

Chronic Rhinosinusitis Patients With and Without Polyps Experience Different Symptom Perception and Quality of Life Burdens

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Abstract

Objective: We sought to determine if chronic rhinosinusitis (CRS) patients with nasal polyps (CRSwNP) differentially perceived CRS symptom burden compared to patients without nasal polyps (CRSsNP) and to what extent CRS symptom severity was associated with quality of life (QOL) and patient-reported symptom control in the 2 groups.

Methods: A total of 600 patients (266 CRSwNP and 334 CRSsNP) presenting with CRS were recruited. CRS symptom burden was assessed with the 22-item Sinonasal Outcome Test (SNOT-22). SNOT-22 nasal, sleep, ear/facial discomfort, and emotional subdomain scores were calculated. General health-related QOL was assessed with the visual analog scale of the 5-dimensional EuroQol questionnaire (EQ-5D VAS). Patients rated their CRS symptom control on a 5-point scale.

Results: SNOT-22 scores did not differ between CRSwNP (mean: 35.6) and CRSsNP (mean: 36.3). There were no differences in nasal, sleep, and emotional subdomains of the SNOT-22. CRSsNP had higher ($P = .003$) ear/facial subdomain scores than CRSwNP, while CRSwNP reported greater hyposmia ($P < .001$). EQ-5D VAS was significantly lower ($P = .011$) in CRSsNP (mean: 68.9) compared to CRSwNP (mean: 73.2). However, CRSwNP patients reported significantly less symptom control, compared to CRSsNP, in association with nasal and emotional symptoms.

Conclusion: CRSwNP and CRSsNP have differences in symptom profile, effect on health-related QOL, and patient-perceived symptom control. CRSsNP experience significantly greater burden of ear/facial discomfort, while CRSwNP report greater hyposmia. Although CRSsNP reports lower general health-related QOL overall, CRSwNP patients had lower levels of CRS symptom control for every incremental increase in symptom burden suggesting greater sensitivity/intolerance to CRS symptoms.

Keywords

chronic rhinosinusitis, polyps, quality of life, disease control, perception, patient-reported outcome, patient perspective

Introduction

Chronic rhinosinusitis (CRS) is a common chronic disease of the paranasal sinuses with a reported prevalence ranging from approximately 2% to 15% of the US population.^{1,2} It is defined by at least 3 months of persistent

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sinonasal inflammation and associated symptoms of nasal congestion, rhinorrhea, hyposmia, and facial pressure.^{1–3} Due to chronic sinonasal symptomatology and their acute exacerbations, as well as exacerbation of comorbid pulmonary disease, CRS is associated with significant morbidity and decreased quality of life.^{4–7} CRS is also associated with a substantial financial impact of billions of dollars annually due to direct costs of health care and indirect costs of lost productivity.⁸

CRS has been phenotypically classified based on the presence of nasal polyps as CRS with nasal polyps (CRSwNP) and CRS without nasal polyps (CRSsNP).¹ The underlying pathophysiologic differences between CRSwNP and CRSsNP are currently under research, but many previous studies have suggested distinct pathophysiological mechanisms for CRSwNP versus CRSsNP. Among patients in Europe and North America, tissue eosinophilia is much more prevalent in CRSwNP⁹ and immunologic profiling studies have found increased expression of Th-2 inflammatory mediators in CRSwNP.^{10,11} However, the distinction between inflammatory profiles of CRSwNP and CRSsNP is not entirely clear-cut, and there is substantial overlap.^{10,12,13} Clinical differences also exist between CRSwNP and CRSsNP. For example, CRSwNP is disproportionately associated with a greater prevalence of comorbid asthma and concomitant airway or pulmonary disease manifestations, atopy, and aspirin sensitivity.^{14,15} Despite well-described differences between CRSwNP and CRSsNP, understanding the distinction between these 2 populations of CRS patients remains a timely and active area of investigation with therapeutic implications.^{16,17}

Patient perception of the CRS disease process is an increasingly recognized as an important modulator of the CRS disease course, affecting tolerance of symptoms and QOL impact felt by patients.^{18–22} Patient perception of disease has not yet been well distinguished between CRSwNP and CRSsNP. Identification of the symptoms most noticeable and most bothersome to these patients may provide focused therapeutic targets and strategies in the treatment of CRSwNP and CRSsNP. Previous studies have shown that CRSwNP and CRSsNP patients experience different CRS symptoms. It has been reported that patients without polyps suffer from facial pressure, while patients with nasal polyps suffer from more nasal obstruction and hyposmia.²³ However, the burden of CRS symptomatology and the perception of those symptoms remains unclear in CRSwNP versus CRSsNP patients. The goal of this study was to systematically characterize CRS symptom burden in CRSwNP compared to CRSsNP, both in magnitude as well as in relation to associated general QOL detriment and patient-reported symptom control (a reflection of patient tolerance for the symptomatology).

Methods

Study Participants

This study was approved by our institution's Human Studies Committee. Adult patients of age 18 years or older with consensus guideline criteria for CRS were recruited prospectively and provided informed consent for inclusion in this study. All participants met consensus guideline established criteria for CRS.²⁴ Exclusion criteria included comorbid diagnoses of (1) vasculitis, (2) cystic fibrosis, (3) sarcoidosis, and (4) immunodeficiency. Patients with acute CRS exacerbations were excluded so that all study participants' symptom severities would be reflective of baseline symptomatology. To remove the confounding effect of recent endoscopic sinus surgery, patients who had endoscopic sinus surgery within the last 6 months were also excluded.

Study Design and Data Collection

This is a cross-sectional study to understand differences in CRS symptom burden, QOL, and symptom control between CRSwNP and CRSsNP. The age, gender, and smoking history of all participants were recorded. Any participant who reported current or former tobacco use was considered a smoker for this study.^{25,26} All participants also completed the 22-item Sinonasal Outcome Test (SNOT-22).^{27,28} The previously validated 4 SNOT-22 subdomain scores were also calculated as follows.²⁹ SNOT-22 nasal subdomain score was calculated by summing SNOT-22 items 1 to 6, 21, and 22. SNOT-22 otologic subdomain score was calculated by summing SNOT-22 items 7 to 10. SNOT-22 sleep subdomain score was calculated by summing SNOT-22 items 11 to 18. SNOT-22 emotional subdomain score was calculated by summing SNOT-22 items 19 and 20. All participants also completed the EuroQol 5-dimensional (EQ-5D) general health questionnaire, from which the visual analog scale (EQ-5D VAS) was used, as a metric for general health-related QOL.^{30,31} The EQ-5D has been previously described as a high-quality measure of general QOL for CRS patients.³² All participants rated the level of control for their CRS symptoms over the last 6 weeks as "Not at all," "A little," "Somewhat," "Very," or "Completely."^{33,34} At enrollment, participants were assessed by the evaluating rhinologist for a history of (1) aeroallergen hypersensitivity based on formal allergy testing, (2) asthma, and (3) nasal polyps.

Statistical Analysis

All analyses were performed with the statistical software package R (www.r-project.org). Unless otherwise specified, comparisons of clinical and demographic characteristics between CRSsNP and CRSwNP patients were

performed with Wilcoxon Rank-Sum test for numeric variables, Fisher's exact test for binary variables and Chi Square test for categorical variables. Associations with EQ-5D as dependent variable were performed with linear regression. Associations with patient-reported symptom control level were performed with ordinal regression. To detect statistically significant differences between point estimates for regression coefficients, θ (with associated standard deviation [SD] for the estimate of θ), we derived P values from z scores that were calculated as $Z = \frac{(\theta_1 - \theta_2)}{\sqrt{(SD_1)^2 + (SD_2)^2}}$.

Results

Study Participants

A total of 600 CRS patients, 334 CRSsNP and 266 CRSwNP, were recruited and their characteristics are described in Table 1. In comparing CRSsNP and CRSwNP patients, CRSwNP patients had a higher prevalence of aeroallergen hypersensitivity ($P = .042$) and asthma ($P < .001$) and also had a greater history of previous endoscopic sinus surgery ($P = .039$). SNOT-22

scores were similar in CRSwNP (mean 35.6, SD: 25.2) and CRSsNP (mean 36.3, SD: 21.6) ($P = .330$). However, while there was no difference in nasal ($P = .398$), sleep ($P = .203$), and emotional ($P = .976$) SNOT-22 subdomain scores, CRSsNP patients had greater ear/facial discomfort SNOT-22 subdomain scores ($P = .003$). Although there was no statistically significant difference in nasal subdomain score, CRSwNP patients scored higher on the hyposmia question of the SNOT-22 (mean = 2.2) compared to CRSsNP patients (mean = 1.5) ($P < .001$) as expected. CRSsNP patients also had lower EQ-5D VAS scores ($P = .008$). However, there was no difference in patient-reported CRS symptom control levels.

Associations of CRS-Associated Symptoms With General Health-Related QOL

We first calculated the association between EQ-5D VAS (as dependent variable) and the response on each individual SNOT-22 item for CRSsNP and CRSwNP participants (Figure 1 and Table 2). In both CRSwNP and CRSsNP, we found that the severity of each symptom

Table 1. Clinical and Demographic Characteristics of Study Participants.

	All CRS (N = 600)	CRSsNP (N = 334)	CRSwNP (N = 266)	P^a
Demographics				
Age, mean in years (SD)	51.9 (15.8)	51.3 (16.2)	52.6 (15.4)	.322
Gender				.356
Male	49.7%	46.7%	53.4%	
Female	50.3%	53.3%	46.6%	
Smoking	27.0%	26.0%	28.2%	.658
Comorbidities				
Aeroallergen hypersensitivity	46.3%	40.1%	54.1%	.042
Asthma	32.2%	18.6%	49.2%	<.001
CRS characteristics				
Previous sinus surgery	36.1%	30.8%	42.9%	.039
Intranasal steroid use	50.7%	48.8%	53.0%	.572
SNOT-22 score, mean (SD)	36.0 (23.2)	36.3 (21.6)	35.6 (25.2)	.330
SNOT-22 subdomain scores, mean (SD)				
Nasal	15.4 (9.2)	15.0 (8.4)	16.0 (10.1)	.398
Sleep	14.1 (11.2)	14.4 (10.6)	13.7 (11.9)	.203
Ear/facial discomfort	5.1 (4.8)	5.6 (4.9)	4.5 (4.6)	.003
Emotional	1.4 (2.2)	1.3 (2.1)	1.5 (2.4)	.976
EQ-5D VAS, mean (SD)	71.0 (20.9)	69.2 (21.1)	73.3 (20.5)	.008
Patient-reported CRS symptom control				.118
Completely	13.7%	12.0%	15.8%	
Very	23.8%	22.2%	25.9%	
Somewhat	32.3%	33.8%	30.5%	
A little	19.2%	22.2%	15.4%	
Not at all	11.0%	9.9%	12.4%	

Abbreviations: CRS, chronic rhinosinusitis; CRSsNP, chronic rhinosinusitis patients without nasal polyps; CRSwNP, chronic rhinosinusitis patients with nasal polyps; EQ-5D VAS, visual analog scale of the 5-dimensional EuroQol questionnaire; SNOT-22, 22-item Sinonasal Outcome Test.

^aDifferences between CRSwNP and CRSsNP cohorts.

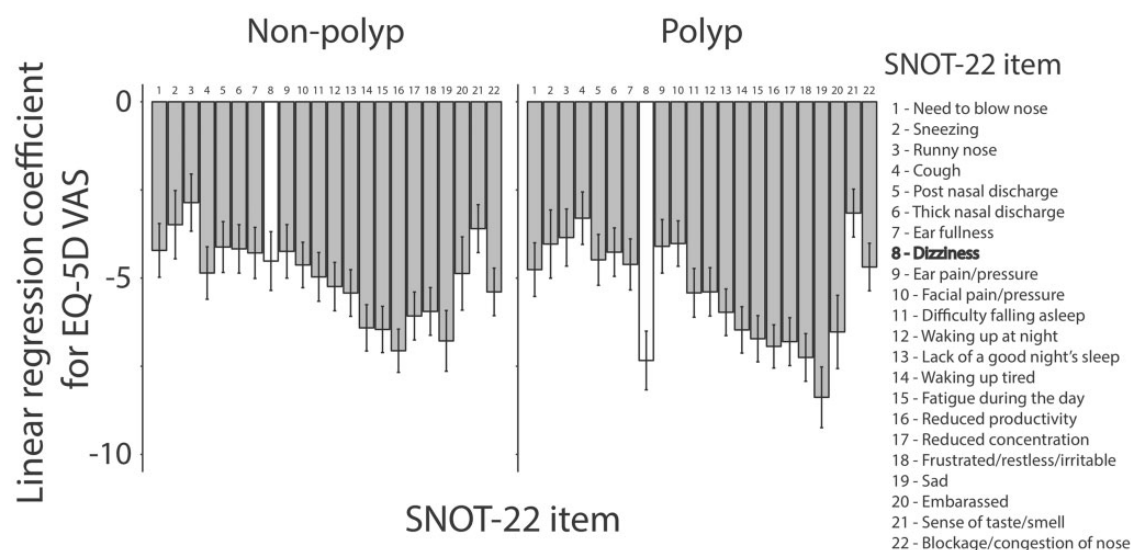


Figure 1. Bar plot of linear regression coefficient of association between general health-related QOL (EQ-5D VAS) and individual SNOT-22 items for patients having CRSsNP (left) and CRSwNP (right). Error bars represent standard errors of the linear regression coefficients. The linear regression coefficients for individual SNOT-22 items that are significantly different ($P < .05$) between the CRSsNP and CRSwNP are represented with white bars and the corresponding SNOT-22 item is bolded in the key. EQ-5D VAS, visual analog scale of the 5-dimensional EuroQol questionnaire; SNOT-22, 22-item Sinonasal Outcome Test.

Table 2. Association of Individual SNOT-22 Items With EQ-5D VAS.

SNOT-22 Item	CRSsNP		CRSwNP	
	β	95% CI	β	95% CI
1—Need to blow nose	−4.21	−5.71 to −2.72	−4.76	−6.19 to −3.33
2—Sneezing	−3.49	−5.38 to −1.59	−4.03	−5.81 to −2.26
3—Runny nose	−2.86	−4.45 to −1.27	−3.85	−5.35 to −2.35
4—Cough	−4.86	−6.31 to −3.40	−3.30	−4.83 to −1.77
5—Post nasal discharge	−4.12	−5.53 to −2.70	−4.48	−5.84 to −3.12
6—Thick nasal discharge	−4.17	−5.52 to −2.82	−4.26	−5.62 to −2.91
7—Ear fullness	−4.29	−5.71 to −2.87	−4.61	−6.16 to −3.07
8—Dizziness	−4.52	−6.15 to −2.88	−7.34	−9.14 to −5.53
9—Ear pain/pressure	−4.24	−5.73 to −2.75	−4.10	−5.94 to −2.26
10—Facial pain/pressure	−4.63	−5.89 to −3.36	−4.02	−5.50 to −2.55
11—Difficulty falling asleep	−4.97	−6.32 to −3.61	−5.42	−6.76 to −4.08
12—Waking up at night	−5.24	−6.58 to −3.90	−5.39	−6.73 to −4.06
13—Lack of a good night's sleep	−5.42	−6.72 to −4.13	−5.97	−7.23 to −4.71
14—Waking up tired	−6.41	−7.70 to −5.12	−6.47	−7.71 to −5.23
15—Fatigue during the day	−6.46	−7.74 to −5.17	−6.72	−8.00 to −5.44
16—Reduced productivity	−7.06	−8.26 to −5.86	−6.94	−8.20 to −5.67
17—Reduced concentration	−6.07	−7.41 to −4.74	−6.80	−8.09 to −5.51
18—Frustrated/restless/irritable	−5.95	−7.27 to −4.62	−7.25	−8.51 to −5.99
19—Sad	−6.78	−8.47 to −5.09	−8.38	−10.03 to −6.73
20—Embarrassed	−4.87	−6.91 to −2.83	−6.53	−8.27 to −4.78
21—Sense of taste/smell	−3.60	−4.93 to −2.27	−3.15	−4.35 to −1.97
22—Blockage/congestion of nose	−5.39	−6.71 to −4.07	−4.69	−5.98 to −3.39

Abbreviations: β , linear regression coefficient; 95% CI: 95% confidence interval of the linear regression coefficient; CRSsNP, chronic rhinosinusitis patients without nasal polyps; CRSwNP, chronic rhinosinusitis patients with nasal polyps; SNOT-22, 22-item Sinonasal Outcome Test.

Bolded and italicized rows indicate statistically significant differences in β between the CRSwNP and CRSsNP cohorts.

reported on the SNOT-22 was associated with decreased EQ-5D VAS. In examining individual symptom/SNOT-22 item scores, we found that the point estimate for the association between EQ-5D VAS and dizziness was greater in CRSwNP ($\beta = -7.34$, 95% CI: -9.14 to -5.53) compared to CRSsNP ($\beta = -4.52$, 95% CI: -6.15 to -2.88) ($P = .023$).

Next, we compared the point estimates for the linear regression coefficient between EQ-5D and all SNOT-22 items to check for a general trend in the magnitude of the associations between EQ-5D and individual SNOT-22 items for CRSwNP versus CRSsNP. We found that CRSwNP participants generally had more negative linear regression coefficients compared to CRSsNP participants ($P = .046$, paired Wilcoxon Rank-Sum test). These results suggest that for every 1-point increase in the score for a SNOT-22 item, CRSwNP patients may experience a larger decrease in general health-related QOL. Based on the strength of the associations between EQ-5D and individual SNOT-22 items (Figure 1 and Table 2), this finding is most dominantly driven by the dizziness SNOT-22 item.

Associations of CRS-Associated Symptoms With Patient-Reported CRS Symptom Control

Previous work has utilized patient-reported CRS symptom control as a reflection of a patient's tolerance of symptoms³⁵ since patient-reported control encompasses the symptoms of the disease that the

patient notices and self-identifies as being unacceptably problematic.²¹ Therefore, we next sought to characterize the association of CRS symptom severities with patient-reported CRS symptom control (Figure 2 and Table 3). For both CRSwNP and CRSsNP participants, the severities of all individual CRS symptoms on the SNOT-22 were associated with reporting of lower levels of CRS symptom control. However, nasal symptoms (need to blow nose, runny nose, post nasal discharge, thick nasal discharge, and blockage/congestion of nose) and emotional symptoms (sad and embarrassed) as well as symptoms from the SNOT-22 sleep subdomain that could also be reflective of psychomotor agitation (frustrated/restless/irritable, reduced concentration, and difficulty falling asleep) were associated with significantly lower levels of symptom control in CRSwNP participants compared to CRSsNP. Although nasal symptoms in general were more associated with lower levels of patient-reported CRS symptom control in CRSwNP than in CRSsNP, this was not the case for the symptom of decreased sense of taste/smell. These results suggest that nasal symptoms (which are not related to hyposmia) and depressed mood (emotional symptoms such as sadness in conjunction with psychomotor agitation) may be more noticeable and problematic for CRSwNP patients—with these patients having lower tolerance for these symptoms and associating them with more poorly controlled CRS symptoms—than CRSsNP.

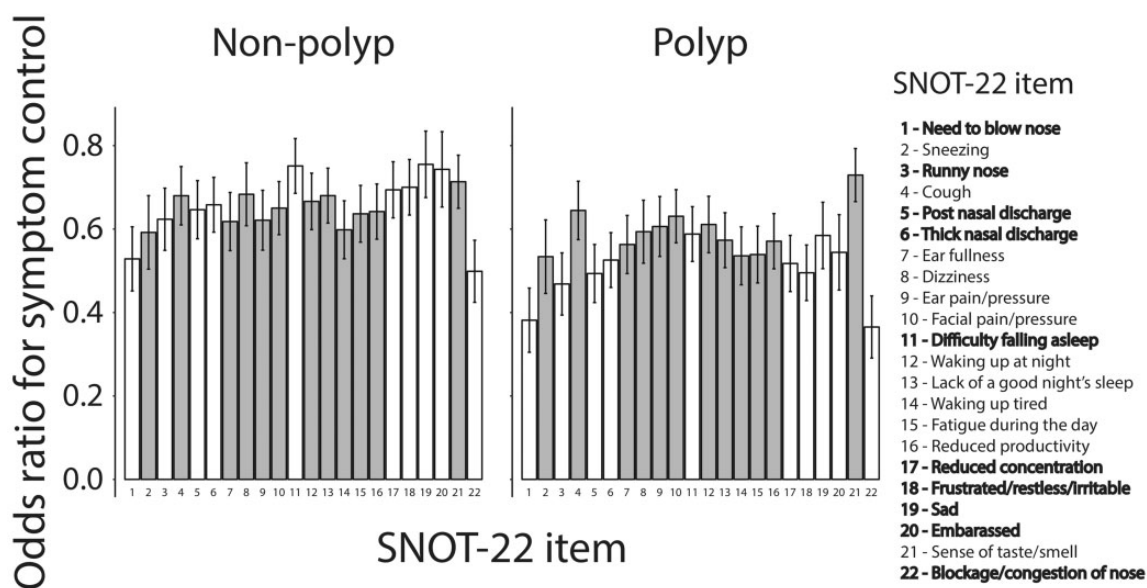


Figure 2. Bar plot of odds ratio for association between patient-reported level of symptom control and individual SNOT-22 items for patients having CRSsNP (left) and CRSwNP (right). Error bars represent standard errors of the odds ratios. The odds ratios for individual SNOT-22 items that are significantly different ($P < .05$) between the CRSsNP and CRSwNP are represented with white bars and the corresponding SNOT-22 item is bolded in the key. SNOT-22, 22-item Sinus Outcome Test.

Table 3. Association of Individual SNOT-22 Items With Patient-Reported Symptom Control.

SNOT-22 Item	CRSsNP		CRSwNP	
	OR	95% CI	OR	95% CI
1—Need to blow nose	0.53	0.45–0.61	0.38	0.32–0.46
2—Sneezing	0.59	0.50–0.70	0.53	0.45–0.64
3—Runny nose	0.62	0.54–0.72	0.47	0.40–0.55
4—Cough	0.68	0.59–0.78	0.64	0.56–0.74
5—Post nasal discharge	0.65	0.56–0.74	0.49	0.42–0.58
6—Thick nasal discharge	0.66	0.58–0.75	0.53	0.45–0.61
7—Ear fullness	0.62	0.54–0.71	0.56	0.48–0.66
8—Dizziness	0.68	0.59–0.79	0.59	0.49–0.71
9—Ear pain/pressure	0.62	0.54–0.71	0.61	0.51–0.72
10—Facial pain/pressure	0.65	0.57–0.74	0.63	0.54–0.73
11—Difficulty falling asleep	0.75	0.66–0.85	0.59	0.51–0.68
12—Waking up at night	0.67	0.58–0.76	0.61	0.53–0.70
13—Lack of a good night's sleep	0.68	0.60–0.77	0.57	0.50–0.66
14—Waking up tired	0.60	0.52–0.69	0.54	0.46–0.62
15—Fatigue during the day	0.64	0.56–0.73	0.54	0.46–0.63
16—Reduced productivity	0.64	0.56–0.73	0.57	0.49–0.66
17—Reduced concentration	0.69	0.61–0.79	0.52	0.44–0.60
18—Frustrated/restless/irritable	0.70	0.61–0.80	0.50	0.42–0.58
19—Sad	0.76	0.65–0.88	0.58	0.49–0.70
20—Embarrassed	0.74	0.62–0.89	0.54	0.45–0.66
21—Sense of taste/smell	0.71	0.63–0.81	0.73	0.65–0.82
22—Blockage/congestion of nose	0.50	0.43–0.58	0.37	0.31–0.44

Abbreviations: 95% CI, 95% confidence interval of odds ratio; CRSsNP, chronic rhinosinusitis patients without nasal polyps; CRSwNP, chronic rhinosinusitis patients with nasal polyps; OR, odds ratio; SNOT-22, 22-item Sinonasal Outcome Test.

Bolded and italicized rows indicate statistically significant differences in OR between the CRSwNP and CRSsNP cohorts.

Discussion

CRS is associated with a significant QOL burden, largely due to chronic symptomatology that may be both nasal and extranasal (relating to poor sleep, craniofacial discomfort, and mood disturbance) in nature.^{4,36} Moreover, patient-specific presentations and evolutions of the disease course—likely reflecting underlying subtypes of CRS—provide additional challenges in the determination of treatment regimens. Phenotypic categories of CRS, CRSwNP, and CRSsNP are not only distinguished by physical exam findings but also by pathophysiology and potentially by CRS symptoms as well.²³ The importance of sinonasal symptomatology experienced by patients, however, must be interpreted in the context of the impact that those symptoms have on QOL as well as the degree to which those symptoms are perceived and tolerated.³⁷ Given the differences between CRSwNP and CRSsNP, the burden of CRS-associated symptomatology—from impact on QOL to tolerance by the patient—in CRSwNP and CRSsNP may very well be different. General QOL is an easily interpretable metric for assessing disease impact on a patient, and patient-reported (and perceived) CRS symptom control is a metric that implicitly incorporates a patient's tolerance of symptoms. In this study, we

compared these 2 established metrics of disease impact and tolerability—general health-related QOL and patient-reported CRS symptom control—to CRS symptom severities reported in CRSwNP and CRSsNP. We found that the reported severity of ear/facial pressure symptoms was higher in CRSsNP than in CRSwNP patients and that general health-related QOL was worse in CRSsNP than in CRSwNP. However, while these results demonstrated greater disease burden in CRSsNP compared to CRSwNP, our results indicated that patients with CRSwNP may be more sensitive to CRS symptomatology with greater association between symptom severity and decreased QOL and less tolerant of the symptoms—in particular nasal symptoms (excluding hyposmia) and depressed mood, reporting poorer symptom control in association with these symptoms compared to patients with CRSsNP.

Previous studies have highlighted possible symptomatic differences between CRSwNP and CRSsNP.³⁸ Patients with nasal polyps have been reported to have less facial and ear discomfort than patients with CRSsNP. In fact, higher polyp scores/greater polyposis has even been reported to be inversely correlated with facial pain.³⁹ Other studies have found increased facial pressure and discomfort reported by CRSsNP

patients.^{23,38,40} These findings seem to also translate to QOL as previous studies have found that CRSwNP patients tend to have better QOL scores compared to CRSsNP patients.^{41,42} Past studies therefore point to greater symptom and QOL burden borne by CRSsNP patients, but to our knowledge, there has been no study to systematically study the differences of CRS symptoms and relationship with QOL and patient tolerance comparing CRSwNP and CRSsNP.

In our study, we systematically studied the differences of CRS symptom burden and tolerance of those symptoms by CRSwNP and CRSsNP patients by examining the relationships between sinonasal symptom severity and general health-related QOL and patient-reported CRS symptom control. Our results extend previous findings by not only confirming the differences in symptoms experienced by CRSsNP and CRSwNP but also showing that the relationship between CRS symptom severity is differentially associated with QOL and patient-reported CRS symptom control between CRSsNP and CRSwNP. Although we found that CRSsNP had higher SNOT-22 ear/facial discomfort subdomain scores (by 1.1 points) over CRSwNP, that difference does not reach the previous reported estimate (3.3) for the minimal clinically important difference (MCID) of this subdomain.⁴³ However, past estimates of MCIDs for the SNOT-22 subdomain have been performed with suboptimal distribution-based methods and their accuracy has not been reported.⁴³ These facts limit the interpretability of previously reported SNOT-22 subdomain MCIDs since anchor-based methods are the preferred method of deriving meaningful MCIDs,⁴⁴ and previous study has also shown that CRS PROM MCIDs may be poorly sensitive in detecting patients experiencing clinically important differences.^{45,46}

We also found that CRS symptoms in CRSwNP are more greatly associated with decreased QOL and decreased patient-reported control. These results suggest that while CRSsNP may be associated with greater symptom burden, CRSwNP patients may be more sensitive to CRS symptomatology. This may be particularly true as it pertains to QOL and symptoms related to dizziness, the burden of which had the dominant individual-level association with worse general QOL. In comparison, multiple different CRS-associated symptoms on the SNOT-22 were found to be more greatly associated with poor patient-reported symptom control in CRSwNP compared to CRSsNP. These results have important implications for disease management. Although we found that symptom severity in CRSwNP was associated with greater losses in QOL, this association of symptom severity with patient-reported symptom control was even more pronounced. These results raise the possibility that CRSwNP patients may also report greater gains in control of symptomatology for every

incremental improvement in CRS symptomatology, compared to patients with CRSsNP. Longitudinal study is needed to prove this possibility, which would also suggest that CRSsNP may potentially be more recalcitrant to improving patient-reported symptom control, despite improving CRS symptoms. This possibility could be especially important as patient perception of sinonasal symptomatology, for example, patient-reported symptom control, is the primary driver management strategies. Again, however, this interpretation is only a possibility suggested by our results but highlights the need for studies to longitudinally investigate the differential changes for CRSwNP and CRSsNP patients in QOL and patient-reported symptom control after treatment.

Our results should be interpreted in the context of the limitations of our study. Our study is a cross-sectional study so while our results may be suggestive of longitudinal responses, longitudinal studies are required. Although our sample size is also very large, our participants were all recruited from 1 tertiary care center so our results may be limited in general applicability. Moreover, it is possible that other characteristics of CRS patients beyond polyps, such as demographics or prior treatments with ESS or medical management, could impact the differential QOL and disease perception that we have reported here. Although we looked at intranasal steroid use in our study population, we did not study other medical interventions that may have led to a difference in symptom control experienced by our 2 subgroups of patients, thus affecting our results. For example, it is possible that preferential past use of antibiotics or oral corticosteroids (in CRSsNP and CRSwNP, respectively⁴⁷) may have contributed to the differences that we report here.

Conclusion

Patients with CRSwNP experience a different burden of symptomatology compared to patients with CRSsNP. Moreover, CRSsNP patients experience lower QOL compared to patients with CRSwNP. Despite this finding, CRSwNP patients may be more sensitive to symptoms of CRS—experiencing greater incremental decrease in QOL and reporting greater incremental decrease in symptom control for every incremental increase in CRS symptomatology. As perception of CRS symptoms and patient-reported control of symptoms is a major factor in developing treatment regimens and assessing their effectiveness, these results may motivate different therapeutic and surveillance approaches to CRSsNP and CRSwNP.

Declaration of Conflicting Interests

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