RESEARCH ARTICLE

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Characteristic of Anatomical Variations in Paranasal Sinus CT-Scan of Chronic Rhinosinusitis Patients at the ENT Clinic Prof. Dr. I.G.N.G Ngoerah General Hospital Denpasar in 2021

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ABSTRACT

***Background*: Anatomical variations and pathological processes in the nose and paranasal sinuses have been widely studied by experts. Many anatomical variations cause chronic sinusitis by causing obstruction of the osteomeatal complex (OMC) and influencing mucociliary transport patterns.**

***Methods*: This is a retrospective study based on radiology data of all rhinosinusitis cases that performed a computed tomography scan of the paranasal sinuses at Prof. Dr. I.G.N.G Ngoerah General Hospital Denpasar for one year (January 2021 to December 2021). The sample of this study was all rhinosinusitis patients undergoing surgery, both male and female, from January 1 to December 31, 2021.**

***Results*: Based on the results of the research data, the highest anatomical variation was concha hypertrophy in as many as 26 people (38.2%).**

***Conclusion*: The most common anatomic variation is concha hypertrophy. Preoperative CT scan examination is essential because it can be helpful as navigation for sinus surgeons. Early detection of anatomic variations is the key for surgical planning and the prevention of complications.**

Keywords: Anatomical Variation, CT-Scan, Paranasal Sinus, Rhinosinusitis.

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I. Introduction

Rhinosinusitis is defined as inflammation of the nose and paranasal sinuses characterized by nasal congestion, nasal discharge, post-nasal drip, facial pain, pressure, and loss of smell by endoscopy and CT scan. This disease occurs due to obstruction in the main area, namely the osteomeatal complex (OMC). Many anatomical variations lead to chronic sinus disease by obstructing the osteomeatal complex (OMC) and affecting mucociliary transport patterns. Changes in the lateral nasal wall and middle turbinate stimulate changes in the mucosa and decrease aeration of the paranasal sinuses and significantly increase the potential for sinus disease. Septal deviation is an anatomical variation that is often found, while double concha is rare [2].

Computed tomography is an excellent means of providing information from the paranasal sinuses, assessing disease and guiding endoscopic sinus functional surgery (FESS). Anatomical variations are often found in the paranasal sinuses [3]. The development of computed tomography (CT) techniques resulted in advances in visualising the anatomic structures of the lateral nasal wall. It allows anatomical variations to be precisely identified and is essential in the surgical treatment of chronic rhinosinusitis [4].

Based on the above background, the authors wanted to know the anatomical variations of CT-scan paranasal sinuses in rhinosinusitis patients undergoing surgery at Prof. Dr. I.G.N.G Ngoerah General Hospital Denpasar. The results of the study are expected to be used as a reference for appropriate interventions to treat rhinosinusitis.

II. Methods

This study is a retrospective study based on a radiology database of all rhinosinusitis cases that performed paranasal sinuses computed tomography scan at Prof. Dr. I.G.N.G Ngoerah General Hospital Denpasar for one year (January 2022 to December 2022). This study was conducted in approximately two months (January 2022 to February 2022). The sample of this study was all rhinosinusitis patients undergoing surgery, both male and female, from January 1 to December 31, 2021. The inclusion criteria of this study were patients aged more than 15 years old and rhinosinusitis who had ventilation problems. The exclusion criteria from this study were patients with facial trauma, positive paranasal sinus pathology, head and neck tumours and a history of previous surgery. The analysis in this study is univariate analysis (descriptive statistics). The univariate analysis aims

to describe the subject characteristics and other variables. Univariate analysis is presented in the form of a frequency distribution table.

III. Result

The study subjects were rhinosinusitis patients who underwent surgery at Prof. Dr. I.G.N.G Ngoerah General Hospital Denpasar in January-December 2021.

TABLE I: Distribution of Rhinosinusitis Patient based on Age Range

Age Range	N	(%)
15-24	7	20
25-34	6	17.1
35-44	9	25.7
45-54	5	14.3
>55	8	22.9
Total	35	100

The age of most patients was 35-44 years old (25.7%), while the lowest was 45-54 years old (14.3%).

TABLE II: Distribution of Rhinosinusitis Patient by Gender

Gender	N	(%)
Male	14	40
Female	21	60
Total	35	100

Based on the results of descriptive statistics on study data, there were 14 male patients (40.0%) and 21 female patients (60.0%).

TABLE III: Distribution of Location of Paranasal Sinuses with Rhinosinusitis Patients Undergoing Surgery

Paranasal Sinus	n	(%)
Maxillary Sinus	30	37.0
Frontal Sinus	6	7.4
Sphenoid Sinus	20	24.7
Ethmoid Sinus	25	30.9

Based on the results of the study data, the highest number of paranasal sinuses was found in the maxillary sinus, amounting to 30 patients (37.0%), while the lowest was the frontal sinus as many as 6 patients (7.4%).

TABLE IV: Anatomical Variation of CT scan of Rhinosinusitis Patients Undergoing Surgery

Paranasal Sinus	n	(%)
Septum deviations	24	35.3
Concha hypertrophy	26	38.2
Concha bullosa	2	2.9
Paradoxical Middle Turbinate	0	0
Haller cells	2	2.9
Agger Nasi cells	10	14.7
Onodi air cells	4	6
Sphenoid sinus pneumatization	0	0
Prominent ethmoid bulla	0	0

Based on the results of study data, it was found that the most anatomical variation was concha hypertrophy as many as 26 patients.

IV. Discussion

Sinusitis is one of the most common diseases that doctors encounter in primary care. Currently, radiological imaging is not only indicated for evaluating cases of uncomplicated sinusitis. Further diagnostic evaluation and radiological imaging should be performed for cases of sinusitis whose symptoms persist or recur [5]. Operators should have a systematic approach to reviewing CT scans of the nose and paranasal sinuses for sinus disease, drainage pathways, anatomic variants, critical variants, and brain soft tissue, neck and orbit [6].

The subjects in the study were rhinosinusitis patients who underwent surgery at Prof. Dr. I.G.N.G Ngoerah General Hospital Denpasar from January to December 2021. Based on the results of descriptive statistics on study data, there were 14 male and 21 female patients. The male: female ratio is 1: 1.5. The study by Regina found the ratio of men to women was 1 to 1.3, while Husni found that women who suffered the most chronic sinusitis were 59 people (53.2%) [7], [8]. Different results were obtained in several studies. The study by Nikita obtained 21 male and 19 female patients from 40 patients with chronic rhinosinusitis [9]. The study by Qureshi of 50 subjects found 34 male and 16 female patients with a mean age of 42.68±18.22 years [10]. Studies by Nada in 2016 and 2018 found the results of 48.4% female patients and 51.6% male patients [11], [12]. Study by Shrestha found a male to female ratio of 1.3:1 [13].

This study found that the location of the most paranasal sinuses was the maxillary sinus, amounting to 30 people (37.0%). Similar results were obtained in the study of Husni *et al.* [8]. Based on the results of non-contrast CT scans, they found the most affected sinus location was the maxillary sinus in as many as 110 people (99.1%) [8]. The study by Nitin et al. also found that the maxillary sinus (68.03%) was the most frequently affected sinus, followed by anterior ethmoid sinusitis (60.66%) [14]. Wahyuni's study showed a correlation between age and height of the left posterior papiracea (p=0.02), but there was no correlation between ethmoid sinus volume and age [15].

From the study, the age of most patients was 35-44 years old (25,7%), while the lowest was 45-54 years old (14,3%). The study by Husni *et al.* [8] showed that the majority of patients with chronic sinusitis aged 30-39 years old were 42 people (37.8%). Nitin's study found the mean age was 35.48 years old, with mostly males [14]. The study of Adeel found that the mean age of the patients was 31±13.15 years old [16]. Nada's study found that the mean age was 38.5±26.5 years old [11], [12]. The study of Shrestha found that patients' ages ranged from 14 to 72 years old with a mean age of 33.2±14.2 years old [13].

Based on the results of the study, it was found that the most anatomical variations were concha hypertrophy in as many as 26 people. Another study showed that the most common anatomical variation was septal deviation [8], [9], [17], [18]. In Shresta's study, 68 patients (89.5%) had at least one type of anatomic variation while eight (10.5%) had no variation [13]. Adeel found one or more anatomical variations in 40 (51.9%) patients [16]. Patients with one variation were seen in 39 patients (51.3%), while 29 patients (38.2%) had two or more variations [13]. Several studies found a significant relationship between nasal septal deviation and chronic

rhinosinusitis [19], [20]. Other studies such as Abdul's study showed that there was no significant relationship between frontal cell type, agger nasi cell, middle concha bullosa and the incidence of frontal rhinosinusitis (p>0, 05) [21]. The study of Abass showed a correlation between nasal septal deviation and the presence of nasal septal pneumatization, nasal spurs, and Haller cells [22]. Study from Rashi and Tapendra showed that the highest variation was a septal deviation, followed by concha bullosa [23], [24]. Lakshmipathi in the study found 86.1% had septal deformity, 58.4% Concha bullosa, 52.3% Agger Nasi, 15.3% Haller Cell, 13% Middle Turbinate Paradox, 4,6% had everted uncinate process, and 3% had bulla enlargement [25]. Nitin found septal deviation was the most common anatomic variation in 59 patients (48.30%) on nasal endoscopy and 62 patients (50.81%) on computed tomography [14].

The results of other studies showed more multi-anatomic variations compared to single anatomical variations [26]. Regina's study found that the most anatomical variations were pneumatization of the middle turbinate (32.73%), followed by agger nasi cells (23.64%), Haller cells (20.91%), septum deviation (20.18%) and sphenoid sinus septum (18%) [7]. Rashi's study found that the maxillary sinus accessory ostium was the most common anatomical variation found in 23 cases (18%) [27]. In several studies, the anatomical variation most commonly observed was agger nasi cells [10], [28]. Pneumatization of crista galli was also found as the most anatomical variation [11], [12]. For complaints before and after surgery showed that there was no difference in postoperative complaints between patients with and without anatomical variations of the osteomeatal complex based on chronic rhinosinusitis CT scan [29].

V. Conclusion

In this study, the most common anatomic variation was concha hypertrophy. Preoperative CT scan examination is essential because it can be helpful as navigation for sinus surgeons. Early detection of anatomic variations is the key for surgical planning and the prevention of complications.

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Author Contribution

All authors discussed the results and commented on the manuscript.

Conflict of Interest

Authors declare that they do not have any conflict of interest.

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