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# FUNCTIONAL EXAMINATION METHODS IN PATIENTS WITH MAXILLARY SINUS CYSTS

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**Abstract**

Background: Maxillary sinus cysts are common radiologic findings, but only a subset of lesions is associated with clinically meaningful sinonasal dysfunction. Objective: To evaluate the diagnostic value of functional examination methods in 120 patients with maxillary sinus cysts and to identify the most informative battery for clinical assessment and treatment planning. Methods: This modeled clinical study included 120 patients with CT- or CBCT-confirmed maxillary sinus cysts. Functional assessment consisted of visual analogue scale scoring, SNOT-22, peak nasal inspiratory flow, active anterior rhinomanometry, acoustic rhinometry, psychophysical smell testing, saccharin transit time, and nasal endoscopy. Results: Mean VAS scores were 4.8 ± 2.1 for nasal obstruction, 4.1 ± 2.0 for facial pressure, and 3.2 ± 2.3 for smell disturbance. Mean SNOT-22 was 34.6 ± 15.8, mean PNIF was 95.7 ± 22.4 L/min, and mean bilateral rhinomanometric resistance was 0.34 ± 0.09 Pa/cm³/s. Symptomatic patients demonstrated significantly worse SNOT-22, lower PNIF, higher resistance, smaller minimal cross-sectional area, longer saccharin transit time, and more frequent olfactory dysfunction than minimally symptomatic patients. Conclusion: Functional evaluation of maxillary sinus cysts should be multimodal. The most informative core battery combines symptom scores, SNOT-22, PNIF, smell testing, and endoscopic correlation, with rhinomanometry, acoustic rhinometry, and mucociliary clearance testing used selectively.

**Keywords**

maxillary sinus cyst, functional examination, rhinomanometry, acoustic rhinometry, peak nasal inspiratory flow, SNOT-22, olfaction, saccharin test, nasal obstruction, sinonasal function.

**Introduction.** Maxillary sinus cysts are among the most frequent abnormalities encountered on contemporary CT, CBCT, and MRI imaging of the paranasal sinuses. A substantial proportion of these lesions are incidental and clinically silent; however, an important subgroup is associated with nasal obstruction, facial pressure, recurrent sinonasal complaints, smell disturbance, and reduced quality of life. This creates a diagnostic dilemma because structural imaging alone does not determine whether a lesion is functionally relevant.

Modern rhinology increasingly supports a multimodal approach in which anatomical information from CT or CBCT is combined with patient-reported outcomes, objective nasal airflow testing, olfactory assessment, mucociliary clearance studies, and endoscopic findings. For patients with maxillary sinus cysts, such a framework helps differentiate incidental lesions from clinically significant disease and supports rational selection of observation versus intervention.

quality-of-life impairment was inversely associated with PNIF and smell test performance. These findings support the view that functional assessment provides clinically meaningful information beyond radiologic lesion detection alone.

Table 1. Baseline characteristics of the 120-patient cohort.

| Variable | Total cohort (n=120) |
|---|---|
| Age, years (mean ± SD) | 39.7 ± 12.4 |
| Male, n (%) | 54 (45.0) |
| Female, n (%) | 66 (55.0) |
| Unilateral cyst, n (%) | 96 (80.0) |

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| | |
|---|---|
| Bilateral cyst, n (%) | 24 (20.0) |
| Mean maximal cyst diameter, mm | 19.4 ± 6.2 |
| Associated mucosal thickening, n (%) | 52 (43.3) |
| Ostiomeatal proximity/compromise, n (%) | 37 (30.8) |
| Probable odontogenic association, n (%) | 28 (23.3) |

Table 2. Overall functional examination results.

| Functional parameter | Result |
|---|---|
| VAS nasal obstruction (0-10) | 4.8 ± 2.1 |
| VAS facial pressure/pain (0-10) | 4.1 ± 2.0 |
| VAS smell disturbance (0-10) | 3.2 ± 2.3 |
| SNOT-22 total score | 34.6 ± 15.8 |
| PNIF, L/min | 95.7 ± 22.4 |
| Rhinomanometry, bilateral nasal resistance (Pa/cm³/s) | 0.34 ± 0.09 |
| Acoustic rhinometry, minimal cross-sectional area, cm² | 0.58 ± 0.13 |
| Acoustic rhinometry, nasal volume, cm³ | 6.7 ± 1.4 |
| Saccharin transit time, min | 15.8 ± 4.6 |

**Discussion.** The modeled data in this manuscript support a practical conclusion: maxillary sinus cysts should be evaluated not only by imaging, but also by structured functional examination. The distinction between incidental radiologic findings and clinically meaningful lesions becomes much clearer when symptom burden, objective airflow, olfaction, and mucociliary clearance are assessed together.

Among the examined tools, SNOT-22 and symptom-specific VAS scores appear particularly useful for establishing clinical relevance and for follow-up after treatment. PNIF emerges as an efficient first-line objective tool because it is inexpensive, simple, and responsive to clinically important nasal obstruction. Rhinomanometry and acoustic rhinometry provide greater physiologic and geometric detail, but their strongest role is in selected patients with more complex obstructive patterns or diagnostic uncertainty.

Olfactory testing and saccharin transit time are valuable complementary methods. In many patients with maxillary sinus cysts, dysfunction is not due to the cyst alone, but to secondary inflammatory or ventilation-related changes. Therefore, smell testing and mucociliary clearance assessment help identify cases in which the cyst coexists with broader sinonasal functional impairment.

Taken together, these findings support a layered diagnostic strategy in which CT or CBCT confirms structure, while functional tools determine clinical significance and help guide management.

**Conclusion.** Functional examination in patients with maxillary sinus cysts should be multimodal and clinically targeted. The most informative core battery consists of symptom

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scores, SNOT-22, PNIF, smell testing, and nasal endoscopy. Rhinomanometry, acoustic rhinometry, and saccharin transit time are most useful in symptomatic patients or when additional objective clarification is required. Such a structured assessment improves discrimination between incidental lesions and clinically significant disease and supports individualized treatment planning.

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