Indian J Otolaryngol Head Neck Surg
(Apr–June 2016) 68(2):202–206; DOI 10.1007/s12070-014-0762-y

ORIGINAL ARTICLE

Nasal Endoscopy Versus Other Diagnostic Tools in Sinonasal Diseases

Y. K Maru · Y. Gupta

Received: 7 July 2014 / Accepted: 4 August 2014 / Published online: 12 August 2014

Abstract Sinonasal endoscopy is an essential part of the rhinologic examination performed by otolaryngologists in the evaluation of sinonasal disease. The use of the endoscopes has been popularized with the advent of endoscopic sinus surgery. To evaluate the role of nasal endoscopy as primary examination in the early and accurate diagnosis of sinonasal diseases in comparison to other diagnostic tools in rhinology. A retrospective and prospective study was carried out on 200 patients with clinical evidence of sinonasal diseases. They were evaluated with anterior rhinoscopy, nasal endoscopy and CT paranasal sinus. The level of agreement between anterior rhinoscopy and nasal endoscopy was substantial for deviated nasal septum, inferior turbinate hypertrophy and polyp (0.735, 0.712 and 0.709, respectively), but moderate for middle turbinate hypertrophy (0.418). The results of endoscopy and CT comparison among 80 patients, whose symptoms warranted CT, indicated that although for most of the findings, there was almost perfect to substantial level of agreement between the results of the two methods, five patients had normal CT imaging report, while they demonstrated early polyps during endoscopic evaluation. Also, CT missed 4 cases of deviated nasal septum. Diagnostic nasal endoscopy proved a better technique to detect various sinonasal pathologies as well as anatomical variations, which are otherwise missed on Computed Tomography or inaccessible on anterior rhinoscopy especially in the key area comprising the ostiomeatal complex. We reinforce the fact that it should be viewed as an essential part of a complete examination of the nose and sinuses.

Keywords Nasal endoscopy · Chronic rhinosinusitis · Diagnosis · CT scan PNS

Introduction

Technology has always been a part of the practice of medicine particularly in otorhinolaryngology-head and neck surgery, where diagnostic and therapeutic advances can make disease process more accessible. Nasal Endoscopy is an excellent example of this [1]. In the 1960s, Hopkins developed the rod optic endoscope, which revolutionized the optical quality available to surgeons [2]. In the 1970s, this new and exciting armamentarium of endoscopic tools allowed surgeons such as Messerklinger, Stammberger, Draf and Wigand to transition sinus surgery from a radical operation to a minimally invasive procedure [2, 3]. Nasal endoscopy allows a detailed examination of the nasal and sinus cavities not possible by standard examination such as anterior rhinoscopy using headlight or head mirror [4]. It is more sensitive than computed tomography for the evaluation of accessible disease and provides valuable information regarding persistent asymptomatic disease postoperatively. Nasal Endoscopy is a minimally invasive, diagnostic medical procedure and currently the most preferred initial method of evaluating medical problems affecting nose and sinuses such as nasal stuffiness and obstruction, sinusitis, nasal polyposis, nasal tumors, epistaxis, recurrent bouts of sneezing and rhinorrhea. Thus, endoscopy should be viewed as part of a complete examination of the nose and sinuses. A strong argument can be made for incorporating endoscopy into the

Y. K Maru · Y. Gupta (✉)
Department of Otorhinolaryngology and Head & Neck Surgery, MGM Medical College & MY Hospitals, 101,Dilpasand Park, New Palasia, Indore, Madhya Pradesh, India
e-mail: dryamini10@gmail.com

routine care of any patient with chronic rhinosinusitis [5]. The present study was conducted to evaluate the role of nasal endoscopy as first hand primary examination in the early and accurate diagnosis of sinonasal diseases and to highlight its importance with respect to ease and cost-effectiveness in comparison to other diagnostic tools in rhinology like computed tomography. The present study was also aimed at evaluating the frequency and types of anatomical variants in and around ostiomeatal complex, and distribution of sinonasal mucosal abnormalities and other pathological changes.

Materials and Methods

The retrospective and prospective study was carried out in the Department of Otorhinolaryngology from July 2009 to October 2013. A total of 200 Patients with clinical evidence of sinonasal diseases were evaluated with anterior rhinoscopy and diagnostic nasal endoscopy. Nasal Endoscopy was performed using Hopkins rod endoscopes of 0° (diameter 4 mm, length 18 cm) by standard three pass technique.

Out of these, 80 patients underwent computed tomographic evaluation whose symptoms warranted the need for CT evaluation. The study included those patients who were clinically diagnosed as having chronic rhinosinusitis with or without nasal polyposis or having clinical evidence of other sinonasal pathologies in the age group 10 years and above irrespective of sex. Patients with previous alteration of paranasal sinus anatomy due to maxillofacial trauma and history of previous sinus surgery were excluded.

Results

The data was collected in data forms and tabulated in a Microsoft Excel® spreadsheet. It was then exported to SPSS, version 20.0 for statistical analysis. The level of agreement between anterior rhinoscopy and endoscopy findings, and CT and endoscopy findings was determined by calculating kappa statistics; considering kappa coefficient: ≤0 poor, 0.01–0.20 slight, 0.21–0.40 fair, 0.41–0.60 moderate, 0.61–0.80 substantial, and 0.81–1 almost perfect. Chi square and Student's t tests were used for statistical analyses. P value < 0.05 was considered statistically significant. As revealed by Table 1, the various cases in % of the groups in descending order were; group 21–30 (31 %), group 10–20 (26 %), with least in group above 50 (8.5 %). M:F ratio was 1.12:1.

Approximately, 27 % patients had prolonged history of 2–5 years and 22.5 % had symptoms persisting for more than 5 years; while a small percentage of patients (2.5 %) had symptoms lasting 3 months. The most common symptom was nasal obstruction (89 %) followed by nasal discharge (81 %), PND (40.5 %), headache (34 %), ear discharge/heaviness (25.5 %) and nasal mass (20 %).

The most common diagnosis was deviated nasal septum (45 %), followed by chronic rhinosinusitis (43 %), and nasal polyposis (26.5 %).

The most common findings on anterior rhinoscopy were deviated Nasal Septum (79.5 %), followed by nasal discharge (57 %), turbinate hypertrophy (43 %) polyps (18.5 %) respactively.

The most common anatomical variations detected on nasal endoscopy were deviated nasal septum (83.5 %) followed by paradoxical middle turbinate (42.5), and concha bullosa (26.5 %). The findings detected on computed tomography were deviated nasal septum in 66.25 %, concha bullosa in 42.5 % and paradoxical middle turbinate in 16.25 % patients.

The most common pathological abnormality detected on nasal endoscopy was mucopus in middle meatus (69 %) and next were hypertrophied (45 and 35 % inferior and middle turbinate respectively) and congested turbinates (44.5 %), followed by polypoidal changes (28 %) and oedematous/congested uncinate process (27.5 %). The findings detected on computed tomography were inferior turbinate hypertrophy in 48.75 %, middle turbinate hypertrophy in 38.75 %, and polyp in 31.25 % patients.

As revealed from Table 2, the nasal pathologies revealed by nasal endoscope and not obvious by anterior rhinoscopic examination included middle meatus polyps in 20 cases, discharge in 26 cases, deviated nasal septum in 12 cases and turbinate hypertrophy particularly middle turbinate in 43 cases. The level of agreement between anterior rhinoscopy and diagnostic nasal endoscopy is substantial for deviated nasal septum, inferior turbinate hypertrophy and polyp (0.735, 0.712 and 0.709, respectively), but moderate for middle turbinate hypertrophy and mucopurulent discharge in middle meatus (0.418 and 0.606, respectively). This observation was found to be statistically significant.

As revealed by Table 3, five patients had normal CT imaging based on the radiologist's report, while they demonstrated nasal polyps during endoscopic evaluation. Also, one case of Allergic fungal rhinosinusitis was falsely diagnosed as sinonasal polyposis on CT. Moreover, CT missed 4 cases of deviated nasal septum. The level of agreement between diagnostic nasal endoscopy and CT is almost perfect for deviated nasal septum, turbinate hypertrophy, concha bullosa, medially bent uncinate process and polyp (0.829, 0.925, 0.821, 0.922, 0.821 and 0.833, respectively); substantial for paradoxical middle turbinate (0.736) and slight for bulla ethmoidalis. This observation was found to be statistically significant.

Table 1 Age and sex incidence of sinonasal diseases

Age (in years)	No. of patients	%	Male	%	Female	%
10–20	52	26	34	17	18	9
21–30	62	31	31	15.5	31	15.5
31–40	40	20	17	8.5	23	11.5
41–50	29	14.5	15	7.5	14	7
Above 50	17	8.5	9	4.5	8	4
Total	200	100	106	53	94	47

Table 2 Level of agreement between anterior rhinoscopy and diagnostic nasal endoscopy in patients with sinonasal diseases

Finding	Endoscopy positive		Endoscopy negative		*Kappa*	*P*
	Anterior rhinoscopy positive	Anterior rhinoscopy negative	Anterior rhinoscopy positive	Anterior rhinoscopy negative		
Deviated nasal septum	155	12	4	29	0.735	<0.05
Inferior turbinate hypertrophy	67	24	4	105	0.712	<0.05
Middle turbinate hypertrophy	27	43	3	127	0.418	<0.05
Mucopurulent discharge in middle meatus	61	26	12	101	0.606	<0.05
Polyp	36	20	1	143	0.709	<0.05

Table 3 Level of agreement between diagnostic nasal endoscopy and computed tomography in patients with sinonasal diseases

Finding	Endoscopy positive		Endoscopy negative		*Kappa*	*P*
	CT positive	CT negative	CT positive	CT negative		
Deviated nasal septum	51	4	2	23	0.829	<0.05
Inferior turbinate hypertrophy	38	2	1	39	0.925	<0.05
Middle turbinate hypertrophy	30	6	1	43	0.821	<0.05
Concha bullosa	31	0	3	46	0.922	<0.05
Paradoxical middle turbinate	13	7	0	60	0.736	<0.05
Uncinate process medially bent	8	2	1	69	0.821	<0.05
Bulla ethmoidalis	30	8	27	15	0.143	<0.05
Polyp	24	5	1	50	0.833	<0.05

Discussion

Initially, the diagnostic utility of nasal endoscopy as first hand primary examination in sinonasal diseases, in relation to common clinical and radiologic criteria, had been assessed in relatively few clinical studies. But, now the role of nasal endoscopy has been well characterized in terms of diagnosis and treatment. The correct diagnosis of a patient presenting with symptoms of rhinosinusitis, and evaluation of etiological and predisposing factors play a key role in the treatment of this common disease [6]. In the past, radiological scanning methods had been widely used as diagnostic tool and today, they are rarely being used. However, the acceptance that the rhinosinusitis diagnosis can be achieved through a correct clinical assessment using endoscopy, dominates nowadays.

In the present study, the most common clinical presentation was nasal obstruction (89 %) followed by rhinorrhea, post nasal drip and headache. The most common diagnosis on nasal endoscopy was chronic rhinosinusitis and deviated nasal septum (43 and 45 % respectively) followed by nasal polyposis (26.5 %). Previous studies also show polyposis and chronic infective rhinosinusitis to be the most common diagnosis [7]. The nasal obstruction may be unilateral or bilateral or is intermittent, progressive or persistent. The routine anterior and posterior rhinoscopy give very little information as we can see only the structures which lie directly in the line of sight and moreover the posterior rhinoscopy may not be possible in some cases. As a result, the early diagnosis of some unpleasant lesions remained elusive without nasal endoscopy. A thorough endoscopic examination of nose and postnasal space is

strongly recommended especially when anterior and posterior rhinoscopies fail to reveal the cause of nasal obstruction [8].

We found anterior rhinoscopy to detect 43 % with turbinate hypertrophy, 18.5 % with nasal polyp and 79.5 % deviated nasal septum. Among these 79.5 % patients four were found to be false positive and were not detected on endoscopy. In earlier studies, presence of nasal discharge was seen in 10 (5 %) individuals on anterior rhinoscopy as compared to 25 (12.5 %) on endoscopy [9]. In our study we found nasal discharge in 114 (57 %) individuals on anterior rhinoscopy as compared to 138 (69 %) on endoscopy. This finding of presence of mucopurulent discharge in middle meatus is pathognomic of sinusitis and was found to be significantly higher on endoscopic examination. The level of agreement between anterior rhinoscopy and nasal endoscopy was found to be moderate for middle turbinate hypertrophy and mucopurulent discharge in middle meatus, while it was substantial for more anterior parts of the cavum nasi.

Moreover, many of the nasal pathologies revealed with the help of nasal endoscope were not obvious by traditional anterior rhinoscopic examination. These findings were middle meatus polyps in 20 cases, discharge in 26 cases, deviated nasal septum in 12 cases and turbinate hypertrophy particularly middle turbinate in 43 cases. There were also certain false positive results on anterior rhinoscopy like 7 cases of turbinate hypertrophy, 12 cases of mucopurulent discharge from middle meatus and 1 case of polyp, consistent with the results of previous studies which emphasize that for patients with unexplained nasal sinus symptoms, one might consider rigid nasal endoscopic office examination as part of the routine office examination because nasal endoscopy can find nasal and sinus pathology that might easily be missed with routine speculum and nasopharyngeal examination [10].

Conventional radiography, nasal endoscopy and high-resolution computed tomography are used for diagnostic purposes in patients with sinonasal diseases. Nasal endoscopy and scanning methods performed before the operation are complementary methods. Anatomical structures like septal deviation, presence of paradoxical middle concha and appearance of infundibulum may be evaluated by nasal endoscopic examination, without any need for scanning methods. Therefore, endoscopic examination performed prior to CT is thought to be very useful. It is known that unnecessary CTs are performed at a high rate due to insufficient clinical assessment and negligence of conventional X-ray methods [6].

The results of endoscopy and CT comparison in our study indicated that although for most of the findings, there was almost perfect to substantial level of agreement between the results of the two methods, some discrepancies existed in some of the patients. five patients had normal CT imaging based on the radiologist's report, while they demonstrated nasal polyps during endoscopic evaluation. Also, one case of Allergic fungal rhinosinusitis was falsely diagnosed as sinonasal polyposis on CT. Moreover, CT missed 4 cases of deviated nasal septum. Similar findings were reported in a study [11], in which patients who had negative CT scans, showed endoscopic exams with nasal polyposis and septum deviation.

In the present study, CT detected concha bullosa in 42.5 % patients compared to 26.5 % by endoscopy [12]. However, CT did not detect 2 cases of inferior turbinate hypertrophy and 5 cases of middle turbinate hypertrophy and 1 was false positive middle turbinate hypertrophy on nasal endoscopy which turned out to be concha bullosa on CT. In one case, false positive middle turbinate hypertrophy was on CT, which appeared normal on diagnostic nasal endoscopy.

Most patients show turbinate hypertrophy by endoscopy compared to the same affection at CT scan [13]. In the current study, the finding of hypertrophic concha was more evidenced in CT scan compared to sinus endoscopy (43.75 vs. 40 %).

Even subtle evidence of disease can be appreciated through the use of nasal endoscopy, notably in critical areas such as the ostiomeatal complex [14]. Several endoscopic findings deserve note. Prolapsed edematous mucosa in the infundibulum and inflamed ethmoidal bulla are evidence of disease in the anterior ethmoid. Mucosal edema and polypoid mucosa in the area of attachment of middle turbinate anteriorly strongly suggest disease in the frontal recess. Anatomic variants such as massive concha bullosa, an enlarged ethmoidal bulla, or an uncinate process that is rotated laterally can interfere with mucociliary clearance and predispose patients to recurrent sinusitis because these anatomic abnormalities are sometimes associated with a contact point between two surfaces of nasal mucosa. At such points ciliary activity is inhibited and mucociliary clearance ceases. Irritation of the surrounding mucosa may result, leading to hypersecretion, disturbance in the nasal cycle, nasal obstruction, nasal congestion, infection or headache. Occasionally the area of mucosal edema noted at a contact point may serve as the base for polyp development. Thus, the development of the modern rigid nasal endoscopy has proved to be a major advance in rhinologic diagnostic capability.

Conclusion

Diagnostic nasal endoscopy is a better technique to detect various sinonasal pathologies as well as anatomical variations, which are otherwise inaccessible on anterior

rhinoscopy especially in the key area comprising the ostiomeatal complex in accordance with the other studies done previously. In pathological lesions including benign and malignant nasal masses brush cytology and histopathology is essential for its final diagnosis where diagnostic nasal endoscopy can prove useful in taking precise biopsy with minimal surgical trauma. Diagnostic nasal endoscopy has proved to be a better diagnostic modality compared to CT scan and routine radiography when conditions like middle meatal secretions, condition of mucosa, synechiae, polyps are looked for. It can detect early polypoidal and other pathological changes missed on CT which can aid in early diagnosis and medical management of sinonasal diseases thereby preventing patient from unnecessary surgical exposure as well as cost and radiation exposure. It is easily available, most inexpensive and the endoscopic images can be captured and recorded for documentation.

In today's era of evidence based medicine, Nasal Endoscopy has a definite role in the early diagnosis of various sinonasal diseases and should be viewed as mandatory part of a complete examination of the nose and sinuses. A strong argument can be made for incorporating endoscopy as first hand primary examination into the routine care of any patient with sinonasal disease even in small set ups.

Conflict of interest None.

References

1. Orlandi RR, Marple BF (2009) Developing, regulating, and ethically evaluating new technologies in otolaryngology-head and neck surgery. Otolaryngol Clin N Am 42:747–752
2. Govindaraj S, Adappa ND, Kennedy DW (2010) Endoscopic sinus surgery:evolution and technical innovations. J Laryngol Otol 124:242–250
3. Chandra RK, Conley DB, Kern RC (2009) Evolution of the endoscope and endoscopic sinus surgery. Otolaryngol Clin N Am 42:747–752
4. Soudry E, Nayak JV (2011). Nasal endoscopy. American Rhinologic Society: (Revised Sep 2011)
5. Tichenor WS, Adinoff A, Smart B, et al (2008) Nasal and sinus endoscopy for medical management of resistant rhinosinusitis, including post-surgical patients. J allergy clin immunol 121(4):917–927
6. Kasapoglu F, Onart S, Basut O (2009) Preoperative evaluation of chronic rhinosinusitis patients by conventional radiographies, computed tomography and nasal endoscopy. Kulak Burun Bogaz Ihtis Derg 19(4):184–191
7. Hughes RGM, Jones NS (1998) The role of nasal endoscopy in outpatient management. Clin Otolaryngol 23:224–226
8. Kishore K, Badial V, Luthra D et al (2012) Pattern of abnormal findings in adult with nasal obstruction on rhinoscopy and nasal endoscopy. JK Sci Jul–Sep 14(3):125–128
9. Awasthi SK, Satish (2010) A comparative study of nasal endoscopy vis-à-vis conventional rhinoscopy in aircrew. Ind J Aerospace Med 54(2):30–37
10. Levine HL (1990) The office diagnosis of nasal and sinus disorders using rigid nasal endoscopy. Otolaryngol Head Neck Surg 102(4):370–373
11. Zojaji R, Mirzadeh M, Naghibi S (2008) Comparative evaluation of preoperative CT scan and intraoperative endoscopic sinus surgery findings in patients with chronic rhinosinusitis. Iran J Radiol 5(2):77–82
12. Maru YK, Gupta Y (2000) Concha bullosa: frequency and appearance on sinonasal CT. Indian J otolaryngol Head Neck Surg 52:40–44
13. Duarte AF, de Soler R C, Zavarezzi F (2005) Nasal endoscopy associated with paranasal sinus computerized tomography scan in the diagnosis of chronic nasal obstruction summary. Rev Bras Otorhinolaryngol 71(3):361–363
14. Bolger WE, Kennedy DW (1992) Nasal endoscopy in the outpatient clinic. Otolaryngol Clin North Am 25(4):791–802