic RCMs. Albu et al. reported that 60% had a feeling of pressure or pain on the face, 27.5% had nasal congestion, and 12.5% had a nasal discharge. In the same study, they found no relationship between the size of the cyst and the severity of the symptoms; surgical removal of the cyst did not provide a significant improvement in symptoms and suggested that surgery should aim to restore ventilation and drainage of the maxillary sinus [4].

The relationship of NSD with paranasal sinus disease continues to be debated among otolaryngologists [17]. A marked deviation of part or all of the nasal septum may not only obstruct nasal breathing but also lead to a disease in the lateral nasal wall and sequentially, in the paranasal sinuses [18]. The NSD can narrow the middle meatus by pushing the concha sideways. In addition to nasal congestion, it also exerts pressure on neighboring structures. This disrupts the drainage pathways, affects mucosal ciliary function with contact, and disrupts normal mucus drainage, resulting in obstruction of all sinuses and secondary nasal infections [18, 19].

Poorey [19] found a highly significant statistical correlation between the deviation angle and sinus mucosal hypertrophy in his study, in which he evaluated the effects of NSD on sinus diseases. More maxillary sinus mucosal changes were observed in patients with increased angles. Yousem et al. [20] evaluated the morphological features predisposing to sinusitis and reported that patients with evidence of sinusitis on CT scan had a higher degree of septal deviation than those without. They also found that sinusitis rates were not significantly different ipsilateral and contralateral to the septal deviation side. Calhoun et al. [21] examined paranasal sinus CT images of both asymptomatic and symptomatic patients and demonstrated a strong correlation between NSD and sinus disease. Elahi et al. [7] evaluated paraseptal structural changes and pathologies caused by nasal septum deviation in an adult population with a clinical diagnosis of chronic rhinosinusitis and reported that deviation and paraseptal pathologies were correlated [22]. We found that NSD to the right significantly increased the risk of the RCMs by 2.29-fold.

Kepekçi et al. [23] examined the relationship between sinonasal anatomical variations and RCMs and showed that right-sided RCMs were significantly higher in male patients. Similar results were also shown in the study of Omezli et al. [12]. Contrary to these studies, the RCMs in our study did not differ with gender.

Limitations

The limitations of our study include the lack of a classification of the severity and localization of NSD and measuring the size of the RCMs. The fact that we did not evaluate patient symptoms can be considered another limitation.

Conclusion

Although thought to be asymptomatic and regress spontaneously, the possibility of transformation to ACP increases the clinical importance of RCMs. We think that early surgical treatment of these patients may be preventive since NSD was a risk factor for the development of RCMs. Further research is needed to determine the correlation between the presence of RCMs and NSD and other paranasal anatomical pathologies, their degree, and clinical findings.

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