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Postnasal Drip and Nasal Endoscopy: Localization and Association With Clinical Features

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Abstract

Objective. Postnasal drip (PND) is a common symptom that is difficult to verify with a traditional examination. Nasal endoscopy has the potential to improve the diagnostic process by confirming the presence and location of mucus. This study sought to describe the association of specific features of PND on nasal endoscopy with other clinical features.

Study Design. Cross-sectional with prospective data collection.

Setting. Outpatient rhinology practice.

Methods. Data were prospectively collected on adult (≥18 years of age) patients with PND who underwent nasal endoscopy over a 6-month period. Variables of interest included reflux-related symptoms, nasal congestion, hyposmia, rhinorrhea, pruritic symptoms, inferior turbinate (IT) hypertrophy, 22-item sinonasal outcome test (SNOT-22) scores, and diagnoses of allergic rhinitis (AR), chronic rhinosinusitis (CRS), and reflux disease. Presence of mucus was designated at the nasal cavity (NC) floor, posterior IT, middle meatus (MM), and sphenoethmoidal recess (SER), and consistency of thick or thin was assigned during nasal endoscopy.

Results. Of 118 patients, 112 (94.9%) had identifiable mucus on nasal endoscopy. MM/SER mucus was associated with SNOT-22 score ≥ 50, diagnosis of CRS, and absence of IT hypertrophy or diagnosis of AR. NC and IT mucus was associated with nasal congestion, rhinorrhea, pruritic symptoms, IT hypertrophy, AR, and absence of CRS. Thick NC/IT mucus was associated with reflux symptoms.

Conclusion. Great majority of patients who report PND have posterior nasal drainage of abnormal mucus that can be directly observed with nasal endoscopy. Clinicians should be encouraged to utilize nasal endoscopy when available to evaluate patients with PND.

Keywords

diagnosis, nasal endoscopy, postnasal drip, reflux, rhinitis, sinusitis

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Postnasal drip (PND) is often encountered in clinical practice as a sensation of mucus in the back of the nose or throat that can have a significant impact on an individual's quality of life.[1,2] Historically, PND was accepted as a subjective symptom that was difficult to verify; however, recent observation has established that this sensation can be explained by actual mucus in the posterior nasal cavity (NC) or nasopharynx.[3] PND has also been equated to a globus sensation in some cases, without clinical evidence of inflammation or irritation on physical exam.[4]

Patients with PND typically report concomitant nasal congestion, nasal obstruction, globus sensation, throat clearing, and/or cough. PND is a nonspecific symptom but warrants investigation for underlying organic causes, most notably allergic rhinitis (AR), nonallergic rhinitis (NAR), chronic rhinosinusitis (CRS), and gastroesophageal reflux disease or laryngopharyngeal reflux (GERD/LPR).[1,4,5] The objective of this study was to describe associations of specific features of PND on nasal endoscopy with other clinical features and concurrent diagnoses. The ultimate aim is to guide the clinician toward the eventual diagnosis in a patient presenting with PND by making optimal use of nasal endoscopy findings.

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Methods

Study Design and Patient Selection

A cross-sectional study was performed utilizing prospectively collected data from adult (≥18 years of age) patients presenting for a new patient encounter in an outpatient rhinology practice between May 2022 and October 2022. Patients were included if they reported active PND, either as a chief complaint or on review of systems. Exclusion criteria included inability to tolerate nasal endoscopy, concurrent epistaxis, and history of head and neck cancer or radiation therapy. This study was approved by the Ochsner Institutional Review Board (Protocol number 2015.170).

Data Collection and Categorization

Each patient was asked to complete the 22-item sinonasal outcome test (SNOT-22) within 24 hours of a new patient evaluation. The SNOT-22 questionnaire evaluates patient symptoms and quality-of-life related to CRS over a 2-week period.[6] SNOT-22 scores were stratified into high score (50 or above) and low score (below 50) categories for statistical analysis.[7,8] Concurrent diagnoses of AR, and CRS and GERD/LPR were recorded. A diagnosis of AR was assigned for characteristic symptoms and at least one positive hypersensitivity to an aeroallergen on skin or blood testing. A diagnosis of CRS was assigned for two or more major symptoms of greater than 3 months' duration and objective findings on examination or radiography. A diagnosis of GERD/LPR was assigned for characteristic symptoms with objective findings on esophagogastroduodenoscopy or flexible laryngoscopy. NAR was not included due to the multiple phenotypes and absence of confirmatory testing.[9,10] The presence of specific symptoms was recorded: globus sensation, throat clearing, cough, hoarseness, dysphagia, ear fullness, nasal congestion, facial pressure, hyposmia, watery rhinorrhea, and pruritic symptoms. Globus sensation, throat clearing, cough, hoarseness, and dysphagia were pooled into one group titled "reflux symptoms" for statistical analysis.

Nasal endoscopy was performed on all patients by the senior author using a flexible nasal endoscopy (Karl Storz) in the following fashion. First, the endoscope was used to visualize the middle turbinate. The endoscope was then advanced along the superior edge of the inferior turbinate (IT), until arriving at the choana, to afford a view of the entire length of the middle meatus (MM). This allowed the examiner to rule in or rule out the presence of a mucus trail from the maxillary ostium or ethmoid infundibulum. Next, the endoscope was withdrawn and redirected along the floor of the NC, adjacent to the nasal septum, making note of mucus along the floor of the NC or flowing from the medial surface of the posterior pole of the IT. Finally, the endoscope was flexed upward to visualize the sphenoethmoidal recess (SER), making note of mucus flowing from this region.

The presence and location of mucus was organized into the following sites: floor of the NC, posterior pole of the IT, MM, and SER. If present, mucus was further categorized as thick or thin based on visual characteristics. Mucus was regarded as thin when underlying mucosal surface features were clearly visible (indicating transparency), whereas mucus was regarded as thick when underlying mucosal features were distorted or obscured. Purulence was uniformly categorized as thick mucus. The presence of deviated nasal septum and inferior turbinate hypertrophy (ITH) was recorded based on anterior rhinoscopy. Representative examples of nasal endoscopy findings are depicted in **Figure 1**.

Because of their shared sites of mucus origin, NC/IT and MM/SER locations were combined into two groups respectively to improve the analytical power of each group. The rationale for these groupings is that MM/SER represents mucus produced in the paranasal sinuses, whereas NC/IT represents mucus produced within the NC. If mucus was present in both NC/IT and MM/SER, that patient was included in both NC/IT and MM/SER counts.

Statistical Analysis

Categorical variables were compared using Fischer's exact test of association. A *t*-test, or *F*-test from an analysis of variance (ANOVA), was used for investigating differences in age between the two or three group, respectively. Results are presented as sample size (percent) for categorical variables and mean (standard deviation [SD]) for continuous variables. Where mucus was present at more than one location in a single patient, each location was analyzed as a separate occurrence.

Results

A total of 118 individual patients were included, 26 (22.0%) of which had mucus in more than one location, for a total of 131 observations. Fifty-one (43%) patients were male with a mean (SD) age of 58.2 (15.2) (**Table 1**). PND was the chief complaint in 59 (45.0%) patients. One hundred twelve (94.9%) patients had identifiable mucus on nasal endoscopy, consisting of (27.1%) within the NC, 39 (33.1%) from the IT, 39 (33.1%) from the MM, and 15 (12.7%) from the SER. Only 6 (5.1%) patients had no mucus in any location.

A total of 71 (60.2%) patients had NC/IT mucus (**Table 2**). The presence of NC/IT mucus was associated with symptoms of nasal congestion (80.3% vs 57.5%, $P = .005$), watery rhinorrhea (12.7% vs 2.1%, $P = .036$), pruritic symptoms (21.1% vs 2.1%, $P = .002$), and ITH (54.9% vs 29.8%, $P = .004$), all of which are associated with AR. Conversely, patients without NC/IT mucus were more likely to have a diagnosis of CRS (66.0% vs 31.0%, $P = .001$). Mean SNOT-22 scores did not differ based on presence or absence of NC/IT mucus (25.0% vs 28.3%, $P = .158$).

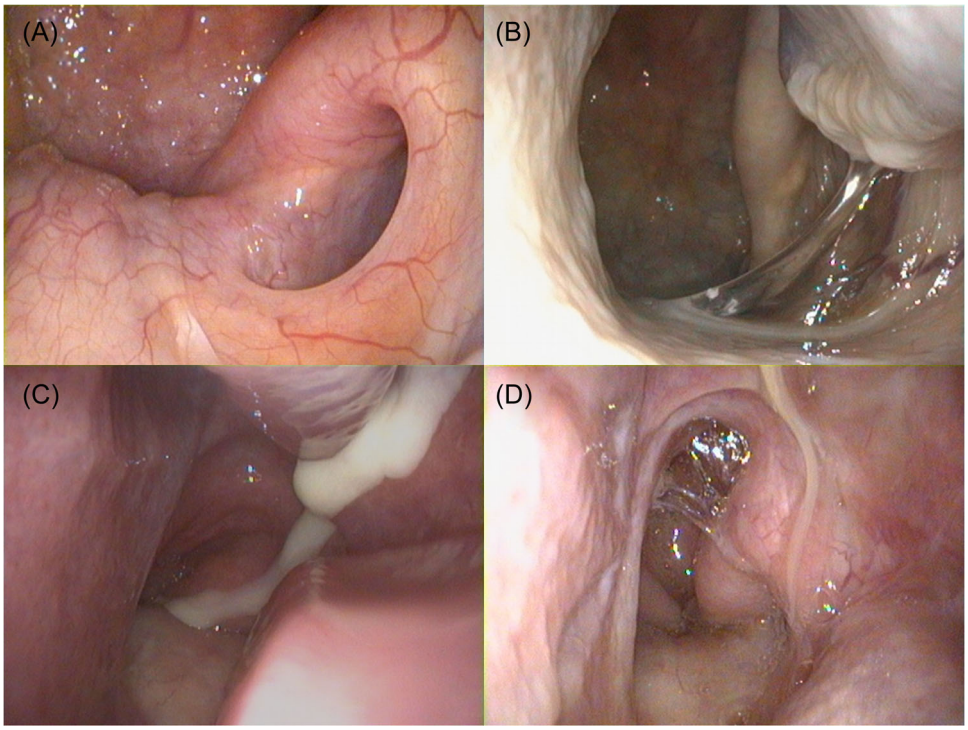

Figure 1. Representative photos of nasal endoscopy findings: (A) thin mucus along the nasal cavity floor, (B) thick mucus from the posterior inferior turbinate, (C) thick purulent mucus from the middle meatus, and (D) thick mucus from the sphenoethmoidal recess.

A total of 54 (45.8%) patients had MM/SER mucus (**Table 3**). The presence of MM/SER mucus was associated with mean SNOT-22 score ≥ 50 (34.0% vs 19.7%, $P = .039$) and a diagnosis of CRS (76.0% vs 18.8%, $P < .001$). Conversely, patients without MM/SER mucus were more likely to have nasal congestion (78.1% vs 63.0%, $P = .032$), pruritic symptoms (21.9% vs 3.7%, $P = .003$), ITH (54.7% vs 33.3%, $P = .010$), and a diagnosis of AR (46.9% vs 27.8%, $P = .016$). Reflux symptoms were associated with the presence of MM/SER mucus (70.4% vs 56.3%, $P = .044$).

Among patients with NC/IT mucus, 34 (47.9%) had thick mucus, and 37 (52.1%) had thin mucus (**Table 4**). Thick mucus was associated with reflux symptoms (76.5% vs 43.2%, $P = .003$) and a diagnosis of CRS (44.1% vs 18.9%, $P = .015$). Thin mucus was associated with pruritic symptoms (29.7% vs 11.8%, $P = .043$), hyposmia (29.7% vs 8.2%, $P = .021$), and a diagnosis of AR (54.1% vs 26.5%, $P = .012$). There was no association with a chief complaint of PND (41.2% vs 46.0%, $P = .175$) with thick or thin NC/IT mucus.

Among patients with MM/SER mucus, 49 (90.7%) had thick mucus, and 5 (9.3%) had thin mucus (**Table 5**). Thick mucus was associated with a chief complaint of PND (55.1% vs 0%, $P = .026$).

Discussion

The present study provides evidence that the objective findings of nasal endoscopy are associated with important clinical features in patients with the symptom of PND. All patients reported the symptom of PND, with 45% being the chief complaint, and 95% having a positive localization of abnormal mucus in the posterior NC or nasopharynx. This suggests that the sensation of PND is produced by actual mucus in the great majority of cases, rather than an imagined globus sensation or psychosomatic symptom. This complements prior work in which 78% of rhinitis patients with PND had posterior mucus on nasal endoscopy.[3] The present study expands on that finding by describing the location and consistency of that mucus and association with comorbidities and the eventual diagnosis.

In our study, mucus produced within the paranasal sinuses (MM/SER) was associated with a high SNOT-22 score, a diagnosis of CRS, and a chief complaint of PND. Additionally, MM/SER mucus was associated with the absence of ITH and a diagnosis of AR. In contrast, mucus from the NC floor or posterior pole of the IT was associated with nasal congestion, watery rhinorrhea, pruritic symptoms, ITH, reflux symptoms (thick), and diagnosis of AR (thin). Additionally, NC/IT mucus was associated with the absence of a CRS diagnosis, when not stratified by thick versus thin mucus. MM/SER mucus and thick NC/IT mucus had two shared positive associations: reflux symptoms and diagnosis of CRS.

PND is a bothersome symptom and associated with AR, NAR, and CRS.[9,11,12] Distinguishing rhinitis from CRS based on symptoms alone can be challenging, as approximately 40% of patients referred to an

Table 1. Characteristics of the Study Population According to Location of Mucus

	All sites N (%)	Mucus location			P-value
		MM/SER n (%)	NC/IT n (%)	None n (%)	
Total, n (%)	131 (100)	54 (41.2)	71 (54.2)	6 (4.6)	-
Characteristic					
Age, mean (SD)	58.2 (15.2)	61.0 (14.5)	55.9 (15.6)	58.3 (12.8)	.169
Male, n (%)	51 (38.9)	25 (42.4)	24 (33.8)	2 (33.3)	.351
Chief complaint of PND, n (%)	59 (45.0)	27 (50.0)	31 (43.7)	1 (16.7)	.281
Symptoms, n (%)					
Reflux symptoms[a]	83 (63.4)	38 (70.4)	42 (59.2)	3 (50.0)	.342
Ear fullness	52 (39.7)	20 (37.0)	29 (40.9)	3 (50.0)	.793
Nasal congestion	96 (72.5)	34 (63.0)	57 (80.3)	4 (66.7)	.094
Facial pressure	54 (41.2)	23 (42.6)	29 (40.9)	2 (66.7)	.905
Hyposmia	27 (20.6)	13 (24.1)	14 (19.7)	0 (0.0)	.370
Watery rhinorrhea	11 (8.4)	2 (3.7)	9 (12.7)	0 (0.0)	.151
Pruritic symptoms	18 (13.7)	2 (3.7)	15 (21.1)	1 (16.7)	**.019**
Symptom scores					
SNOT-22 score ≥50, mean (SD)		18 (34.0)	17 (25.0)	0 (0.0)	.166
Comorbidities, n (%)					
Allergic rhinitis	47 (35.9)	15 (27.8)	29 (40.9)	3 (50.0)	.244
Chronic rhinosinusitis	63 (48.1)	41 (75.9)	22 (31.0)	0 (0.0)	**<.001**
GERD/LPR	55 (42.0)	21 (38.9)	33 (46.5)	1 (16.7)	.304
Exam findings, n (%)					
Deviated nasal septum	58 (44.6)	20 (37.0)	35 (50.0)	3 (50.0)	.342
IT hypertrophy	59 (45.0)	18 (33.3)	39 (54.9)	2 (33.3)	**.047**

Bold values indicate statistically significant differences ($P < .05$).

Abbreviations: GERD, gastroesophageal reflux disease; IT, inferior turbinate; LPR, laryngopharyngeal reflux; MM, middle meatus; NC, nasal cavity; PND, postnasal drip; SD, standard deviation; SER, sphenoethmoid recess; SNOT, sinonasal outcome test.

[a]Includes globus sensation, throat clearing, hoarseness, and/or dysphagia.

otolaryngologist for CRS actually may have a different diagnosis, usually rhinitis.[13] Therefore, the current paradigm established by international consensus holds that the diagnosis of CRS requires both subjective and objective criteria, either by a positive nasal endoscopy or by a CT scan.[11] A positive nasal endoscopy is defined as inflammation on nasal endoscopy and/or purulence from paranasal sinuses or ostiomeatal complex. In a meta-analysis, Kim et al concluded that a positive nasal endoscopy can rule in CRS, but a negative endoscopy cannot rule out CRS, necessitating a CT scan.[14]

The role of nasal endoscopy in the diagnosis of AR is less well-established compared to CRS. In a retrospective study, Brook et al showed that an atopic rhinitis patient was more likely to have abnormal nasopharyngeal secretions compared to those without atopy.[15] Otherwise, studies investigating nasal endoscopy and AR have focused more on turbinate hypertrophy, adenoidal hypertrophy, and mucosal inflammation, rather than mucus production.[16-18] Eren et al concluded that nasal endoscopy is not a reliable tool for diagnosing AR, reporting high interrater variability.[19] In a 2023 international consensus statement on AR, nasal endoscopy is considered an optional diagnostic adjunct, upgraded from a Grade D to Grade C recommendation from the previous 2018 statement.[20] Nasal endoscopy can improve examination of the middle and ITs, assess for signs of central compartment inflammation, and rule out CRS with or without polyposis.[20]

Studies directly comparing endoscopic findings between sinusitis and rhinitis patients are limited. Koskinen et al compared endoscopy scores between CRS without polyps and AR patients and found no difference in mucosal edema, ITH, MM obstruction, or NC obstruction.[21] Conversely, the present study suggests that focusing on the distinct endoscopic findings of mucus can help separate CRS from AR in a patient with PND.

Abnormal mucus emanating from the paranasal sinuses (MM/SER) was associated with a diagnosis of CRS, which fulfills published diagnostic criteria.[12] Furthermore, when a patient was noted to have MM/SER mucus, ITH and diagnosis of AR were more likely to be absent. Alternatively, abnormal mucus originating from NC/IT was positively associated with

Table 2. Patient Characteristics According to Presence or Absence of Mucus From the NC and/or IT

	NC and/or IT mucus		
	Not present N (%)	Present N (%)	*P*-value
Total, n (%)	47 (39.8%)	71 (60.2%)	-
Characteristic			
Age, mean (SD)	61.8 (14.1)	56.1 (15.3)	**.036**
Male, n (%)	22 (46.8)	24 (33.8)	.057
Chief complaint of PND, n (%)	24 (51.1)	31 (43.7)	.110
Symptoms, n (%)			
Reflux symptoms[a]	32 (68.1)	42 (59.2)	.097
Ear fullness	18 (38.3)	29 (40.9)	.147
Nasal congestion	27 (57.5)	57 (80.3)	**.005**
Facial pressure	20 (42.6)	29 (40.9)	.149
Hyposmia	9 (19.2)	14 (19.7)	.187
Watery rhinorrhea	1 (2.13)	9 (12.7)	**.036**
Pruritic symptoms	1 (2.13)	15 (21.1)	**.002**
Symptom scores			
SNOT-22 score ≥ 50, mean (SD)	13 (28.3)	17 (25.0)	.158
Comorbidities, n (%)			
Allergic rhinitis	16 (34.0)	29 (40.9)	.118
Chronic rhinosinusitis	31 (66.0)	22 (31.0)	**.001**
GERD/LPR	17 (36.2)	33 (46.5)	.083
Exam findings, n (%)			
Deviated nasal septum	19 (40.4)	35 (50.0)	.090
IT hypertrophy	14 (29.8)	39 (54.9)	**.004**

Bold values indicate statistically significant differences ($P < .05$).
Abbreviations: GERD, gastroesophageal reflux disease; IT, inferior turbinate; LPR, laryngopharyngeal reflux; NC, nasal cavity; PND, postnasal drip; SD, standard deviation; SNOT, sinonasal outcome test.
[a]Includes globus sensation, throat clearing, hoarseness, and/or dysphagia.

Table 3. Patient Characteristics According to Presence or Absence of Mucus From the MM and/or SER

	MM and/or SER mucus		
	Not present N (%)	Present N (%)	*P*-value
Total, n (%)	64 (54.2%)	54 (45.8%)	-
Characteristic			
Age, mean (SD)	55.9 (15.5)	60.3 (14.5)	.0988
Sex, n (%)	21 (32.8)	25 (46.3)	**.0498**
Chief complaint of PND, n (%)	28 (43.8)	27 (50.0)	.117
Symptoms, n (%)			
Reflux symptoms[a]	36 (56.3)	38 (70.4)	**.0443**
Ear fullness	27 (42.2)	20 (37.0)	.1278
Nasal congestion	50 (78.1)	34 (63.0)	**.0321**
Facial pressure	26 (40.6)	23 (42.6)	.1452
Hyposmia	10 (15.6)	13 (24.1)	.0957
Watery rhinorrhea	8 (12.5)	2 (3.70)	.065
Pruritic symptoms	14 (21.9)	2 (3.70)	**.0029**
Symptom scores			
SNOT-22 score ≥ 50, mean (SD)	12 (19.7)	18 (34.0)	**.0389**
Comorbidities, n (%)			
Allergic rhinitis	30 (46.9)	15 (27.8)	**.016**
Chronic rhinosinusitis	12 (18.8)	41 (76.0)	**<.0001**
GERD/LPR	29 (45.3)	21 (38.9)	.1164
Exam findings, n (%)			
Deviated nasal septum	34 (54.0)	20 (37.0)	**.0281**
IT hypertrophy	35 (54.7)	18 (33.3)	**.0101**

Bold values indicate statistically significant differences ($P < .05$).
Abbreviations: GERD, gastroesophageal reflux disease; IT, inferior turbinate; LPR, laryngopharyngeal reflux; MM, middle meatus; PND, postnasal drip; SD, standard deviation; SER, sphenoethmoid recess; SNOT, sinonasal outcome test.
[a]Includes globus sensation, throat clearing, hoarseness, and/or dysphagia.

classic AR symptoms (ie, nasal congestion, watery rhinorrhea, and pruritis), ITH, and absence of CRS. When the NC/IT was thin, there was a positive association with a diagnosis of AR. Mucus production within the NC, especially the posterior IT, is shown to be an important source of PND in the present study. These results support that nasal endoscopy can identify central compartment inflammation or abnormal paranasal sinus drainage as the source of PND, suggesting AR or CRS as the etiology of PND, respectively.

Categorizing mucus as thick or thin further supports the use of visualized mucus to describe the clinical condition. When MM/SER mucus was found, nearly all cases (91%) were noted to have thick or purulent mucus. Thick NC/IT mucus is not specifically explained by the present results but may indicate an overlay with CRS, as consistency of mucus is suggestive of sinusitis, independent of location. Further investigation is warranted to establish this relationship. Thin NC/IT mucus was associated with a diagnosis of AR, consistent with the classic "watery" rhinorrhea associated with the disease.[11,20,22]

Additionally, thick NC/IT mucus was more likely to cause symptoms associated with LPR (ie, globus sensation, throat clearing, cough, hoarseness, and dysphagia). Some authors have proposed that LPR may be overdiagnosed, likely due to nonspecific laryngoscopy findings.[23] In a prospective study, de Bortoli showed that only 40% of LPR cases had concurrent esophagitis or GERD based on pH analysis.[24] Our results suggest a potential role for assessing nasal endoscopy findings that may result from LPR, such as the putative exposure of the posterior NC and turbinate mucosa to extraesophageal refluxate. To our knowledge, this is the first study to report a correlation between nasal endoscopy findings and reflux symptoms. Further investigation is warranted to determine the prevalence of physical findings of sinusitis and rhinitis in patients with LPR and GERD.

Limitations included relatively small sample size, which precludes meaningful sensitivity and specificity

Table 4. Characteristics of Patients With Thick Versus Thin Mucus From the NC and/or IT

	NC and/or IT mucus		
	Thick mucus	Thin mucus	*P*-value
Total, n (%)	34 (47.9%)	37 (52.1%)	-
Characteristic			
Age, mean (SD)	55.5 (14.9)	56.7 (16.0)	.7185
Sex, n (%)	12 (35.3)	12 (32.4)	.1917
Chief complaint of PND, n (%)	14 (41.2)	17 (46.0)	.1747
Symptoms, n (%)			
Reflux symptoms[a]	26 (76.5)	16 (43.2)	**.0034**
Ear fullness	14 (41.2)	15 (40.5)	.1904
Nasal congestion	28 (82.4)	29 (78.4)	.2157
Facial pressure	12 (35.3)	17 (46.0)	.1274
Hyposmia	3 (8.82)	11 (29.7)	**.0213**
Watery rhinorrhea	2 (5.88)	7 (18.9)	.0776
Pruritic symptoms	4 (11.8)	11 (29.7)	**.0433**
Symptom scores			
SNOT-22 score ≥ 50, mean (SD)	10 (32.3)	7 (18.9)	.1016
Comorbidities, n (%)			
Allergic rhinitis	9 (26.5)	20 (54.1)	**.0122**
Chronic rhinosinusitis	15 (44.1)	7 (18.9)	**.0154**
GERD/LPR	14 (41.2)	19 (51.4)	.1314
Exam Findings, n (%)			
Deviated nasal septum	12 (36.4)	23 (62.2)	**.0193**
IT hypertrophy	20 (58.8)	19 (51.4)	.1552

Bold values indicate statistically significant differences ($P < .05$).
Abbreviations: GERD, gastroesophageal reflux disease; IT, inferior turbinate; LPR, laryngopharyngeal reflux; NC, nasal cavity; PND, postnasal drip; SD, standard deviation; SNOT, sinonasal outcome test.
[a]Includes globus sensation, throat clearing, hoarseness, and/or dysphagia.

Table 5. Characteristics of Patients With Thick Versus Thin Mucus From the MM and/or SER

	MM and/or SER mucus		
	Thick mucus	Thin mucus	*P*-value
Total, n (%)	49 (90.7%)	5 (9.3%)	-
Characteristic			
Age, mean (SD)	59.4 (14.2)	69.3 (15.6)	.1081
Sex, n (%)	24 (49.0)	1 (20.0)	.1878
Chief complaint of PND, n (%)	27 (55.1)	0 (0.00)	**.0255**
Symptoms, n (%)			
Reflux symptoms[a]	36 (73.5)	2 (40.0)	.1245
Ear fullness	18 (36.7)	2 (40.0)	.3595
Nasal congestion	30 (61.2)	4 (80.0)	.2933
Facial pressure	22 (44.9)	1 (20.0)	.2288
Hyposmia	9 (18.4)	4 (80.0)	**.0093**
Watery rhinorrhea	2 (4.08)	0 (0.00)	.8218
Pruritic symptoms	1 (2.04)	1 (20.0)	.1712
Symptom scores			
SNOT-22 score ≥ 50, mean (SD)	16 (33.3)	2 (40.0)	.349
Comorbidities, n (%)			
Allergic rhinitis	14 (28.6)	1 (20.0)	.3901
Chronic rhinosinusitis	37 (75.5)	4 (80.0)	.4163
GERD/LPR	19 (38.8)	2 (40.0)	.3623
Exam Findings, n (%)			
Deviated nasal septum	17 (34.7)	3 (60.0)	.2022
IT hypertrophy	15 (30.6)	3 (60.0)	.1626

Bold values indicate statistically significant differences ($P < .05$).
Abbreviations: GERD, gastroesophageal reflux disease; IT, inferior turbinate; LPR, laryngopharyngeal reflux; MM, middle meatus; PND, postnasal drip; SD, standard deviation; SER, sphenoethmoid recess; SNOT, sinonasal outcome test.
[a]Includes globus sensation, throat clearing, hoarseness, and/or dysphagia.

calculations. Other limitations include the single institution design and lack of confirmatory testing for AR and GERD/LPR. However, being a single institution and surgeon study allowed for standardization of endoscopy without interrater variability.

Conclusion

The great majority of patients who report PND have posterior nasal drainage of abnormal mucus that can be directly observed with nasal endoscopy. Furthermore, nasal endoscopy can effectively localize the site of mucus associated with the symptom of PND which supports a probable diagnosis. Thin mucus from the NC or posterior IT is suggestive of underlying AR, whereas thick NC or posterior IT mucus may suggest reflux disease. Thick mucus from the MM or SER is consistent with sinusitis. Clinicians should be encouraged to utilize nasal endoscopy when available to evaluate patients with PND.

Author Contributions

Jenilkumar H. Patel, design, data acquisition, analysis, and interpretation of data for the work; drafting/revision manuscript; approval of the final submission; accountable for all aspects of the work. **Nicholas Mankowski**, analysis and interpretation of data for the work; drafting/revision manuscript; approval of the final submission; accountable for all aspects of the work. **Robbie A. Beyl**, analysis and interpretation of data for the work; drafting/revision manuscript; approval of the final submission; accountable for all aspects of the work. **Manal S. Malik**, data acquisition; drafting/revision manuscript; approval of the final submission; accountable for all aspects of the work. **Andrew Parker**, data acquisition; drafting/revision manuscript; approval of the final submission; accountable for all aspects of the work. **Edward D. McCoul**, conception, design, analysis, and interpretation of data for the work; drafting/revision manuscript; approval of the final submission; accountable for all aspects of the work.

Disclosures

Competing interests: Edward D. McCoul is a consultant for Advanced Rx, 3D Matrix, Optinose, Sanofi, Stryker, and Zsquare.

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