

Lung Functions of Japanese Patients with Chronic Rhinosinusitis Who Underwent Endoscopic Sinus Surgery

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ABSTRACT

Background: Chronic rhinosinusitis (CRS), which is clinically classified into CRS without nasal polyps (CRSsNP) and CRS with nasal polyps (CRSwNP), shows considerable geographic differences and heterogeneity. Eosinophilic (E) CRS with nasal polyps (ECRSwNP) has a higher degree of disease severity and higher frequency of comorbid asthma. Epidemiologic studies in different ethnic populations have improved understanding of the pathophysiology of the disease. Here we report the clinical characteristics of Japanese patients with medically refractory CRS undergoing endoscopic sinus surgery (ESS).

Methods: We recruited a total of 210 CRS patients and assessed them by nasal endoscopy, the Lund-Mackay score using computed tomography (CT), peripheral eosinophilia and smoking status. We also examined the comorbidity of asthma, effects of age and lung functions in the patients.

Results: In this study, 13% of CRSwNP patients and 20% of CRSwNP patients with peripheral blood eosinophilia exhibited obstructive lung dysfunction ($FEV_1/FVC < 70\%$) despite the absence of an asthma diagnosis. Among elderly nonsmoker patients (≥ 60 years) who had never been diagnosed with asthma, 50% of CRSwNP patients with peripheral blood eosinophilia showed decreased $FEV_1/FVC < 70\%$.

Conclusions: Our findings suggest that asthma is under-diagnosed in CRS patients who undergo ESS, especially the elderly. Although the association between CRS and asthma has been recognized, increased attention to the comorbidity of obstructive airway diseases such as asthma is still needed for management of medically refractory CRS.

KEY WORDS

asthma, chronic rhinosinusitis, eosinophils, lung functions, nasal polyps

INTRODUCTION

Chronic rhinosinusitis (CRS), a common disease associated with persistent inflammation of the nasal and paranasal sinuses, is a public health problem resulting in a socioeconomic burden throughout the world.^{1,2} CRS is commonly classified into two groups, CRSsNP and CRSwNP. Considerable heterogeneity within CRSwNP has been recognized and there are geographic differences in the condition.^{3,4} Tissue from Caucasian patients with CRSwNP is character-

ized by eosinophilic inflammation, whereas samples from Asian patients are biased toward neutrophilic inflammation.^{3,4} Eosinophilic (E) CRSwNP has been found in 65-90% of subjects with CRSwNP in Caucasians and in 50% of them in East Asian populations.¹⁻³ ECRSwNP represents a higher degree of disease severity, with an impaired sense of smell, higher recurrence rate after surgery and higher frequency of comorbid asthma.² The association of ECRSwNP and asthma is well recognized in western countries;^{5,6} however, asthma comorbidity in CRSwNP patients in

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Table 1 Clinical characteristics of patients with chronic rhinosinusitis

	CRSSNP <i>n</i> = 40	CRSwNP <i>n</i> = 170	<i>P</i> -value
Age (median, range)	57 (35-64)	54.5 (44-63)	NS
Sex (male/female) (female %)	31/9 (23)	109/61 (36)	NS
Smoker, no. (%)	21 (53)	56 (33)	<0.05
Current smoker, no. (%)	21 (53)	46 (27)	<0.01
Brinkman index of smokers	430 (290-728)	560 (300-854)	NS
Asthma, no. (%)	2 (5)	44 (26)	<0.01
Aspirin-induced asthma, no. (%)	0 (0)	10 (6)	NS
Allergic rhinitis, no. (%)	8 (20)	48 (28)	NS
Rhinorrhea, no. (%)	34 (85)	124 (73)	NS
Nasal congestion, no. (%)	23 (58)	138 (81)	<0.01
Headache, no. (%)	17 (43)	38 (22)	<0.05
Olfactory dysfunction, no. (%)	11 (28)	112 (66)	<0.0001

P values were determined using the Mann-Whitney U test, or Fisher's exact test as appropriate. CRSwNP, chronic rhinosinusitis with nasal polyps; CRSSNP, chronic rhinosinusitis without nasal polyps; NS, not significant.

Asian countries has not been fully studied. Nor are the clinical features of CRS such as sinus scores evaluated by CT scanning and lung functions in Asian populations well investigated.

Epidemiologic studies have shown that asthma and rhinitis often coexist in the same patients and suggest the 'united airways' concept.^{4,7-11} Underdiagnosis and undertreatment of asthma is a significant public problem all over the world, especially in the elderly.¹² The awareness of asthma is frequent in those with comorbid rhinitis,¹³ and it has also been suggested that symptoms may predominate in one organ and be unrecognized in other organs even though they exist.⁸ A higher CT score and more nasal polyp formation are observed in elderly patients with CRS.¹⁴ However, the influence of aging on the clinical features of CRS in Japanese patients has not been examined.

ESS is the treatment choice for medically refractory CRS with or without nasal polyposis.¹⁵ To clarify the clinical features of refractory CRS in Japanese patients, we conducted a cross-sectional study with a total of 210 CRS patients who underwent ESS. We assessed their clinical phenotypes through the use of nasal endoscopy, considering peripheral eosinophilia, CT scores based on the Lund-Mackay system, smoking status, comorbidity of asthma, effects of age and lung functions.

METHODS

SUBJECTS

CRS was defined as a condition with at least two of the following symptoms: anterior and/or posterior rhinorrhea, nasal obstruction, decreased sense of smell, and nasal pressure existing for 12 weeks despite medical management.^{1,2} We recruited all patients with CRS who underwent ESS at the University of Yamanashi Hospital from January 2002 to October 2011. All individuals were Japanese, and we excluded

patients with autoimmune disease, cancer, papilloma, fungal infection, postoperative maxillary cysts, choanal polyps, and nasal foreign bodies before enrollment. We excluded patients with allergic fungal rhinosinusitis based on CT and/or histopathological findings from the start. We included patients with unilateral CRS and those with nasal polyps. The presence or absence of nasal polyps was confirmed by endoscopy. Finally, a total of 210 subjects were analyzed (Table 1). CRS patients were classified into CRSwNP and CRSSNP groups based on the criteria of the American Academy of Otolaryngology-Head and Neck Surgery Chronic Rhinosinusitis Task Force.¹ Comorbidity of asthma was determined from the patients' medical histories based on doctors' interviews. We defined individuals who had asthma diagnosed by a doctor at any point in their lifetime as having bronchial asthma. This study was approved by the ethics committee of the University of Yamanashi Hospital. We informed patients that any clinical data would be used for research analyses by placing a notice on walls in the medical examination room and hospital lobby in the University of Yamanashi Hospital. We individually responded to patients who dissented from such use. In this study, we recruited subjects who did not dissent from use of the clinical data. This process of obtaining informed consent was approved by the ethics committee of the University of Yamanashi Hospital.

PERIPHERAL EOSINOPHIL COUNT

A total of 19 patients (9%) were treated with systemic corticosteroids in the two months before the operation, and 91 patients (43%) were treated with intranasal steroids in the month before the operation. Since the eosinophil count is sensitive to steroid treatment, we recorded the highest peripheral blood eosinophil percentage among all the blood tests done before operation.

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