Buletin Kedokteran & Kesehatan Prima
Vol.3 No.2 (2024)
DOI: 10.34012/bkkp.v3i2.5817

ORIGINAL ARTICLE

Anatomical variation findings of the paranasal sinuses based on CT scans in rhinosinusitis

Adeline Thelim[1], Ica Yulianti Pulungan[2]*, Ikhwanul Hakim Nasution[2], Clairine Altin Nur Rahmi[1]

ABSTRACT

Rhinosinusitis is an inflammation of the paranasal sinuses and nasal mucosa that occurs due to bacterial, viral, fungal infections, allergens, or autoimmune conditions with signs and symptoms such as nasal congestion, runny nose, facial pain, and decreased olfactory ability, with causes such as host factors that are divided into systemic and local (such as anatomical abnormalities) as well as environmental factors such as viral or bacterial infections and allergen exposure. Anatomical variations in the sinonasal area can cause impaired drainage and ventilation to obstruction of the osteomeatal complex which ultimately causes and even exacerbates inflammation of the sinus mucosa, examples of anatomical variations such as septal deviation, agger nasi cells, concha bullosa, haller cells, onodi cells, and others, with the radiological modality widely used is CT - Scan. This study aimed to identify anatomical variations in rhinosinusitis cases based on CT scan examination results. This study is descriptive and uses a total sampling technique. A total of 53 samples were taken, with rhinosinusitis as the main diagnosis. Subsequently, a frequency distribution test was conducted. It was found that 45 samples had no anatomical variation and eight samples had anatomical variations in the form of septal deviation. The results showed that the anatomical variation found in rhinosinusitis patients at RSUD Dr. Pirngadi had a septal deviation of as many as eight samples (15.1%).

Keywords: anatomical variations, paranasal sinuses, rhinosinusitis, CT - Scan

Introduction

Sinusitis, also known as rhinosinusitis, is the combination of rhinitis and sinusitis. Rhinosinusitis is an inflammation of the paranasal sinuses and nasal mucosa that occurs due to infection by bacteria, viruses, fungi, allergens, or autoimmune conditions. Signs and symptoms such as nasal congestion/congestion, runny nose (anterior/posterior drip), conchal hypertrophy, facial pain, and decreased olfactory ability.[1–4] In children usually found coughing during the day and night as well as rhinnorhea with colored secretions.[4]

The causes of rhinosinusitis are host factors that can be divided into systemic (such as allergy, immunodeficiency, congenital abnormalities, and mucociliary dysfunction) and local (such as anatomical abnormalities) factors, as well as environmental factors, such as viral infections, bacteria, and allergen exposure. Frequent viral infections include rhinovirus, adenovirus, coronavirus, influenza virus, parainfluenza virus, and respiratory syncytial virus. The most common bacteria are *Haemophilus influenzae*, *Streptococcus pneumoniae*, *Moraxella catarrhalis*, and *Staphylococcus aureus*. Rhinosinusitis can cause

Affiliation
[1]Undergraduate Programme in Medical Science, Universitas Prima Indonesia, Medan, Indonesia
[2]Department of Radiology, Universitas Prima Indonesia, Medan, Indonesia

***Corespondence:**
icayuliantipulungan@unprimdn.ac.id

complications, such as orbital and intracranial abnormalities, osteomyelitis, and pulmonary abnormalities.[2–4]

The paranasal sinuses are the site of many possible lesions that vary in number and shape. Anatomical variations in the sinonasal area play a role in impaired drainage and ventilation to obstruct the osteomeatal complex, which can ultimately cause and even aggravate inflammation of the sinus mucosa. Anatomical abnormalities (anatomical variations are septal deviation, septal spur, konka bullosa, agger nasi cell, haller cell, onodi cell, bulla ethmoid, bulla uncinatus, antral septum of maxillary sinus, frontal sinus aplasia. Identification of anatomical variations in rhinosinusitis can be performed for therapeutic purposes, as well as for preoperative analysis. The most widely used radiologic modality is computed tomography (CT). Examination with CT can provide an overview of areas that are not or difficult to see on endoscopy.[5,6] Because anatomical variations are one of the causes of rhinosinusitis, the author wanted to see if there are anatomical variations found in patients with rhinosinusitis at Dr. Pirngadi Hospital. Based on previous research by Husni et al[7], it was found that sinusitis patients were mostly experienced by the age group of 30-39 years, with the most gender being female, where the most common anatomical variation was septal deviation.

Method

This study is descriptive and quantitative and is located at dr. Pirngadi Hospital, Medan, was conducted from August 1 to August 30, 2024. The population used was patients with rhinosinusitis, and sampling was performed using the total sampling technique. The sample criteria used were rhinosinusitis as the main diagnosis and CT - Scan examination. This study used secondary data from medical records obtained from 2019 to 2023 at dr. Pirngadi Hospital, Medan. From the initial survey conducted by the author, 53 participants met the criteria. Data were taken in the form of sex, age, chief complaint, location of infected paranasal sinuses, and anatomical variations. The data were then processed using SPSS to conduct a frequency distribution test and are presented in the form of tables and graphs.

Results and Discussion

Frequency analysis of the 53 samples showed that the majority of rhinosinusitis patients in this study were male (27 patients, 50.9%). Meanwhile, 26 people (49.1%) were female. This finding contrasts with previous studies, such as those conducted by Putra et al.[1] and Elvan et al.[6] who reported a higher prevalence of rhinosinusitis in women.

Of the 53 samples studied, the age group of rhinosinusitis was mostly found in the age range of 20 to 45 years, with a total of 20 samples (37.7% of the total sample). This was followed by the age group above 60 years with 13 samples (24.5%), the age group of 11 to 19 years with 11 samples (20.8%), and finally the age group of 46 to 59 years with 9 samples (17%).

Table 1. Characteristics of patients (n=53)

Characteristics	n	%
Gender		
Female	27	49.1
Male	26	50.9
Age (years)		
11-19	11	20.8
20-44	20	37.7
45-59	9	17.0
>60	13	24.5

The most common complaint among the 53 participants was nasal congestion, affecting 41.5% of the individuals (see Table 2). Other frequent complaints included nasal congestion accompanied by cephalgia (headache) in 9.4% of cases and epistaxis (nosebleed) in 7.5% of cases. A smaller proportion of participants reported symptoms such as a runny nose, isolated cephalgia, and combinations of symptoms such as nasal congestion with dizziness, runny nose, epistaxis, cold, nose pain, ear throbbing, and even more complex combinations of fever, dyspnea, and ear pain. Some individuals also reported less common symptoms, such as nose numbness and isolated dizziness.

Table 2. Main complaints identified (n=53)

Complaint	n	%
Nasal congestion	22	41,5
Nasal congestion, cephalgia	5	9,4
Epistaxis	4	7,5
Runny Nose	3	5,7
Cephalgia	2	3,8
Nasal congestion, dizziness	2	3,8
Nasal congestion, runny nose	1	1,9
Nasal congestion, epistaxis	1	1,9
Nasal congestion, cold	1	1,9
Nasal congestion, nose pain	1	1,9
Nasal congestion, ear throbbing	1	1,9
Nasal congestion, runny nose, cephalgia	1	1,9
Nasal congestion, cephalgia, cold	1	1,9
Stuffy nose, smelly nose, runny nose, cephalgia	1	1,9
Runny nose, dizziness	1	1,9
Cephalgia, cold	1	1,9
Cephlagia, nose pain	1	1,9
Fever, runny nose, dyspnea, dizziness	1	1,9
Ear pain, cough, fever	1	1,9
Dizziness	1	1,9
Nose numbness	1	1,9

As shown in Table 3, of the 53 cases, the maxillary sinus was the most commonly infected, affecting 41.5% of individuals. In nearly one-fifth of the cases (18.9%), both the maxillary and frontal sinuses were involved. Other common combinations included maxillary and ethmoid (11.3%), and maxillary, frontal, and ethmoid (5.7%). Less frequent combinations involved the sphenoid sinus, either alone or in combination with the other sinuses. Isolated infections of the frontal, ethmoid, and sphenoid sinuses are relatively rare, accounting for less than 2% of cases.

Table 3. Infected paranasal sinuses (n=53)

Infected paranasal sinuses	n	%
Maxillary	22	41,5
Maxillary, Frontalis	10	18,9
Maxillary, Ethmoidalis	6	11,3
Maxillary, Frontalis, Ethmoidalis	3	5,7
Maxillary, Frontalis, Ethmoidalis, Sphenoidalis	3	5,7
Ethmoidalis, Sphenoidalis	2	3,8
Maxillary, Frontalis, Sphenoidalis	2	3,8
Maxillary, Ethhmoidalis, Sphenoidalis	2	3,8
Frontalis	1	1,9
Ethmoidalis	1	1,9
Frontalis, Ethmoidalis	1	1,9

Analysis of 53 study subjects revealed anatomical variations in the nasal cavity. Of the total subjects, 15.1% (eight people) were found to have septal deviation, which is a deviation from the normal position of the wall that divides the nasal cavity into two parts. Other anatomical variations such as septal spur, conchal bullosa, agger nasi cells, Haller cells, Onodi cells, ethmoid bulla, bulla uncinatus, antral septum of the maxillary sinus, and frontal sinus aplasia were not found in all subjects studied. In total, 84.9% (45 patients) showed no significant anatomical variations in their nasal cavities. Overall, the results of this study indicate that septal deviation was the most common anatomical variation found in the studied subject group.

Table 4. Anatomical variations detected (n=53)

Anatomical variations	n	%
Septal Deviation	8	15,1
Septal Spur	-	-
Concha Bullosa	-	-
Agger rice cell	-	-
Haller cell	-	-
Onodi cell	-	-
Bulla Ethmoid	-	-
Bulla Uncinatus	-	-
Maxillary Sinus Antral Septum	-	-
Frontalis Sinus Aplasia	-	-
Not Found	45	84,9

In this study, limitations arose in the form of secondary data, namely the medical records used, which were taken for the last 5 years so that medical record retention had been carried out by the relevant institutions. In addition, data collection of medical records that have switched to electronic (e-medical records) requires additional time when rechecking data from old medical records with those that have entered the electronic section (computer), so that no data collection errors occur.

Conclusion

Based on the results of the frequency distribution analysis of CT-Scan data in rhinosinusitis patients, it was found that the most common anatomical variation was septal deviation, which was found in eight samples (15.1%). Further analysis showed that most patients with anatomical variations were male (50.9%). The age group of 20-45 years was the most common for this anatomical variation (37.7%). The main complaint most commonly reported by the patients was nasal congestion (41.5%). The maxillary sinus was the most commonly infected sinus in the patient group (41.5%). Future research should be conducted by expanding the population and sample size to identify other anatomical variations that may occur.

References

1. Putra TRI, Teuku Husni T.R, Hesti Anandini Sariningrum, Dhiatama Endalif. Characteristics of Chronic Sinusitis Based on Non-Contrast CT Scan at the ENT-Head and Neck Surgery Polyclinic of Regional General Hospital Dr. Zainoel Abidin Banda Aceh. Indones J Trop Infect Dis. 2022 Apr 28;10(1):55–61.
2. Mustafa M, Patawari P, Iftikhar H, Shimmi S, Hussain S, Sien M. Acute and Chronic Rhinosinusitis, Pathophysiology and Treatment. Int J Pharm Sci Invent. 2015;4(2).
3. Sharma GK, Lofgren DH, Hohman MH, Taliaferro HG. Recurrent Acute Rhinosinusitis. Treasure Island (FL): StatPearls Publishing; 2022.
4. Gunawan VL, Widjaja G. Diagnosis dan Tata Laksana Rinosinusitis Akut. Cermin Dunia Kedokt. 2023 Apr 3;50(4):191–3.
5. Devaraja K, Doreswamy SM, Pujary K, Ramaswamy B, Pillai S. Anatomical Variations of the Nose and Paranasal Sinuses: A Computed Tomographic Study. Indian J Otolaryngol Head Neck Surg. 2019 Nov 26;71(3):2231–40.
6. Elvan Ö, Esen K, Çelikcan HD, Tezer MS, Özgür A. Anatomic Variations of Paranasal Region in Migraine. J Craniofac Surg. 2019 Sep;30(6):529–32.
7. Husni T, Pradista A. Faktor predisposisi terjadinya rinosinusitis kronik di Poliklinik THT-KL RSUD dr. Zainoel Abidin Banda Aceh. J Kedokt Syiah Kuala. 2012;12(3).