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The Effect Of Antrochoanal Polyp on Maxillary Sinus Size and Volume: A Thin-Slice Computed Tomography Analysis Study

Antrokoanal Polibin Maksiller Sinüs Boyut ve Hacmine Etkisi: Bir İnce Kesit Bilgisayarlı Tomografi Çalışması

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Özet

Bu çalışmanın amacı antrokoanal polip nedeniyle tedavi edilen hastalarda maksiller sinüs boyutlarının polipten etkilenip etkilenmediğini araştırmaktır.

Metod

Bu retrospektif çalışmada ACP nedeniyle opere edilmiş 38 hastanın medikal kayıtları geriye dönük olarak incelenmiştir. Bu hastalardan multislice computed tomografisi (MSCT) olan 30 hastanın paranazal multislice komputerize tomografi (CT) görüntüleri ile 30 tane benzer yaş ve cinsiyetteki herhangi paranazal bir hastalığı olmayan 30 sağlıklı bireyin CT görüntüleri değerlendirilmiştir. 30 ACP li hastanın polipli taraftaki MS anteroposterior, transvers ve craniocaudal mesafeleri ile MS yüzey alanları ve MS hacimleri aynı hastaların karşı taraflarıyla ve sağlıklı bireylerle karşılaştırıldı.

Bulgular

ACP li hastaların yaş ortalaması 29.75 ± 13.61 kontrol grubunun yaş ortalaması 28.88± 12.78 di. ACP li hastaların polipli MS leri ile karşı taraf MS leri karşılaştırıldığında MS anteroposterior, transvers, yükseklik, yüzey alanı ve hacim açısından istatistiksel olarak farklılık saptanmadı(p=0.21, p=0.06, p=0.09, p=0.07, p=0.05 sırasıyla). Buna karşın ACP li hastaların polipli taraftaki MS leri ile sağlıklı bireylerin MS leri karşılaştırıldığında anteroposterior, transvers, yüzey alanı açısından istatistiksel fark olmasada MS yüksekliği ve hacmi açısından istatistiksel fark bulunmuştur(p=0.05, p=0.15, p=0.06, p=0.02, p=0.02, sırasıyla)

Sonuç

ACP li hastalarda polipli MS boyutları genel olarak artış göstermesine rağmen sadece MS yüksekliği ve hacimi açısından normal bireylere göre anlamlı düzeyde artış göstermektedir.

Anahtar Kelimeler: Antrokoanal polip, maksiller sinüs, hacim

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Introduction

The aim of this study was to investigate whether the maxillary sinus dimensions of patients who were treated with antrochoanal polyps were affected by polyps.

Material and Methods

In this retrospective cross-sectional study, the medical records of 38 patients who were operated on for antrochoanal polyp were retrospectively reviewed. After exclusion 30 patients with multislice computed tomography and paranasal multislice computed tomography images and computed tomography images of 30 healthy individuals with similar age and gender without any paranasal disease were evaluated. Maxillary sinus anteroposterior, transverse and craniocaudal distances , maxillary sinus surface areas and Maxillary sinus volumes on the polyped side of the 30 Antrochoanal polyp patients were compared to the opposite sides of the same patients and to healthy subjects.

Results

Mean age of the antrochoanal polyp patients was 29.75 ± 13.61 and the mean age of the control group was 28.88 ± 12.78. There was no statistically significant difference in the anteroposterior, transverse, elevation, surface area, and volume of maxillary sinus compared with the polyped maxillary sinus of antrochoanal polyp patients ($p = 0.21$, $p = 0.06$, $p = 0.09$, $p = 0.07$, $p = 0.05$, respectively) . None the less, there was a statistically significant difference in MS height and volume with respect to the anteroposterior, transverse, and surface area statistical difference when comparing antrochoanal polyp on polyped side of antrochoanal polyp patients with that of healthy individuals ($p=0.05$, $p=0.15$, $p=0.06$, $p=0.02$, $p=0.02$, respectively)

Conclusion

Although polyped Maxillary sinus sizes in antrochoanal polyp increases in patients with antrochoanal polyp, but shows only a significant increase in maxillary sinus height and volume compared to normal individuals.

Key Words: Antrochoanal polyp, Maxillary sinus, Volume

Introduction

Antrochoanal polyp (ACP) is a slowly growing unilateral benign nasal mass originating from the maxillary sinus (MS) and extending to the choana. It is most commonly seen in men and at young age (2). The most common symptom is unilateral nasal passage, with symptoms such as nasal discharge, snoring, nasal bleeding, and nasal discharge (2, 3). ACP may occur most frequently in the posterior wall of the maxillary sinus while at least in the anterior wall (4).

In the MS embryonic period with the ethmoid sinuses starting from birth, the maxillary bones start to form after the second moon and complete their development at the age of 20 (5). MS dimensions may vary according to age, gender, and race (6). In clinical situations involving MS, predominantly Waters graphy and Computed Tomography (CT) was used more frequently in later periods and was found to be more valuable in distinguishing clinical conditions (7).

The aim of this study is to evaluate the maxillary sinus dimensions of patients who

have been operated on due to ACP through calculations on thin-slice CT images.

Material and Methods

This retrospective, case-control study included patients aged 16 years or older who were operated on between March 2015 and January 2018 in Tokat State Hospital due to ACP 30 patients with preoperative thin-section tomography of 38 patients who had undergone ACP surgery and 30 patients with similar age and gender group were evaluated for thin-section paranasal CT images. Patients with maxillofacial trauma, sinusitis, developmental deformity, maxillary hypoplasia, septal surgical history and insufficient image quality were excluded in both groups. Eight patients with ACP were excluded from this study due to insufficient image (n=6), bilateral ACP (n=1) and pseudocyst in other sinus (n=1). As a result thin-section CT scans of 30 patients with ACP and 30 healthy subjects CT were evaluated. CT were evaluated with multidetector computed tomography (MDCT) scanner Siemens 64-bit CT scanner (120 kV, 180 mA, Somatom Sensation 64; Siemens Medical Systems, Erlangen, Germany) slice thickness of 0,5 mm. CT of all patients were taken in the supine position, unenhanced and when patient was awake. MDCT reformatted images were evaluated on axial, coronal, and sagittal planes. Anteroposterior (AP), transverse and craiocaudal distances were measured on these images. The AP distance was measured in terms of the maximum antero-posterior diameter of the maxillary sinus in the axial view , the distance transversally between the two most distant points on the lateral and medial wall in the coronal view , and the distance between the two furthest points between the sinus ceiling and the base in coronal view. The calculation of the surface area was performed by measuring in cm^2 of multiplying AP distance and transverse distance . MS volume was the found as a result of calculating by multiplying AP, transverse and height distances' halves (AP X Transverse X High x 0,5) (Fig 1).

Fig 1. Calculation of Maxillary sinus dimensions. A. Calculation of anteroposterior dimension of maxillary sinus from axial view. B. Calculation of transverse dimension from coronal view. C. Calculation of craniocaudal dimension of maxillary sinus from coronal view.

Statistical analysis

SPSS package (version 21; SPSS Inc., Chicago, IL) was used for statistical analysis. The mean and standard deviations of all of the numerical findings in the study were calculated. The Kolmogorov-Smirnov test was used to evaluate the distribution of the variables. ACP patients' normal side MS difference with MS on the diseased side was assessed by independent t test. In the comparison of diseased MS of ACP patients with normal patients, independent t-test was also performed. A p value of <0.05 was considered statistically significant.

Results

A total of 60 individuals were included in this study. 16 of the 30 patients with ACP were male (M/F: 16/14). The mean age of ACP patients was 29.75 ± 13.61 (range, 16-51). Of the patients who constituted the control group, 16 were male (M/F: 16/14). The mean age of the patients in the control group was 28.88 ± 12.78 (range, 16-52). 17 of the patients had polyps on the right side and 13 were on the left side.

When thin-section CT of the 30 patients with polyp was examined, the mean AP distance of the maxillary sinus on the polyped side was 3.95 cm ± 0.37. Mean AP distance in opposite MS of ACP patients was 3.86

cm±0.38. There was no statistically significant difference between the polyp and non-polyp side AP distances of the ACP patients (p> 0.05). Transverse mean distance on the polyped side of the ACP patients was 2.91 cm ± 0.38 and 2.72 cm ± 0.37 on the opposite MS (p> 0.05). In ACP patients, the mean height of the MS on the polyped side was 4,12 ± 0,47 and the mean value of the opposite MS was 3.92 cm ± 0,45 (p> 0.05). The average surface area was 11.58 cm^2±2.17 on the ACP side, and the mean surface area was 10.59 cm^2 ± 2.06 on the opposite side (p> 0.05). In ACP patients, the mean volume of the MS on the polyped side was 24.18 cm^3 ± 6.73, and the mean volume of the MS on the opposite side was 21.02 cm^3 ± 5.68 (p> 0.05) (Table 1).

Table 1. Comparison of the maxillary sinus dimensions, surfaca area and volumes between the patients with the antrochoanal polyps and the without polyps side

	Side with polyp			**Side without polyp**			
Measurements of MS	mean	SD	min-max	mean	SD	min-max	*p*
Anteroposterior (cm)	3,95	0,37	3,38-4,71	3,88	0,37	3,25-4,52	0,06
Transverse (cm)	2,91	0,38	1,77-3,58	2,72	0,37	1,6-3,19	0,06
Craniocaudal(cm)	4,12	0,47	3,21-4,88	3,92	0,45	2,91-4,46	0,09
Surface area(cm^2)	11,58	2,17	6,19-15,82	10,59	2,09	5,24-13,74	0,07
Volume (cm^3)	24,18	6,67	15,25-40,5	21,02	5,68	10,31-29,54	0,05

MS: Maxillary Sinus, SD: Standart Deviation

When the measurements of polyped MS of ACP patients were compared with the control group; although polyped MS of ACP patients had a higher AP distance than the control group, there was no statistical difference between them (p> 0,05). There was no statistically significant difference between the transverse distance of the polyped side of the MS and the transverse distance of the control group of ACP patients (p> 0,05). Polyped side MS height of the ACP patients was statistically significant than the control group (p <0,05). While there was no statistically significant difference between the surface area of MS on the polyped side of ACP patients; there was a significant difference between the two groups in terms of volume (p> 0,05, p <0,05 respectively) (Table 2).

Table 2. Comparison of the maxillary sinus dimensions, surface area and volumes between the patients with antrochoanal polyps and control group.

	Patients with ACP(n=30)			**Control Group(n=30)**			
	Mean	SD	Min-Max	Mean	SD	Min-Max	p
Anteroposterior(cm)	3,95	0,37	3,38-4,72	3,83	0,28	3,34-4,54	0,05

Transvers	2,91	0,38	1,77-3,58	2,81	0,42	1,72-3,66	0,15
High	4,12	0,47	3,21-4,88	3,88	0,5	2,38-4,92	**0,01**
Surface Area	11,58	2,17	6,19-15,82	10,81	2,03	5,3-15,82	0,06
Volume	24,18	6,67	15,25-40,5	21,21	5,79	6,31-39,35	**0,02**

Discussion

There is no consensus on the etiology of allergies, dental trauma, inflammation, and chronic sinusitis in the formation of ACP. Cook et al. and Heck et al. found in all ACP patients with an allergy rate of 23.4% and 69.7%, respectively (8,9). Mostafa et al. suggested the effect of lymphatic obstruction on ACP formation (10).

Studies on MS dimensions and volume have recently been made especially via 3D CT and are particularly concerned with gender comparisons. In the study of Paknahad et al., the distance and height of maxillary sinus AP in males were found to be significant than females, but no difference was found for MS width (11). However, in the study of Urooge et al., no significant difference was found between males and females in terms of MS size (12). In a study by Aydin et al., of 36 patients with ACP related to the effect of ACP on MS dimensions in terms of MS volume within and the control group, they found that the volume of MS on the polyp side of the ACP patients increased significantly compared to the side without polyp (13). They also found that ACP patients' MS on the polyped side was significantly increased than the MS volume volume on the same side. But there is no evidence of their size in their study. In our study, although the dimensions of the MS on the ACP side were higher in terms of AP, transverse, height, surface area, volume, only a statistically significant change in height and volume was observed.

In a study of 15 patients with Veau Class III who were included in the study conducted by Kula et al. on the effect of the left lips/palates on MS volume, MS volumes were significantly lower in cleft lips/palates patients than in the control group (14). They claimed that the cleft lips/palates developmental defect was directly effective on the development of maxillary sinus. Similar results were obtained in other studies (15,16). This state indicates that congenital defects that affect maximal volume on MS volume and size are more effective.

As in all other sinuses, another condition that causes MS enlargement is mucocele. Mucocele refers to the accumulation of mucus in the gland as a result of blockage of glandular secretions. Proptosis is seen if thinning of the sinus wall and influencing the frontal sinus in the advanced period in cases with mucocele (17). In some other publications, it has been shown that MS size increases after mucocele (18,19). The mucocele, in particular, has a relatively strong wall of its own, and is not prone to go out of the MS ostium, but presses on the sinus walls. This condition may explain why the MS size increase. However, the tendency of the ACP to move out of the ostium to the choana reduces the pressure on the MS walls as much as possible. This may explain why ACP does not affect sinus dimensions as well as mucocele as we have in our study.

Conclusion

In conclusion, while ACP leads to a slight increase in MS size, the orientation towards the cochlea through the ostium appears to be unlikely to lead to significant dimensional changes on the MS.

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