CLINICAL STUDY

EFFECTS OF ADENOID PRESENCE AND SEPTAL DEVIATION ON PARANASAL SINUS PATHOLOGIES: A CT-BASED ADULT POPULATION STUDY

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SUMMARY

Objective: Anatomical variations and mucosal pathologies of the paranasal sinuses are of critical importance in nasal surgical planning. This study aims to evaluate, in an adult population, the relationship between adenoid tissue presence, morphological subtypes of septal deviation, and paranasal anatomical variations with sinus mucosal pathologies based on paranasal CT reports, and to compare the findings with the existing literature.

Methods: This retrospective descriptive study included 203 adult patients. Adenoid tissue, septal deviation (presence and type), mucosal thickening, retention cysts, and anatomical variations were systematically evaluated based on paranasal CT reports. Chi-square and Mann-Whitney U tests were used for statistical analyses.

Results: Adenoid tissue was detected in 7.4% of patients and showed a significant association with mucosal thickening in the maxillary, ethmoid, frontal, and sphenoid sinuses ($p < 0.05$). Frontal sinus mucosal thickening was significantly higher in patients with septal deviation ($p = 0.0161$). Moreover, the morphological type of septal deviation was significantly associated with the reporting of completely normal sinuses ($p < 0.05$). The distribution of anatomical variations was largely consistent with the literature, although some variations (e.g., paradoxical middle concha) were less frequent.

Conclusion: This study is one of the few systematic investigations demonstrating a significant association between adenoid tissue and sinus mucosal pathologies in the adult population. The morphological characteristics of septal deviation, not just its presence, should be considered in evaluating sinus anatomy. Paranasal CT imaging provides valuable and objective data not only for surgical planning but also for assessing the anatomical contributors to sinus physiology.

Keywords: Adenoid hypertrophy, septal deviation, computed tomography, paranasal sinus, anatomical variation, mucosal thickening

ADENOİD VARLIĞI VE SEPTUM DEVİASYONUNUN PARANAZAL SİNÜS PATOLOJİLERİ ÜZERİNDEKİ ETKİLERİ: BT TABANLI YETİŞKİN POPÜLASYON ÇALIŞMASI

ÖZET

Amaç: Paranasal sinüslerin anatomik varyasyonları ve mukozal patolojileri, nazal cerrahi planlamasında kritik öneme sahiptir. Bu çalışmanın amacı, erişkin bireylerde bilgisayarlı tomografi (BT) raporları üzerinden adenoid doku varlığı, septum deviasyonunun morfolojik alt tipleri ve diğer anatomik varyasyonların paranasal sinüs mukozal patolojileriyle olan ilişkisini değerlendirmek ve elde edilen bulguları literatürle karşılaştırmaktır.

Yöntem: Tanımlayıcı retrospektif nitelikteki bu çalışmaya 203 erişkin hasta dahil edilmiştir. Hastalara ait paranasal BT raporları üzerinden adenoid doku, septum deviasyonu varlığı ve tipi, mukozal kalınlık, retansiyon kistleri ve anatomik varyasyonlar sistematik olarak incelenmiştir. İstatistiksel analizlerde Ki-kare ve Mann-Whitney U testleri kullanılmıştır.

Bulgular: Adenoid doku, hastaların %7.4"ünde saptanmış olup, adenoid varlığı ile maksiller, etmoid, frontal ve sfenoid sinüs mukozal kalınlaşmaları arasında anlamlı ilişkiler gösterilmiştir ($p < 0.05$). Septum deviasyonu varlığı, frontal sinüs mukozal kalınlığı ile ilişkili bulunmuş ($p = 0.0161$); ayrıca septum deviasyonunun morfolojik tipi ile sinüslerin normal raporlanma durumu arasında anlamlı fark saptanmıştır ($p < 0.05$). Anatomik varyasyon oranları büyük ölçüde literatürle uyumlu olup, bazı parametrelerde (örneğin paradox orta konka) daha düşük oranlar izlenmiştir.

Sonuç: Bu çalışma, erişkin yaş grubunda adenoid doku varlığı ile sinüs mukozal patolojileri arasında anlamlı ilişki gösteren nadir sistematik çalışmalardan biridir. Septum deviasyonunun yalnızca varlığı değil, morfolojik özellikleri de sinüs anatomisinin değerlendirilmesinde dikkate alınmalıdır. Paranasal BT görüntülemeleri, yalnızca cerrahi planlama açısından değil, sinüs fizyolojisini etkileyen anatomik yapılarla ilgili objektif ve detaylı veri sağlaması açısından da değerlidir.

Anahtar Sözcükler: Adenoid hipertrofi, septum deviasyonu, bilgisayarlı tomografi, paranasal sinüs, anatomik varyasyon, mukozal kalınlaşma

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INTRODUCTION

Anatomical variations of the paranasal sinuses and associated mucosal pathologies are critical structural factors that must be thoroughly assessed prior to nasal surgeries performed for both functional and aesthetic purposes. Such variations can disrupt sinus ventilation and drainage, predisposing patients to clinical

conditions like chronic rhinosinusitis and increasing the risk of surgical complications.[1,2]

While adenoid tissue has been extensively studied in the pediatric population for its role in nasopharyngeal obstruction and the pathogenesis of rhinosinusitis,[3,4] its presence and clinical relevance in adults-both in terms of prevalence and association with sinus pathologies-remain relatively underexplored in the literature. Existing studies focusing on adenoid tissue in adults are largely limited to case reports or histopathological series, with retrospective analyses based on conventional CT data being particularly scarce.[5,6]

Similarly, although septal deviation is among the most common anatomical variations linked to nasal obstruction and sinus disease, the effects of specific morphological subtypes (e.g., C-shaped or S-shaped deviations) on sinus pathology have not been thoroughly investigated. Moreover, parameters such as the frequency with which sinuses are classified as "normal" in CT reports have largely been overlooked.

Although adenoid hypertrophy is classically considered a pediatric condition, increasing evidence suggests that adenoid tissue may persist into adulthood and contribute to upper airway obstruction, impaired nasal ventilation, and sinonasal inflammation. However, data regarding its prevalence and radiological impact on paranasal sinus pathology in adults remain limited and fragmented. In particular, CT-based evaluations focusing on adult populations are scarce, leaving a significant gap in understanding the potential role of adenoid tissue in adult sinonasal disease.

This study aims to assess, through paranasal CT reports of adult patients, the relationship between the presence of adenoid tissue, morphological subtypes of septal deviation, and various paranasal anatomical variations with sinus mucosal pathologies.

MATERIAL and METHODS

This study was designed as a retrospective, descriptive investigation using a convenience sampling method. Approval was obtained from the local ethics committee. As the study was conducted retrospectively based on file data, the requirement for informed consent was waived. All procedures performed in this study were conducted in accordance with the ethical standards of the institutional and/or national research committees and with the 1964 Declaration of Helsinki and its subsequent amendments.

The study included patients who underwent rhinoplasty surgery at a single secondary healthcare center between December 1, 2018, and December 31, 2024. All rhinoplasty procedures were performed under general anesthesia using an open technique. Individuals under the age of 18, patients whose surgeries were performed at other centers, those with concomitant systemic diseases, patients with abnormalities detected in preoperative evaluations, and cases with incomplete data were excluded from the study.

At our institution, rhinoplasty operations are routinely performed under general anesthesia. Although paranasal CT scans are not obtained routinely in the preoperative period, patients with preoperative paranasal CT reports available in their files were included. Evaluations were based on the official CT reports prepared by radiologists, rather than direct imaging reviews.

Septal deviation morphology was classified as C-shaped or S-shaped based on the predominant curvature pattern described in the radiology reports, consistent with commonly used anatomical classifications in the literature. Sinuses were considered "normal" when radiology reports explicitly stated the absence of mucosal thickening, retention cysts, or other pathological findings.

All radiological data were obtained from official paranasal sinus CT reports generated during routine clinical practice. The CT images were not re-evaluated by the authors. Reports were prepared by different radiologists working at the same institution according to standard reporting protocols. Interobserver variability was not assessed, which represents a methodological limitation of the study, particularly for interpretation-dependent findings such as adenoid tissue presence and mucosal thickening.

During data collection, in addition to recording patients" age and sex, various anatomical and radiological parameters were assessed based on paranasal CT reports. Specifically, the presence of mucosal thickening in the paranasal sinuses, the degree of regional

involvement (up to five sinus regions, with the right and left maxillary sinuses evaluated separately), the presence of retention cysts (including the maxillary, ethmoid, frontal, and sphenoid sinuses), the presence of adenoid tissue, the direction of septal deviation (right, left, or S-shaped), and the morphological type of deviation (C-shaped, S-shaped, or no deviation) were evaluated. Additionally, findings related to nasal anatomical variations, including concha bullosa, middle turbinate hypertrophy, inferior turbinate anomalies (hypertrophy, atrophy, inversion), osteomeatal complex patency, the presence of bony spurs, and aeration of the anterior clinoid process, were analyzed.

Descriptive statistics were expressed as mean, standard deviation (SD), median, and range. The Chi-square test was used for comparisons of categorical variables; the Mann-Whitney U test was applied for comparisons of ordinal or non-normally distributed variables between two groups; and the Kruskal-Wallis test was used for comparisons among multiple groups. All statistical analyses were performed using IBM SPSS Statistics Version 20.0 (IBM Corp., Armonk, NY, USA). A p-value of < 0.05 was considered statistically significant.

RESULTS

The mean age of the 203 patients included in the study was calculated as 26.68±8.39 years (median: 23, range: 18-54). Regarding gender distribution, 32.5% (n=66) of the patients were male and 67.5% (n=137) were female.

In the evaluation of maxillary sinus mucosal thickening, no thickening was detected in 133 patients (65.5%). Thickening was identified in the right maxillary sinus alone in 10 patients (4.9%), in the left sinus alone in 12 patients (5.9%), and bilaterally in 48 patients (23.6%). Concerning maxillary sinus retention cysts, no cysts were observed in 171 patients (84.2%), while retention cysts were identified in the right sinus of 5 patients (2.5%), the left sinus of 14 patients (6.9%), and bilaterally in 11 patients (5.4%). Additionally, bilateral fibrous septa and fluid levels were each reported at a rate of 0.5% (Table 1).

For the ethmoid sinus, 148 patients (72.9%) showed no mucosal thickening, while thickening was present in 55 patients (27.1%). Ethmoid sinus retention cysts were observed in only 4 patients (2.0%).

In the frontal sinus evaluation, 176 patients (86.7%) exhibited no mucosal thickening, whereas 27 patients (13.3%) did. When assessed along with variations such as hyperaeration and hypoplasia, 194 patients (95.6%) had no frontal sinus retention cysts; retention cysts were detected in 2 patients (1.0%), hyperaeration in 2 patients (1.0%), and hypoplasia in 5 patients (2.5%).

Regarding the sphenoid sinus, mucosal thickening was absent in 181 patients (89.2%) and present in 22 patients (10.8%). Sphenoid sinus retention cysts were absent in 200 patients (98.5%) and present in 3 patients (1.5%).

In the evaluation of the inferior turbinate, no hypertrophy was observed in 44.8% of the patients, while hypertrophy was detected on the right side in 10.8%, on the left side in 6.4%, and bilaterally in 37.9%. Inferior turbinate atrophy was absent in 195 patients (96.1%), while it was present on the right side in 2 patients (1.0%), on the left side in 2 patients (1.0%), and bilaterally in 3 patients (1.5%). An inversion anomaly of the right inferior turbinate was reported in only 1 patient (0.5%).

Regarding paradoxical middle turbinate, no anomaly was found in 199 patients (98.0%), while right, left, and bilateral anomalies were each observed in 0.5% of the cases. Middle turbinate hypertrophy was absent in 170 patients (83.7%), and hypertrophy was detected on the right side in 9 patients (4.4%), on the left side in 10 patients (4.9%), and bilaterally in 14 patients (6.9%).

Concha bullosa was absent in 134 patients (66.0%), while it was observed on the right side in 21 patients (10.3%), on the left side in 18 patients (8.9%), and bilaterally in 30 patients (14.8%).

Septal deviation was not observed in only 21 patients (10.3%). Right-sided deviation was noted in 93 patients (45.8%), left-sided deviation in 73 patients (36.0%), and "S-shaped" deviation in 16 patients (7.9%). Regarding morphological types, C-shaped deviation was identified in 166 patients (81.7%), and S-shaped deviation in 16 patients (7.9%).

In the evaluation of the osteomeatal complex, patency was observed in 193 patients

(95.1%). Obstruction was identified in the right side of 5 patients (2.5%), the left side of 2 patients (1.0%), and bilaterally in 3 patients (1.5%). Anterior clinoid process aeration was absent in 194 patients (95.6%), while it was present in the right side of 3 patients (1.5%), the left side of 2 patients (1.0%), and bilaterally in 4 patients (2.0%). A bony spur was observed in 30 patients (14.8%) and absent in 173 patients (85.2%).

Regarding adenoid tissue, normal nasopharyngeal architecture was observed in 188 patients (92.6%), while adenoid tissue was identified in 15 patients (7.4%).

Patients with adenoid tissue demonstrated a significantly higher frequency of paranasal sinus mucosal thickening compared to those without adenoid tissue ($p = 0.0018$, Chi-square test). Similarly, the degree of regional sinus involvement was significantly greater in patients with adenoid tissue ($p < 0.0001$, Mann-Whitney U test). The overall presence of sinus pathology (defined as mucosal thickening or retention cyst in at least one sinus) was also significantly associated with the presence of adenoid tissue ($p = 0.0034$, Chi-square test). However, no significant association was found between the presence of retention cysts and adenoid tissue ($p = 1.000$) (Table 2).

Table 1 Comprehensive Anatomical Variation and Pathology Analysis Compared with Literature

Parameter	This Study	Literature Range	Closest Literature (Study – Year)
Age (mean ± SD)	26.68 ± 8.39	—	—
Gender	Female: 67.5%, Male: 32.5%	—	Yıldırım 2008 – Female-predominant
Septal Deviation Rate	89.7%	20–72.8%	Güngör 2019 – 72.8%
Morphological Type of Septal Deviation (C/S/None)	C: 81.7%, S: 7.9%, None: 10.3%	—	—
Concha Bullosa	34.1%	24–53%	Devareddy 2019 – 32%
Paradoxical Middle Turbinate	2%	7–26%	Jones 2002 – 7–26%
Inferior Turbinate Hypertrophy	55%	51–62.2%	Aysel 2021 – 55%
Inferior Turbinate Atrophy	3.9%	—	—
Middle Turbinate Hypertrophy	16.3%	—	—
Maxillary Sinus Mucosal Thickening	34.5%	31.1%	Patel 1996 – 31.1%
Ethmoid Sinus Mucosal Thickening	27.1%	Lower	Patel 1996, Flinn 1994
Frontal Sinus Mucosal Thickening	13.3%	13.3%	Patel 1996 – 13.3%
Sphenoid Sinus Mucosal Thickening	10.8%	9%	Flinn 1994 – 9%
Maxillary Sinus Retention Cyst	15.8%	6.9–14.4%	Kayalıoğlu 2000 – 14.4%
Ethmoid Sinus Retention Cyst	2%	—	—
Frontal Sinus Retention Cyst	1%	—	—
Sphenoid Sinus Retention Cyst	1.5%	—	—
Frontal Sinus Hypoplasia	13.3%	4.6–15%	Devareddy 2019
Frontal Sinus Hyperaeration	1%	—	—
Anterior Clinoid Process Pneumatization	20%	3.3–28.8%	Turna 2014, Güngör & Okur 2019
Crista Galli Pneumatization	7%	7–8.8%	Nautiyal 2020, Talaiepour 2005
Osteomeatal Complex Patency	95.1% (open)	—	—
Spur (Bony Spur)	14.8%	—	—
Presence of Adenoid Tissue	7.4%	—	Bhatia 2020, Rout 2020

Tablo 2. Exploratory Statistical Analysis of Anatomical and Pathological Relationships

Findings	p-Value	Statistical Test Used
Association between frontal sinus mucosal thickening and septal deviation presence	0.0161	Chi-square test
Association between normal paranasal sinuses and morphological type of septal deviation (C/S)	0.0126	Chi-square test
Association between normal paranasal sinuses and presence of septal deviation	0.0248	Chi-square test
Association between presence of adenoid tissue and mucosal thickening in at least one sinus	0.0018	Chi-square test
Association between presence of adenoid tissue and maxillary sinus mucosal thickening	0.0023	Chi-square test
Association between presence of adenoid tissue and ethmoid sinus mucosal thickening	0.0008	Chi-square test
Association between presence of adenoid tissue and regional sinus involvement degree	<0.0001	Mann-Whitney U test
Association between presence of adenoid tissue and overall sinus pathology presence	0.0034	Chi-square test
Association between presence of adenoid tissue and sinus retention cyst presence	1.0000	Fisher's Exact Test

These findings suggest that the presence of adenoid tissue may be particularly associated with paranasal sinus pathologies in terms of mucosal thickening and the extent of involvement, although it does not appear to influence the presence of retention cysts.

Moreover, when comparing the morphological type of septal deviation (C-type, S-type, or no deviation) with paranasal sinus pathologies, no statistically significant differences were found in the presence of mucosal thickening ($p = 0.6584$), the frequency of retention cysts ($p = 0.1837$), or the degree of involvement ($p = 0.8533$). This suggests that the type of septal deviation may not have a significant impact on the severity or extent of paranasal sinus pathology.

Sinuses were reported as completely normal in 43.8% of cases (n=89), and this finding was significantly associated with both the presence ($p = 0.0248$) and morphological type (C/S) ($p = 0.0126$) of septal deviation. Additionally, frontal sinus mucosal thickening was significantly associated with the presence of septal deviation ($p = 0.0161$).

DISCUSSION

In this study, paranasal CT reports of adult patients were analyzed to evaluate the distribution of anatomical variations and pathologies. The findings were compared with national and international literature, highlighting significant differences and points of concordance. Due to the retrospective and report-based design of the study, causality cannot be inferred from the observed associations.

In our study, septal deviation was detected at a high rate of 89.7%, which is notably higher than rates reported by Turna (2014) (59.1%), Talaiepour (2005) (63%), Güngör (2019) (72.8%), and Subbiah (2025) (66.6%).[1,7-9] This discrepancy may be attributed to the patient population consisting of individuals scheduled for rhinoplasty and potential differences in the definitions of deviation.

Not only the presence but also the morphological subtype of septal deviation (e.g., C-shaped, S-shaped) may affect nasal airflow and sinus drainage. However, in our study, there was no statistically significant association between the morphological types of septal deviation (C-type 81.7%, S-type 7.9%) and the presence of paranasal sinus mucosal thickening, retention cyst frequency, or the degree of sinus involvement ($p > 0.05$). This suggests that the clinical impact of deviation should be evaluated not solely based on its morphology but also considering factors such as the severity, localization (e.g., proximity to the osteomeatal complex), and accompanying variations. Similarly, some studies in the literature have reported no relationship between deviation type and sinus pathologies, emphasizing the importance of the deviation"s effect on nasal airflow rather than on sinus disease directly.[10,11] Therefore, deviation type alone may not be a decisive factor for sinus diseases.

Moreover, a significant association was found between frontal sinus mucosal thickening and the presence of septal deviation ($p = 0.0161$), with patients exhibiting deviation demonstrating a higher incidence of frontal sinus mucosal thickening. This finding suggests that deviation localized near the frontal recess and osteomeatal complex may impair frontal sinus drainage and promote inflammatory changes. Moorthy et al. (2014) similarly reported that septal deviation could lead to drainage impairment in the frontal and ethmoid sinuses.[10] However, few studies have directly demonstrated this relationship through p-values.

Additionally, the rate of cases in which paranasal sinuses were reported as completely normal was found to be significantly associated with both the presence ($p = 0.0248$) and morphological type (C/S type) ($p = 0.0126$) of septal deviation. This suggests that anatomical deviations may influence not only pathological findings but also the classification of "normalcy" in sinus CT reports. It can be postulated that C-type deviation may cause more pronounced asymmetry and affect anatomical integrity by restricting sinus ventilation. Turna et al. (2014) emphasized the indirect effects of septal deviations on sinus drainage and ventilation but did not directly investigate the relationship with sinus normalcy.[1]

The rate of concha bullosa detection in our study was 34.1%, which falls within the 24-53% range reported in Jones" (2002) review.[2] Similar rates have been reported by Devareddy (2019) (32%), Güngör (2019) (75.9%), and Aysel (2021) (36%).[8,12,13] Additionally, the rate is comparable to the 33.3% reported by Patel (1996).[14] These findings suggest that our results regarding concha bullosa are consistent with the literature.

The rate of paradoxical middle turbinate observed in our study was low at 2%. In the literature, this rate has been reported as 12.2% (Kayalıoğlu, 2000), 16.6% (Güngör, 2019), 9% (Devareddy, 2019), and between 7-26% (Jones, 2002).[2,8,12,15] Despite being lower, our findings still reflect similar morphological classifications.

The prevalence of maxillary sinus retention cysts in our study was 15.8%, higher than rates reported by Patel (1996) (6.9%), Munde (2021) (7.4%), and Aysel (2021) (7%).[13,14,16] However, it closely matches the 14.44% rate reported by Kayalıoğlu (2000).[15] This similarity highlights consistency between our findings and those studies that used adult populations and CT-based evaluations.

Our rates of mucosal thickening-ethmoid (27.1%), frontal (13.3%), sphenoid (10.8%), and maxillary sinuses (34.5%)-are generally higher compared to studies by Patel (1996), Havas (1988), Flinn (1994), and Subbiah (2025).[9,14,17,18] However, they show close concordance with Patel’s (1996) rates for frontal (13.3%) and maxillary (31.1%) sinuses. Similarly, Flinn’s (1994) report of a 9% sphenoid sinus involvement rate is comparable to our finding of

10.8%.[18] These results suggest that while our findings are consistent with certain literature, our higher rates may reflect the focus on an adult rhinoplasty patient population.

In our study, the presence of adenoid tissue was identified in 7.4% of cases and was significantly associated with higher frequencies of paranasal sinus mucosal thickening and regional involvement. This finding can be explained by the pathophysiological mechanism whereby adenoid hypertrophy narrows the nasopharyngeal airway, impairs nasal ventilation, and obstructs natural sinus drainage pathways. Similarly, Szczepanowicz et al. (2023) reported associations between adenoid hypertrophy and various sinonasal pathologies, including upper airway obstruction and chronic sinusitis.[19] These findings highlight the need to consider the impact of adenoid tissue on sinus health, even in adults. While the literature mainly addresses this relationship in pediatric populations,[5] our study indicates that adenoid tissue may also significantly influence sinus mucosal changes in adults, particularly in the maxillary and ethmoid sinuses. However, no significant association was found between adenoid tissue and the presence of retention cysts, suggesting that adenoid-related effects are primarily inflammatory rather than glandular.

In this study, anterior clinoid process pneumatization was detected in 20% of cases, frontal sinus hypoplasia in 13.3%, frontal sinus hyperaeration in 1%, inferior turbinate hypertrophy in 55%, inferior turbinate atrophy in 3.9%, middle turbinate hypertrophy in 16.3%, and crista galli pneumatization in 7%. These rates are largely consistent with those reported in the literature. For example, anterior clinoid pneumatization has been reported to range from 3.3-28.8%,[7,8] frontal sinus hypoplasia from 4.6-15%,[12] inferior turbinate hypertrophy from 51-62.2%,[13,15] and crista galli pneumatization from 7-8.8%.[7,20] Our findings align with these ranges, especially regarding turbinate and frontal sinus variations, providing detailed classification that contributes to the existing literature.

When comparing our findings to six studies covering both pediatric and adult populations, our results particularly contribute to the literature by highlighting the effect of adenoid hypertrophy on sinus mucosal thickening. Studies by Tursun, Maheswaran, and Tuncer have reported varying associations between adenoid tissue and sinus findings in pediatric cohorts.[3,4,21] However, our study demonstrates a significant association between adenoid tissue and mucosal thickening across the entire sinus system in adults, suggesting that adenoid tissue may contribute to sinus pathologies even beyond childhood.

While studies by Bhatia, Rout, and Yıldırım focused on clinical and histological evaluations of adenoid tissue in adults,[5,6] our study, through CT-based structural analysis, offers new insights into the statistical relationships between adenoid tissue and sinus pathologies in adults.

Maheswaran et al. reported a 57% association between adenoid hypertrophy and sinusitis in children, but did not find a significant relationship with S. pneumoniae colonization.[3] Although microbiological data were not available in our study, radiological evidence of mucosal thickening was found to be significantly associated with adenoid tissue. Moreover, while Maheswaran"s study used endoscopy and X-ray techniques, our CT-based evaluation offers a more objective assessment.

Tuncer et al. (2004) concluded that adenoid hypertrophy in children acts more as a mechanical obstruction rather than an infection reservoir.[4] Similarly, our study suggests that adenoid tissue in adults may promote an inflammatory response in the sinus mucosa and should not be overlooked clinically.

Frontal sinus mucosal thickening was significantly more common in patients with septal deviation ($p = 0.0161$), suggesting that septal deviation may impair frontal sinus drainage and predispose to mucosal changes.

Lastly, the proportion of cases in which the paranasal sinuses were reported as completely normal was significantly associated with both the presence of septal deviation ($p = 0.0248$) and its morphological type (C/S) ($p = 0.0126$), indicating a potential impact of septal structure on the anatomical integrity of the sinuses.

Limitations

This study has several limitations. First, all evaluations were based on radiology reports rather than direct re-interpretation of CT images, and the reports were prepared by multiple radiologists. Therefore, interobserver variability could not be assessed. This may have affected interpretation-dependent parameters such as adenoid tissue detection and mucosal thickening. However, the use of standardized institutional reporting practices partially mitigates this limitation. Additionally, adenoid tissue was evaluated only as present or absent, without grading, volumetric assessment, or evaluation of the degree of nasopharyngeal obstruction, which limits detailed clinical interpretation. Although the overall sample size was adequate, the relatively small number of patients with adenoid tissue (n=15) necessitates cautious interpretation of statistically significant associations. A priori power analysis was not performed due to the retrospective design. Future studies with larger, multicenter cohorts are needed to validate these findings. Given the exploratory nature of this retrospective analysis, no formal correction for multiple comparisons was applied, and the results should be interpreted accordingly."

CONCLUSION

In this study, paranasal CT reports of adult individuals evaluated with paranasal CT imaging were retrospectively analyzed, with a detailed examination of both anatomical variations and mucosal pathologies. The collected data were comparatively analyzed against existing literature, and significant differences were identified in certain parameters.

A statistically significant association was observed between the presence of adenoid tissue and paranasal sinus mucosal thickening, making this one of the few studies to demonstrate the impact of adenoid tissue on sinus physiology in the adult population. Furthermore, significant relationships were found between the presence of septal deviation and both frontal sinus mucosal thickening and the rate of sinuses reported as normal. Future prospective studies are needed to explore the causal nature of these associations.

The distribution of anatomical variations (such as concha bullosa, inferior/middle turbinate hypertrophy, and bony spur) was largely consistent with the literature, although lower rates were noted for some parameters (e.g., paradoxical middle turbinate).

Overall, this study demonstrates that adenoid tissue presence and septal deviation characteristics are significantly associated with paranasal sinus mucosal changes in adults. These findings suggest that such anatomical factors should be considered during adult sinonasal evaluation, even in the absence of overt sinonasal symptoms, and that paranasal CT may serve as a valuable adjunctive tool for functional assessment and surgical planning. Future prospective and multicenter studies are warranted to further clarify the clinical relevance and causal nature of these associations.

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