

Correlation between polyp grading system and NOSE scale, Lund MacKay system and Nasometry

Original Article *Hebatullah Ali Zain Elabdeen Abdel-Azim¹, Soad Yehia Mostafa², Sayed Mohammed Said Kadah³, Hoda Ali Ibrahim⁴, Yossra Abdel-Naby Sallam⁵*

Department of ^{1,2,3,4}Otolaryngology, ⁵Phoniatrics, Faculty of Medicine, Al-Azhar University, Egypt.

ABSTRACT

Background: Endoscopic polyp-grading system is commonly used for the assessment of patients with Sino nasal polyposis. However, its strength has not been examined before against any objective measure.

Aim of the Work: To assess the strength of endoscopic polyp-grading system against valid objective measures and to explore the association between both of them, because endoscopic polyp-grading system is a common assessment procedure in patients with Sino nasal polyposis.

Results: Hypo nasality is the main symptoms affect quality of life in all patients (100%) with bilateral Sino nasal polyposis suffered from variable degrees of nasal obstruction. standardized endoscopic polyp-grading system to assess the extent of nasal polyp in clinical practice and to measure the effect of reflected hypo nasality in patients. These grading scales divided patients into 4 groups according to the size and extension of polyp in the nasal cavity. Comparison between the grades of polyp in endoscopic polyp-grading system and NOSE scale, Lund MacKay system, and Nasometry revealed strong positive correlation (*P value: 0.000, 0.000, 0.001* respectively).

Relation between patient's results and types of graft used showed no statistically significant differences between them.

Conclusion: This study showed the endoscopic polyp-grading system can be used as a reliable tool for the assessment of patients with Sino nasal polyposis.

Key Words: 4-stage polyp-grading system, lund MacKay system, nasalance scores, NOSE scale, sino nasal polyposis.

Received: 3 December 2022, **Accepted:** 28 February 2023

Corresponding Author: Hebatullah Ali Zain Elabdeen Abdel-Azim, MD, Department of Otolaryngology, Faculty of Medicine, Al-Azhar University, Egypt. **Tel.:** 01007924785, **E-mail:** amar_elzamaan@yahoo.com

ISSN: 2090-0740, 2023

INTRODUCTION

Sino nasal polyposis is one of the chronic diseases of the nose and paranasal sinuses, Sino nasal polyposis is considered a non-neoplastic inflammatory process of Sino nasal mucosa that eventually leads to the excessive outgrowth of abnormal projections inside the mucosa of nasal cavity and Para nasal sinuses, which subsequently may lead to complete nasal obstruction^[1]. Nasal obstruction causes restlessness and has detrimental effect on the patient's quality of life. Failure of pharmacotherapy had lead to the development of various surgical approaches, despite the possibility of recurrence of polyposis after the surgery^[2].

Rhinologists routinely use nasal endoscopy in the examination of the nose and paranasal sinuses to evaluate the extent of Sino nasal inflammation^[3].

Endoscopic polyp-grading system may be used to categorize the size and extent of polyp inside the nasal cavity^[4]. Endoscopic polyp grading is easy to apply but its validity has not been examined.

NOSE scale^[5], Lund MacKay system^[6] and Nasometer^[7] are valid objective tools that are frequently used for complete evaluation of patients with Sino nasal polyposis or nasal obstruction due to any other cause. The correlation between these valid measures and endoscopic grading system could examine the strength of the endoscopic polyp-grading system.

The aim of this study is to assess the strength of endoscopic polyp-grading system against valid measures, as NOSE scale, Lund MacKay system, and Nasometry, and to explore the association between them in order to encourage its use as preliminary, out patient assessment tool.

PATIENTS AND METHODS:

This prospective study has been conducted on 63 patients (126 nasal cavities) with bilateral Sino nasal polyposis in the age range of 18 to 69 years.

The Inclusion Criteria:

Cases clinically diagnosed as nasal polyp(s) and/or Polypoidal nasal masses

1) Patient diagnosed of chronic Rhino sinusitis (CRS) with bilateral nasal obstruction. Sino nasal polyposis may be predisposed by habitual, occupational, and environmental factors as allergic systemic disorders; many of them are atopic and may suffer from bronchial asthma which may affect the severity of the pathology, however they have no effect on the assessment tools especially nasoendoscope.

2) Refractory chronic Rhinosinusitis (CRS) defined by persistent symptoms despite of medical treatment (alkaline nasal wash, nasal decongestants, local and systemic steroids, and local and systemic antiallergic) for three months without improvement.

3) Patients who underwent previous FESS with recurrent Sino nasal polyposis.

4) Patients who had antrochoanal polyp with bilateral nasal obstruction.

The Exclusion Criteria:

1) Patients below 18 years

2) Patients presenting with congenital nasal and/or Para nasal sinuses masses

3) Patients with nasal mass of intracranial origin.

4) Any structural or functional disorders that might affect resonance of speech other than Sino nasal polyposis, as deviated nasal septum or bilateral inferior turbinate hypertrophy.

5) Long term oral corticosteroid use for any other medical condition as systemic immune diseases.

All patients underwent complete Otorhinolaryngological evaluation including;

a) NOSE scale. The NOSE survey assesses nasal obstruction from the patients' own words. It is a brief questionnaire consisting of 5 self-rated items, each item scores from 0 to 4. The NOSE score represents the sum of the responses to the 5 individual items and ranges from 0 to 20^[15,16].

b) Nasoendoscopy (Karl Storz Nasoendoscope) to assess the degree of obliteration of the nasal cavity by Sino nasal polyposis and to exclude other obstructive nasal lesions as deviated nasal septum and hypertrophied inferior turbinate. Cases with severe nasal obstruction were assessed using the pediatric nasoendoscope and confirmed by CT^[4].

In endoscopic polyp-grading system 0 means that there is no visible Nasal polyp (NP); 1 means that sino nasal polyposis is confined within the middle meatus not exceeding osteomeatal complex; 2 means that polyps occupy the middle meatus; 3 means that polyps extend beyond the middle meatus; whereas 4 means that polyps completely obstruct the nasal cavity^[4].

c) CT scan of the nose and para nasal sinuses was done to all patients and were graded according to the Lund-Mackay score, which is a widely used method for radiologic staging of chronic Rhino sinusitis. Each sinus had a score of: 0 (no abnormality), 1 (partial opacification) or 2 (complete opacification). The ostiomeatal complex is assigned a score of either 0 (not obstructed) or 2 (obstructed). The sinuses are grouped into: frontal sinus, anterior ethmoid cells, posterior ethmoid cells, maxillary sinus, sphenoid sinus, and ostiomeatal complex^[6].

d) Nasometry testing gives the examiner a nasalance score, which is the percentage of nasal acoustic energy to the total acoustic energy (nasal plus oral). The advantage of nasometry is that it provides objective data that can be compared to standardized norms for interpretation. When an individual's score is compared to normative data, a judgment can be made regarding the normality of resonance^[17].

(Kay Elemetrics Nasometer Model 6400-2) to assess the degree of nasal resonance.

Statistical analysis:

Statistical analysis was done using SPSS version 20 and the correlation between endoscopic polyp-grading system, Lund Mackay score and Nasometry has been examined. *P Value of 0.005* was considered a level of significance.

RESULTS:

In this study Hypo nasality is the main symptoms affect quality of life in all patients (100%) with bilateral Sino nasal polyposis suffered from variable degrees of nasal obstruction. standardized endoscopic polyp-grading system to assess the extent of nasal polyp in clinical practice and to measure the effect of reflected hypo nasality in patients. These grading scales divided patients into 4 groups according to the size and extension of polyp in the nasal cavity. Comparison between the grades of polyp in endoscopic polyp-grading system and NOSE scale, Lund MacKay system, and Nasometry revealed strong positive correlation (*P value: 0.000, 0.000, 0.001* respectively). This study included 126 nasal cavities, 63 patients, 34 females (54%) and 29 males (46%) in the age range of 18-69 years old (mean age 34.98 ± 18.17 years).

Table 1: Demographic data demonstrate Gender and age distribution of the studied group.

		No.	%
Sex	Female	34	54.0%
	Male	29	46.0%
Age	Range	18 -69	
	Mean±SD	34.98±18.17	

This table shows that 34 patients were female (54%) and 29 were males (46%) were no statistically significant.

Table 2: Severity of nasal obstruction according to NOSE scale

		No.	%
Severity of nasal obstruction	Mild	20	31.7%
	Moderate	22	34.9%
	Severe	21	33.3%
	Range	2 – 10	
	Mean ±SD	5.48 ± 2.77	

This table shows that all patients suffered from variable degree of nasal obstruction as rated by NOSE scale (31.7% of patients presented with mild nasal obstruction, 34.9% of patients suffered from moderate nasal obstruction and 33.3% presented with severe nasal obstruction).

Table 3: Polyp grading according to 4 stage endoscopic grading system

		No.	%
Endoscopic grading of polyp	Grad I	10	15.9%
	Grad II	21	33.3%
	Grad III	15	23.8%
	Grad IV	17	27.0%

This table shows that 15.9% of nasal polyposis were grade I, 33.3% were grade II, 23.8% were grade III, and 27% of were grade IV.

Table 4: sinus involvement on CT Scan (Lund–Mackay scoring system)

Sinus	Grade 1	Grade 2	Total affection
Maxillary	22 / 37.3%	37 / 62.7%	59
Anterior ethmoid	12 / 23%	40 / 80%	52
Posterior ethmoid	9 / 30%	21 / 70%	30
Frontal	36 / 75%	12 / 25%	48
Sphenoid	16 / 59%	11 / 41%	27
OMC	*****	63 / 100%	63

This table shows anterior and posterior ethmoid were most affected sinuses by polyposis 80% and 70% respectively.

Table 5: Nasometric score of the patients

	Range	Mean ± SD
Nasal sentence	17-56	36.10 ± 19.79
Oral sentence	6-25	15.04 ± 9.28

This table shows the nasalance score for the oral sentence (6-25 Mean ± SD. 15.04 ± 9.28) and nasal sentence(17-56 Mean ± SD 36.10 ± 19.79)

Table 6: correlation between NOSE scale, Lund and MacKay system, Nasometry and endoscopic grading system

		Endoscopic grading of Sino nasal polyposis
NOSE scale	Pearson Correlation	$r=0.86$
	<i>P value</i>	$P=0.000^*$
Lund and MacKay CT scoring system	Pearson Correlation	$r=0.87$
	<i>P value</i>	$P=0.000^*$
Nasal score of Nasometry	Pearson Correlation	$r=0.72$
	<i>P value</i>	$P=0.001^*$
Oral score of Nasometry	Pearson Correlation	$r=0.11$
	<i>P value</i>	$P=0.391$
Nasalance	Pearson Correlation	$r=0.19$
	<i>P value</i>	$P=0.119$

This table shows significant positive correlation between endoscopic polyp-grading system and NOSE scale, Lund-MacKay system and Nasometry which revealed strong positive correlation (*P value*: 0.000, 0.000, 0.001).

DISCUSSION

Nasal polyps are a ubiquitous diagnosis that can manifest in a variety of diseases, the most common being chronic rhinosinusitis and chronic nasal obstruction. Although benign, nasal polyps and their underlying disease may have a huge impact on a patient's quality of life^[18].

To date, nasal endoscope is the most convenient diagnostic tool for the evaluation of Sino nasal polyposis^[10]. Therefore endoscopic polyp-grading system is frequently needed to point out the extent of polyps in nasal cavities, although it has not been validated^[4]. The aim of this study was to examine its strength against other valid measures to encourage its use as preliminary out patient diagnostic tool (Table 6).

Patients who have upper airway diseases that cause nasal obstruction (Table 1, 2, 3, 4) usually complain of changes in the resonance of speech (Table 5). These changes annoy the patients and can be observed by clinicians and demonstrated with objective methods. The Nasometer has been standardized for normal Egyptian Arabic speakers^[11] with comparable results to Kummer^[12].

In the current study, the nasal polyps were more common in females than males with male to female ratio of 1: 1.2. This female predominance is similar to Bakari *et al.*, who found that nasal polyps are more common in females (M: F ratio was 1:1.2)^[8]. On the other hand, Hastan *et al.*, found no difference between male and female patients with nasal polyp^[9]. Although these differences are remarkable, they could not be attributed to diagnostic measures. They may be attributed to different samples size.

This variability may be attributed to different samples' size.

Regarding clinical presentation in the current study the most common complaint of patients with nasal polyposis was hyponasal speech (100%), (100%) suffer from nasal obstruction, headache and smell disorders (95.2%) presented with itching, (79%) presented with Rhinorrhea, (39.7%) with epistaxis, (79%) with mouth breathing, and (4.8%) presented by Proptosis. In addition to the clinical presentation, all patients of the study showed Hypo nasal speech according to Nasometric evaluation (mean 36.10 ± 19.79 for the nasal sentence).

Our results also matched with the study done by Bakari *et al.*^[8]. The main presenting symptoms in that study were nasal obstruction (97.4%), rhinorrhea (94.7%), headache (77%), allergic symptoms (52.6%), anosmia (34.6%), and epistaxis that was noticed in 30.3% of the patients.

As regard the radiological findings of the patients in this study, all cases were grade 2 according to Lund–Mackay scoring system, regardless of the involved sinuses. The most commonly affected sinuses were the anterior ethmoid sinus (80%), followed by posterior ethmoid sinus (70%), maxillary sinus (62.7%), sphenoid sinus (41%) and frontal sinus (25%).

Deepthi *et al.*^[13] postulates that classifying the findings of CT scan according to Lund–Mackay staging scores provides strong specification and staging for the assessment of Para nasal sinuses.

As regard Endoscopic grading of polyp; 15.9% of patients diagnosed as grade 1, 33.3% diagnosed as grade 2, 23.8% diagnosed as grade 3, and 27% diagnosed as grade 4 nasal polyps.

Tamer Abou-Esaad *et al.*^[11] and Nabil *et al.*^[14] used endoscopic polyp-grading system together with Nasometer to assess the outcome of FESS in patients with bilateral Sino nasal polyposis.

The results of the study showed positive correlation between endoscopic grading of Sino nasal polyposis with NOSE scale (*P value: 0.000*), radiological grading of Sino nasal polyposis according Lund and MacKay CT (*P value: 0.000*) scoring system and nasalance score of the nasal sentence (*P value: 0.001*) which reflects specifically the degree of hyponasality. These results indicate that endoscopic polyp-grading system can be used as a valid tool for diagnosis of nasal polyp.

CONCLUSIONS

Endoscopic polyp-grading system can be used as a valid outpatient assessment tool of patients with sino nasal polyposis.

CONFLICT OF INTEREST

There are no conflicts of interest.

REFERENCES

1. Stevens WW, Schleimer RP, Kern RC. Chronic Rhinosinusitis with Nasal Polyps. *J Allergy Clin Immunol Pract.* 2016; 4(4): 565–572. doi:10.1016/j.jaip.2016.04.012
2. Browne J, Hopkins C, Slack R, *et al.* (2006): Health related quality of life after polypectomy with and without additional surgery, *Laryngoscope*; 116: 297–302.
3. Pirimoglu B, Sade R, Sakat M, *et al.* (2018): Low-Dose Noncontrast Examination of the Paranasal Sinuses Using Volumetric Computed Tomography. *J Comput Assist Tomogr.* 2(3):482-6.
4. Berke G, Mendelsohn A, Howard N, *et al.*, (2013): “Neuromuscular induced phonation in a human ex vivo perfused larynx preparation,” *J. Acoust. Soc. Am.* 133(2), 114–117.
5. Mukulika S, Shoham, Rabi H,1 *et al.*,(2017): Use of Nasal Obstruction Symptom Evaluation Scale in Objective Evaluation of Symptomological Improvement in Post Septoplasty Patients. *Bengal Journal of Otolaryngology and Head Neck Surgery* 25.(1) 213_252
6. Lund V and Mackay I (1993): Staging in chronic rhinosinusitis, *Rhinology.* 31 (4): 183–4.
7. Georges Z, Maher K, Doja S, *et al.*, (2017): Clinical application of nasometry in patients with nasal obstruction. *Ear, Nose & Throat Journal.* 96,10-11
8. Bakari A, Olushola A, Adeyi A, *et al.* (2010): Clinico-pathological profile of sinonasal masses: an experience in national ear care center Kaduna, Nigeria-BMC Research Notes 20:103_186.
9. Hastan D, Fokkens WJ, Bachert C, *et al.* (2011). Chronic rhinosinusitis in Europe: An underestimated disease, *Allergy* 66:1216–1223.
10. Alsaïd A (2017); Paranasal sinus Anatomy: What the surgeon Needs to know; *Eur Arch Otorhinolaryngol*; 10: 1:33.
11. Tamer Abou-Esaad, Amal Q, Hemmat B, Rasha E. standarization of nasometry for normal Egyptian Arabic speakers. *folia phoniatr logop* 2012;64:271-277

12. Kummer A. (2006): Resonance disorders and nasal emissions, evaluation and treatment using “low tech” and “no tech” procedures. *The ASHA Leader*; 11:4-26.
13. Deepthi N V, Menon U K, Menon I R, *et al.* (2013): Correlations and comparison between repeat computed tomography scores, endoscopy scores and symptomatic improvement before and after endoscopic sinus surgery: a pilot study. *Clin Rhinol An Int*; 6:32–40.
14. Nabil G., Ahmed A., Basim M. *et al.*, (2019): Relationship between the endoscopic, radiological, and operative findings in sinonasal polyposis, *Int Forum Allergy Rhinol* 12, 163_169.
15. Stewart M., Witsell D., Weaver E. *et al.*, (2004): Development and validation of the Nasal Obstruction Symptom Evaluation (NOSE) scale. *Otolaryngol Head Neck Surg*; 130 (2) 157- 163
16. Young T., Peppard P.(2002). Epidemiology of obstructive sleep apnea: a population health perspective. *Am J Respir Crit Care Med*;165 (9) 1217- 1239
17. Dejonckere P, Hogen E: Nasometric assessment of hypernasality in children: optimized speech material and normative values. *Advances in pediatric ORL. Proceedings of the 8th International Congress of Pediatric Otorhinolaryngology. Advances in Pediatric ORL, 2003, vol. 1254, pp 169–173.*
18. Hopkins C. Chronic Rhinosinusitis with Nasal Polyps. *N Engl J Med.* 2019 Jul 04;381(1):55-63.