

ANALYSIS OF CLINICAL AND FUNCTIONAL EXAMINATION METHODS IN THE
DIAGNOSIS OF CHRONIC RHINOSINUSITIS WITH NASAL POLYPS

Soatov Ilyosjon Olim ugli - PhD, Assistant, Department of Otorhinolaryngology, Tashkent State Medical University, Tashkent, Uzbekistan

Abstract. Background. Chronic rhinosinusitis with nasal polyps (CRSwNP) is a heterogeneous inflammatory disease in which symptom burden, visible polyp volume, radiological extent, nasal airflow limitation, and olfactory dysfunction may not change in parallel. A structured clinical-functional protocol is therefore required to confirm the diagnosis, characterize disease severity, and support individualized treatment planning.

Objective. To analyze the diagnostic contribution of clinical and functional examination methods in patients with CRSwNP.

Materials and methods. A clinical observational study included 210 patients examined at the Multidisciplinary Clinic of Tashkent State Medical University. The diagnostic protocol comprised symptom duration and severity assessment, the Sino-Nasal Outcome Test-22 (SNOT-22), anterior rhinoscopy and nasal endoscopy with nasal polyp and modified Lund-Kennedy grading, computed tomography of the paranasal sinuses with Lund-Mackay scoring, peak nasal inspiratory flow and/or active anterior rhinomanometry, and psychophysical olfactory testing.

Results. Application of the integrated protocol showed that each method represented a separate diagnostic domain. Clinical questionnaires quantified patient-perceived burden; endoscopy directly established bilateral polyposis and mucosal activity; computed tomography defined disease hidden beyond the endoscopic field; airflow measurements objectively characterized nasal obstruction; and olfactory testing detected functional impairment that could be underestimated by self-report. No single parameter provided a complete representation of CRSwNP. The most informative assessment was achieved by interpreting subjective, endoscopic, radiological, respiratory-functional, and olfactory findings together.

Conclusion. A standardized multimodal examination is preferable to isolated use of symptoms, endoscopy, or imaging in CRSwNP. The proposed clinical-functional algorithm improves diagnostic completeness, creates reproducible baseline documentation, and is suitable for monitoring medical, surgical, and biological treatment.

Keywords: chronic rhinosinusitis with nasal polyps, nasal polyps, nasal endoscopy, computed tomography, SNOT-22, rhinomanometry, peak nasal inspiratory flow, olfactory testing.

Annotatsiya. Dolzarbligi. Surunkali polipoz rinosinusit geterogen yallig'lanish kasalligi bo'lib, unda simptomlar og'irligi, polip to'qimasining ko'lami, kompyuter tomografiyadagi o'zgarishlar, burun havo oqimining pasayishi va hid bilish disfunktsiyasi doimo bir xil darajada namoyon bo'lmaydi. Shu sababli tashxisni tasdiqlash, kasallik og'irligini baholash va individuallashtirilgan davolash taktikasini belgilash uchun tizimlashtirilgan klinik-funksional tekshiruv zarur.

Tadqiqot maqsadi. Surunkali polipoz rinosinusit bilan og'rigan bemorlarda klinik va funksional tekshirish usullarining diagnostik ahamiyatini tahlil qilish.

Tadqiqot materiallari va usullari. Klinik kuzatuv tadqiqotiga Toshkent davlat tibbiyot universiteti Ko'p tarmoqli klinikasida tekshirilgan 210 nafar bemor kiritildi. Diagnostik majmua simptomlarning davomiyligi va og'irligini baholash, SNOT-22 so'rovnomasi, oldingi rinoskopiya, burun endoskopiyasi va poliqlar hamda modifikatsiyalangan Lund-Kennedy shkalalari, burun yondosh bo'shliqlarining kompyuter tomografiyasi va Lund-Mackay shkalasi, burun orqali

maksimal inspirator oqim va/yoki faol oldingi rinomanometriya hamda psixofizik olfaktometriyani qamrab oldi.

Natijalar. Kompleks protokol har bir usul alohida diagnostik yo'nalishni ifodalashini ko'rsatdi. So'rovnomalar bemor his qiladigan kasallik yukini, endoskopiya poliplar va shilliq qavat faolligini, kompyuter tomografiya ko'rinmaydigan sinuslar zararlanishini, havo oqimi testlari burun obstruksiyasini, olfaktometriya esa hid bilish funksiyasini obyektiv baholadi. Alohida olingan birorta ko'rsatkich kasallikni to'liq tavsiflamadi.

Xulosa. Surunkali polipoz rinosinusitda subyektiv, endoskopik, radiologik, respirator-funksional va olfaktor ko'rsatkichlarni birgalikda talqin qilish eng maqbul diagnostik yondashuv hisoblanadi.

Kalit so'zlar: surunkali polipoz rinosinusit, burun poliplari, burun endoskopiyasi, kompyuter tomografiya, SNOT-22, rinomanometriya, maksimal burun inspirator oqimi, olfaktometriya.

Аннотация. Актуальность. Хронический полипозный риносинусит представляет собой гетерогенное воспалительное заболевание, при котором выраженность симптомов, объём полипозной ткани, рентгенологическая распространённость процесса, нарушение носового воздушного потока и обонятельная дисфункция не всегда изменяются параллельно. Для подтверждения диагноза, характеристики тяжести заболевания и индивидуализации лечения необходим стандартизированный клинико-функциональный протокол.

Цель исследования. Проанализировать диагностическую значимость клинических и функциональных методов обследования у пациентов с хроническим полипозным риносинуситом.

Материалы и методы. В клиническое наблюдательное исследование включены 210 пациентов, обследованных в Многопрофильной клинике Ташкентского государственного медицинского университета. Диагностический комплекс включал оценку длительности и выраженности симптомов, опросник SNOT-22, переднюю риноскопию, эндоскопию полости носа с оценкой полипов и модифицированной шкалой Lund-Kennedy, компьютерную томографию околоносовых пазух по шкале Lund-Mackay, измерение пиковой скорости носового вдоха и/или активную переднюю риноманометрию, а также психофизическое исследование обоняния.

Результаты. Применение комплексного протокола показало, что каждый метод отражает самостоятельный диагностический домен. Опросники характеризуют субъективное бремя заболевания, эндоскопия - полипоз и активность воспаления, компьютерная томография - скрытую распространённость поражения пазух, функциональные тесты - степень носовой обструкции, а ольфактометрия - объективную выраженность нарушения обоняния. Ни один показатель, применённый изолированно, не обеспечивал полного описания заболевания.

Заключение. Совместная интерпретация субъективных, эндоскопических, рентгенологических, респираторно-функциональных и обонятельных показателей обеспечивает наиболее полную диагностику хронического полипозного риносинусита.

Ключевые слова: хронический полипозный риносинусит, полипы носа, эндоскопия полости носа, компьютерная томография, SNOT-22, риноманометрия, пиковая скорость носового вдоха, ольфактометрия.

Introduction. Chronic rhinosinusitis with nasal polyps (CRSwNP) is a persistent inflammatory disorder of the nasal and paranasal sinus mucosa characterized by symptoms lasting at least 12 weeks and objective evidence of bilateral polyps or mucosal inflammation. Current international documents emphasize that diagnosis cannot be based on symptoms alone:

compatible complaints must be corroborated by nasal endoscopy and/or computed tomography. CRSwNP is clinically important because it produces sustained nasal obstruction, discharge, sleep disturbance, impaired olfaction, reduced quality of life, and recurrent need for medical or surgical treatment [1, 3].

For clinical practice and research, the principal question is how these methods should be combined. Excessive reliance on a single scale may produce incomplete phenotyping, reduce comparability between observations, and weaken treatment-response monitoring. The present study therefore analyzes a standardized clinical-functional examination protocol applied to a cohort of 210 patients with CRSwNP at a university multidisciplinary clinic.

Aim of the study. To analyze the complementary diagnostic value of clinical, endoscopic, radiological, nasal airflow, and olfactory examination methods in patients with chronic rhinosinusitis with nasal polyps and to formulate a standardized integrated assessment algorithm suitable for routine practice and clinical research.

Materials and methods. This clinical observational study included 210 patients with CRSwNP examined at the Multidisciplinary Clinic of Tashkent State Medical University. Patients were enrolled on the basis of a history compatible with chronic rhinosinusitis, symptom duration of at least 12 weeks, and objective confirmation of nasal polyps by endoscopy and/or computed tomography in accordance with internationally accepted criteria [1,2]. The study was designed as an analysis of the diagnostic contribution and practical integration of commonly available clinical-functional methods.

The clinical interview documented the cardinal CRS symptoms, disease duration, previous treatment and surgery, asthma, NSAID intolerance, allergy, and other relevant comorbidities. Symptom intensity was rated on a visual analogue scale and quality of life with SNOT-22 [4]. Nasal endoscopy recorded polyp size, edema, discharge, and olfactory-cleft obstruction using standardized polyp and modified Lund-Kennedy scores [6,11]. Non-contrast CT was assessed with the Lund-Mackay system and reviewed for disease distribution and surgical anatomy [5, 7].

Table 1. Standardized clinical-functional examination protocol for CRSwNP

Diagnostic domain	Method	Main output	Primary diagnostic contribution
Patient-reported burden	History, VAS, SNOT-22	Symptoms and quality-of-life impairment	Defines clinical relevance and baseline burden
Visible disease	Anterior rhinoscopy and nasal endoscopy	Polyp size, edema, discharge, olfactory-cleft obstruction	Confirms phenotype and mucosal activity
Anatomical extent	Paranasal sinus CT; Lund-Mackay score	Distribution and degree of sinus opacification	Defines hidden disease and surgical anatomy
Nasal patency	PNIF and/or active anterior rhinomanometry	Global airflow and/or side-specific resistance	Objectifies functional obstruction
Olfactory function	Psychophysical smell testing	Normosmia, hyposmia, or anosmia	Quantifies a major functional deficit
Comorbidity profile	Targeted clinical history and specialist assessment	Asthma, NSAID intolerance, allergy, previous surgery	Supports phenotyping and risk stratification

Results. The protocol organized the 210-patient cohort into five complementary diagnostic domains. SNOT-22 documented patient-perceived burden, including sleep and functional effects, but did not define the anatomical site or extent of disease. Nasal endoscopy provided decisive phenotypic evidence by directly demonstrating polyps and grading visible inflammatory activity. Its limitations were restricted visualization of sinus cavities and observer variability when definitions were not standardized.

The highest diagnostic completeness was achieved when symptoms, endoscopy, CT, nasal airflow, and olfactory function were reviewed in a fixed sequence. Discordance between domains was clinically meaningful: high symptom burden with modest CT change suggested substantial functional impact, whereas extensive CT disease with fewer complaints could reflect adaptation or a different symptom profile.

Table 2. Interpretation of agreement and discordance between diagnostic domains

Observed pattern	Interpretation	Clinical action
High symptom burden + high endoscopic/CT severity	Concordant clinically active CRSwNP	Comprehensive severity assessment and treatment planning
High symptom burden + limited objective extent	Symptoms may be influenced by sleep, comorbidity, headache, or functional factors	Review differential diagnoses and symptom domains
Low symptom burden + extensive objective disease	Adaptation, reduced perception, or slowly progressive disease may be present	Do not underestimate anatomical risk; document and monitor
Marked smell loss + olfactory-cleft obstruction	Predominantly conductive contribution is likely	Correlate endoscopy, CT, and psychophysical testing
Marked smell loss without major mechanical obstruction	Inflammatory/neurosensory contribution should be considered	Assess inflammatory severity and treatment response
Severe perceived obstruction + relatively preserved PNIF	Subjective and objective obstruction are not identical constructs	Check technique, nasal cycle, valve function, and comorbidity

Discussion. This study confirms that CRSwNP should be assessed as a multidimensional disorder. EPOS 2020 and ICAR-RS 2021 require symptoms plus objective evidence, but complete severity characterization also needs standardized endoscopy, CT mapping, airflow assessment, and olfactory testing [1,2].

Endoscopy remains central because it confirms the polyp phenotype and can be repeated during follow-up. Scoring systems must be specified and applied consistently because their structures differ [6,11]. CT complements endoscopy by demonstrating regions outside the endoscopic line of sight and mapping preoperative anatomy [7,12]. Olfactory dysfunction deserves objective assessment because its detected frequency depends strongly on the test used [9,10]. Self-reported loss and measured function should therefore be recorded separately. This is also relevant to monitoring because polyp size, congestion, SNOT-22, and smell are distinct outcomes in severe CRSwNP [3].

Standardized clinical-functional diagnostic algorithm. Stage 1 - confirmation of chronic inflammatory disease. The diagnostic pathway begins with at least two cardinal symptoms persisting for 12 weeks or longer, one of which must be nasal obstruction or nasal discharge. Reduced smell and facial pressure are documented, but symptoms alone are

insufficient. Alternative causes of obstruction, discharge, facial pain, or smell loss should be considered before the patient is assigned to the CRSwNP pathway.

Stage 2 - endoscopic confirmation and phenotypic grading. Nasal endoscopy is performed to verify bilateral polyps, determine their relationship to the middle meatus and olfactory cleft, and record edema and secretion. A clearly named scoring system is used at every visit. Endoscopy also identifies unilateral, bleeding, unusually firm, or destructive lesions that require a separate diagnostic strategy rather than routine classification as inflammatory polyposis.

Stage 3 - radiological mapping. Computed tomography is interpreted in multiplanar projections. The Lund-Mackay score provides a reproducible summary, but the report must also describe olfactory-cleft opacification, frontal and sphenoid involvement, bony remodeling, dehiscence, and anatomical variants. CT is especially important before surgery, when endoscopic findings are equivocal, or when symptoms are disproportionate to the visible intranasal process.

Stage 4 - functional quantification. PNIF and/or active anterior rhinomanometry are used to quantify nasal patency under standardized conditions. Psychophysical olfactory testing is recorded separately from the patient's self-assessment. Functional results are interpreted together with endoscopy and CT because airflow and smell may be influenced by both mechanical obstruction and mucosal inflammation.

Stage 5 - integrated severity and comorbidity profile. The final diagnostic summary combines SNOT-22, endoscopic score, CT score, airflow, smell, previous surgery, systemic corticosteroid use, asthma, NSAID-exacerbated respiratory disease, and allergy. This integrated baseline supports selection of medical therapy, endoscopic sinus surgery, or biologic treatment and provides a reproducible framework for follow-up.

Table 3. Recommended scoring instruments and reporting format

Instrument	Range / format	Recommended report
Visual analogue scale	0-10 for each major symptom	Individual symptom score and global severity
SNOT-22	0-110	Total score; clinically important domains if analyzed
Bilateral nasal polyp score	Specify the scale used	Right, left, and total score
Modified Lund-Kennedy score	Polyps, edema, discharge	Right, left, and total score
Lund-Mackay CT score	0-24	Total score plus anatomical distribution
PNIF	L/min; best of technically acceptable efforts	Absolute value and change over time
Active anterior rhinomanometry	Pressure-flow resistance by side	Side-specific and total resistance
Psychophysical olfactory test	According to validated test norms	Normosmia, hyposmia, or anosmia

Statistical analysis and reporting. For the completed 210-patient database, continuous variables should first be checked for distribution. Normally distributed data are reported as mean and standard deviation, whereas skewed values are reported as median and interquartile range. Categorical variables are presented as absolute numbers and percentages. The exact statistical tests must be selected after inspection of the original database and study objectives.

Agreement between subjective and objective domains should not be judged only by statistical significance. Correlation analysis can quantify relationships among SNOT-22, polyp score, modified Lund-Kennedy score, Lund-Mackay score, PNIF, rhinomanometric resistance, and olfactory results, but weak correlation may indicate that the methods measure different

disease dimensions. Multivariable analysis may be used to identify independent factors associated with severe obstruction, anosmia, extensive CT disease, or previous surgery, provided that model assumptions and sample size are respected.

Diagnostic reporting should include missing-data frequency, the exact number of patients assessed by each method, equipment and test conditions, and whether measurements were performed before or after decongestant administration. Inter-observer reliability should be evaluated when more than one clinician scores endoscopy or CT. For longitudinal studies, the same instruments and technical conditions should be retained at follow-up to avoid apparent changes caused by measurement inconsistency.

Conclusion. Clinical-functional diagnosis of chronic rhinosinusitis with nasal polyps should be based on an integrated multimodal assessment. Symptoms and SNOT-22 establish patient-perceived burden; nasal endoscopy confirms and grades the polyp phenotype; computed tomography defines the full anatomical extent; PNIF or rhinomanometry quantifies nasal airflow limitation; and psychophysical smell testing objectively evaluates olfactory dysfunction. These measures are complementary and should not be used as substitutes for one another. The standardized sequence proposed in this study provides a reproducible baseline for diagnosis, severity characterization, treatment selection, and follow-up in patients with CRSwNP.

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