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Nasal patency as a factor for successful transnasal endoscopy

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ABSTRACT

In recent years, transnasal endoscopy had been more widely accepted for its safety and convenience, and although it can lead to a weaker pharyngeal reflex, compared with the effects of transoral endoscopy, examinees often suffer intolerable pain and discomfort during passage of the endoscope through the nasal cavity. The aim of this study was to estimate the relationship between the uncomfortable factors during transnasal endoscopy and nasal patency. The subjects comprised 23 consecutive patients who underwent transnasal endoscopy from October 2007 to April 2009 at our Gastroenterology and Otorhinolaryngology Departments. Immediately prior to endoscopy, the left and right nasal resistance was measured with an active anterior rhinomanometer; a value of 100 Pa was determined as nasal resistance. The transnasal endoscope was inserted in the subjectively preferred side by the examinee. Thereafter, the subjects were asked to fill in a questionnaire on physical tolerance during the procedure, to quantify the sensations of nasal pain, nausea, and choking on a 10-point visual analogue scale. The mean scores were 3.0 ± 2.7 for nasal pain, 1.7 ± 2.0 for choking, and 1.6 ± 1.9 for nausea. The most intolerable factor among the complaints was pain (45%), which was followed by nausea (18%) and choking (9%). Unilateral nasal resistance was significantly related with nasal pain only (P = 0.0135). In conclusion, the most difficult problem during transnasal endoscopy was pain, which was related to nasal patency. We successfully demonstrated the clinical significance of nasal patency in determining the side of insertion for transnasal endoscopy.

Keywords: transnasal endoscopy, nasal patency, anterior rhinomanometer, nasal pain

INTRODUCTION

In recent clinical practices, transnasal endoscopy had been more widely accepted for its safety and convenience, compared with conventional transoral endoscopy.[1-6] Although the transnasal technique can lead to a weaker pharyngeal reflex, compared with the effects of the transoral

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method, examinees often suffer from intolerable pain and discomfort during passage of the endoscope through the nasal cavity, even under local anesthesia. Incidentally, the nasal patency of either side could be an indicator of easier or more comfortable insertion of the transnasal endoscope and may be reflected by the nasal resistance. To date, the relationship between the factors responsible for discomfort experienced during transnasal endoscopy and nasal patency have not been examined in detail. Therefore, this study examined the relationship between the factors responsible for discomfort experienced during transnasal endoscopy and nasal patency, which is directly influenced by the usefulness of endoscopy.

METHODS

Subjects

The subjects comprised 23 consecutive patients who underwent transnasal endoscopy during a 19-month period, from October 2007 to April 2009, at the Departments of Gastroenterology and Otorhinolaryngology of Nagoya University Hospital. Written informed consent was obtained from all subjects in this study.

Study Design

The subjects underwent transnasal endoscopy of the upper gastrointestinal tract by a designated gastroenterologist. Immediately prior to the endoscopy, we measured the nasal resistance using an active anterior rhinomanometer (MPR3100; Nihon Kohden, Tokyo, Japan), with the patient kept still and seated upright after 10 minutes of rest and asked to breathe deeply through the nose several times. The value of 100 Pa was determined as nasal resistance under spontaneous nasal breathing for each side. After these rhinomanometry measurements, we inserted the endoscope in the subjectively preferred side by the examinee, based on a feeling of more patency; the side of insertion was switched to the other side when the initial attempt failed.

The present study and its protocol were in accordance with the Declaration of Helsinki and were approved by the Research Ethics Committee of Nagoya University Hospital.

Instruments

We used the transnasal endoscope EG-530N2 (Fujifilm Co., Saitama, Japan) that was equipped with the Fujinon system processor Sapientia and had an outer diameter of 5.9 mm, an accessory channel diameter of 2.0 mm, a total length of 1,400 mm, and a working length of 1,100 mm. The endoscopy had 3 functions of forward-viewing, with 120° field angle, 3–100 mm depth of field, up/ down angulation with −210°/ 90° angle, and right/ left deflection with −100°/100° angle (Table 1, Fig. 1).

Endoscopy Procedures

For standardization, all the endoscopic procedures were performed by the designated gastroenterologist and under local anesthesia, without any sedative pre-medications. The laterality of insertion was initially determined by the examinee as the preferred side that felt more patent. For the immediate pre-endoscopy preparations, we used a mixture of 80 mg dimethylpolysiloxan; 20,000U pronase MS; and 1 g sodium hydrogen carbonate dissolved in water. The bilateral nares were sprayed with 0.05% naphazoline nitrate, and 4 mL of 2% viscous lidocaine was placed in the pre-determined side for 5 minutes before insertion.

The endoscope was inserted soon after the preparation, with the patient in the left lateral recumbent position, which was the position that had been reported to have minimal gravitational

Table 1 Comparison of the specifications between EG-530N2 and EG-590WR

	EG-530N2	EG-590WR
Direction of view	Forward-viewing	Forward-viewing
Field of view	120°	140°
Outer diameter	5.9 mm	9.6 mm
Depth of field	3–100 mm	6–100 mm
Tip deflection	Up –210°/Down 90° Right –100°/Left 100°	Up –210°/Down 90° Right –100°/Left 100°
Accessory channel diameter	2.0 mm	2.8 mm
Working length	1,100 mm	1,100 mm

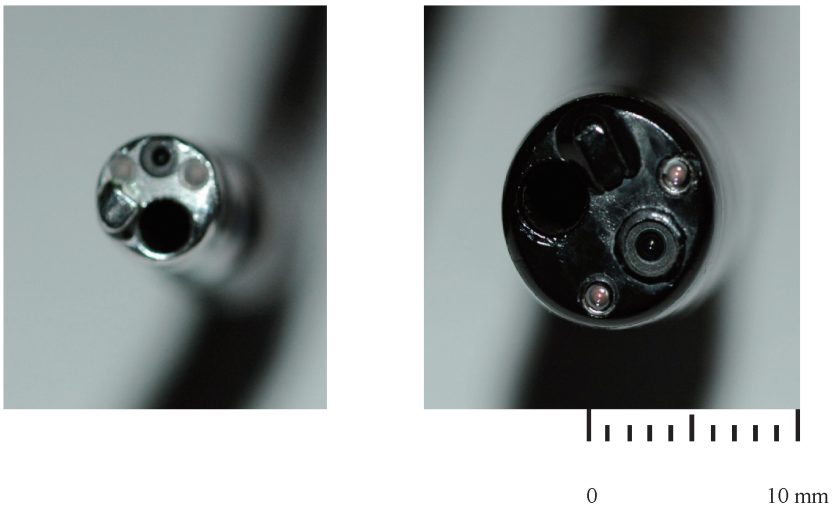

Fig. 1 Comparison of specifications between EG-530N2 and EG-590WR

influence on the left nasal turbinate.[7] The gastroenterologist routinely examined the entire upper gastrointestinal tract up to the second part of the duodenum, gastric antrum, cardia, fundus, and esophagus; biopsies were taken, as necessary.

Questionnaires

Immediately after the endoscopy, questionnaires were handed to the patients. We assessed each patient's physical tolerance during the procedure, by quantifying the sensations of nasal pain, nausea, and choking on a 10-point visual analogue scale (VAS), with 0 representing nonexistent and 10 representing unbearable (Table 3).

Statistical Analysis

Quantitative variables were described as mean ± standard deviation (SD). The relationship of the variables with the nasal resistance value at 100 Pa was evaluated using Pearson's correlation. Using the Fisher's exact test, the coincidences and complications were evaluated and compared between the subjective and objective assessments of nasal patency. A P value less than 0.05 was considered significant. Statistical analyses were performed using Statcel2 (OMS, Saitama, Japan).

RESULTS

A total of 20 men and 3 women, with a mean age of 49.9 ± 16.2 years and a mean body mass index of 26.6 ± 5.2 took part in the study. Of the 23 subjects, 16 (69.6%) had undergone prior conventional transoral endoscopic examination. Allergic rhinitis was found in 6 patients, chronic sinusitis in 2 patients, and old nasal bone fracture in 1 patient. Insertion of the endoscope through the subjectively preferred side was successful in 21 of 23 (91.3%) subjects. In the remaining 2 patients, the initial insertion failed due to severe pain; in these cases, the nasal resistance was 1.85 and 0.78, respectively, on the attempted side and 0.47 and 0.40, respectively, on the opposite side. Endoscopy was performed through the right nose in 15 patients and through the left nose in 8 patients (Table 2). The mean VAS scores were 3.0 ± 2.7 for nasal pain, 1.7 ± 2.0 for choking, and 1.6 ± 1.9 for nausea (Table 3). The most intolerable factor, among the 3 major complaints, was pain (43%), which was followed by nausea (21%) and choking (9%).

The mean unilateral nasal resistance value of 0.66 ± 0.55 Pa exhibited some relationship with nasal pain (Fig. 2), but not with nausea and choking (Figs. 3 and 4). The coincidence rate of laterality for endoscopic insertion between the objective and subjective assessments of nasal patency was 47.8% (11 of 23); all the 11 corresponding patients had no complications during the procedure. On the other hand, 3 of the remaining 12 patients had complications of epistaxis (n = 1) and intolerable pain (n = 2). In the patient with epistaxis, the nasal resistance was 1.44 Pa in the side through which endoscopy was performed and 0.48 Pa in the opposite side. Based on the Fisher's exact test, the occurrence rate of any complication during transnasal endoscopy was significantly less when the objective and subjective assessments of nasal patency were identical than when both assessments were different (P >0.05) (Fig. 5).

Table 2 Demographic and clinical data of the study population

Age (mean ± SD)	49.8 ± 16.2
Sex	Male: Female = 20:3
Body Mass Index	26.6 ± 5.2
Insertion rate	91.3 % (21/23)
Previous endoscopy	69.6 % (16/23)
Past history of nasal disease	Allergic rhinitis 6, chronic sinusitis 2 Nasal bone fracture 1, none 14
Selected nasal cavity	Right: Left = 15: 8

Table 3 Patient's data

Case	Age (years)	Sex	BMI	VAS			ΔP100 Pa (Pa/cm³/s)
				Nasal pain	Choking	Nausea	
#1[a]	44	M	27.4	8	3	2	1.44
#2	48	M	32.3	7	0	1	0.55
#3	47	M	28.4	0	0	0	0.29
#4	52	M	35.1	7	2	2	1.6
#5	45	M	21.8	0	3	0	0.36
#6	59	M	29.7	3	0	4	0.38
#7	46	M	31.9	5	2	1	0.52
#8	54	F	26.1	0	0	0	0.11
#9	26	M	23.7	5	8	2	0.42
#10	52	F	21.5	3	3	0	0.41
#11	37	M	26.8	0	0	0	0.25
#12	76	M	22.8	0	0	0	0.27
#13[b]	36	M	21.3	non	non	non	1.85
				2	0	0	0.47
#14	72	M	24.5	0	0	0	0.4
#15	26	M	22.2	5	2	8	1.01
#16	80	F	27.5	3	3	2	1.93
#17	36	M	36.8	7	0	2	0.3
#18	72	M	20.3	2	1	1	1.02
#19[b]	35	M	22.8	non	non	non	0.78
				0	2	3	0.4
#20	45	M	37.3	3	3	3	0.26
#21	79	M	20.3	5	5	0	0.42
#22	41	M	25.9	3	3	1	0.38
#23	39	M	24.9	0	0	4	0.24

[a] Experienced slight epistaxis during transnasal endoscopy

[b] Endoscope could not be inserted in the side preferred by the patient due to severe nasal pain, so it was inserted in the other side.

VAS: 10-point visual analogue scale; BMI: body mass index

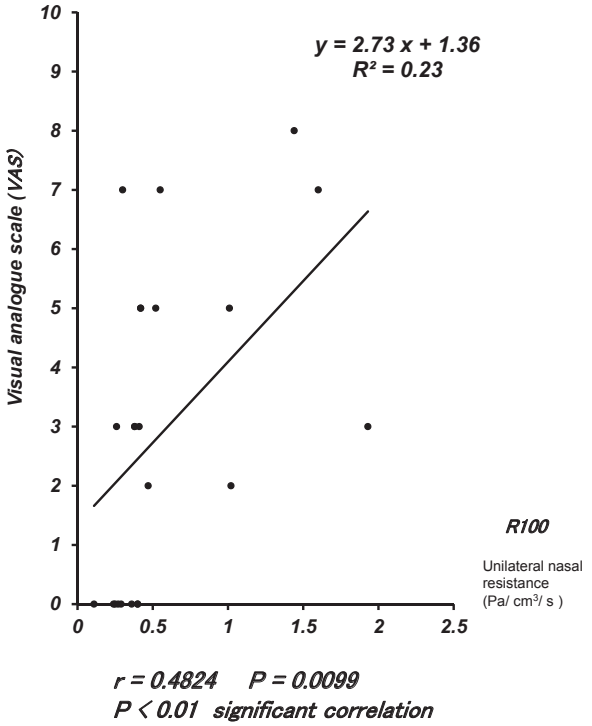

Fig. 2 Correlation between nasal pain and unilateral nasal resistance at 100 Pa
VAS, visual analogue scale

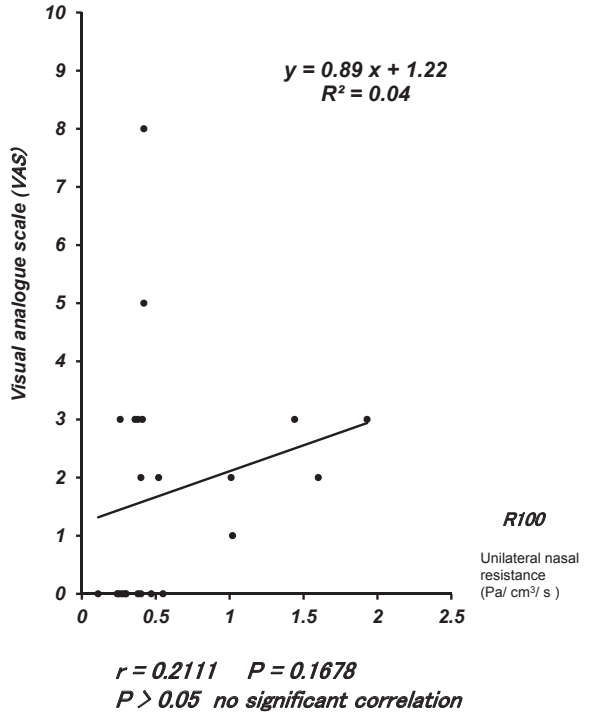

Fig. 3 Correlation between choking and unilateral nasal resistance at 100 Pa

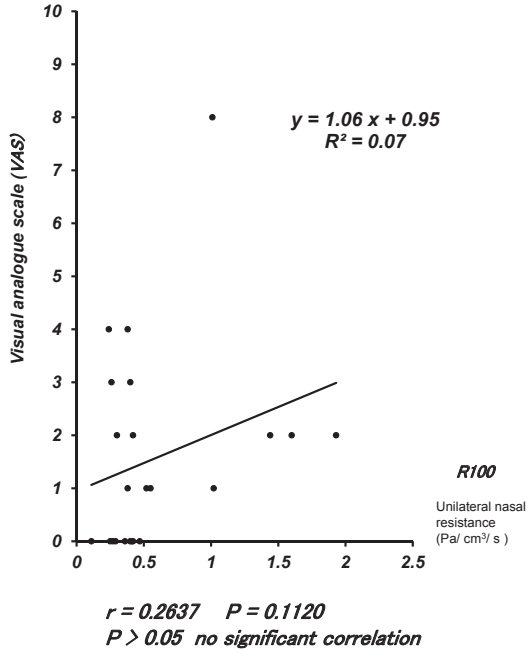

Fig. 4 Correlation between nausea and unilateral nasal resistance at 100 Pa

	Complications +	Complications -	Sum
No coincidence[a]	3	9	12
Coincidence[b]	0	11	11
Sum	3	20	23

P = 0.22 (Fisher's exact test)

Fig. 5 Correlation between determining side of the nasal cavity and complications
[a] The subjectively more patent side did not coincide with the side objectively judged by the rhinomanometer
[b] The subjectively more patent side coincided with the side objectively judged by the rhinomanometer

DISCUSSION

The present investigation revealed that the most difficult problem during transnasal endoscopy was pain and that the painful sensation was related with the level of nasal patency on rhinomanometry. The advantage of transnasal endoscopy over the conventional transoral method might be the less pharyngeal reflex and, likely, the more comfort for most examinees. However, in some cases, transnasal passage of the endoscope could generate intolerable pain, nausea, or choking.[8-12]

The subjective assessment of nasal patency was based on the side preferred by the patients before endoscopy; whereas the objective assessment of nasal patency was determined by the examiner as the side that had the lowest resistance on rhinomanometry immediately before endoscopy. According to our results, insertion of the endoscope in the side that had lower nasal resistance by rhinomanometry correlated with significantly less pain during routine endoscopic examination of the upper gastrointestinal tract; these results were similar with those of many previous studies.[9-11] In 3 cases that had very high nasal resistance, the subjectively preferred side of insertion needed to be changed due to pain in 2 patients and epistaxis in 1 patient. These results suggested that nasal patency may not always be reflected by the examinees' subjective assessment. The patency of the right and left nasal passages generally differ among individuals, depending on body position, temperature, humidity, and asymmetrical structures, with different nasal volumes comprised by a deviated septum or hypertrophy of the inferior turbinate.[13-15] In this context, we believed that insertion of the endoscope in an objectively assessed side by rhinomanometry could provide a comfortable procedure of transnasal endoscopy.

The limitations of this study were the lack of a control group and the small number of subjects. Further studies should address the clarification of the threshold values of pain and the concomitant bilateral nasal resistance during difficult transnasal endoscopy. Nevertheless, we should emphasize that bilateral nasal patency is the most important factor for a safe and comfortable transnasal endoscopy. To our knowledge, this was the first article that reported on nasal patency as a factor for successful transnasal endoscopy. Moreover, in recent years, since endoscopy has been often performed in patients being administered antithrombotic drugs, it is important to avoid epistaxis during transnasal endoscopy.

In conclusion, we demonstrated the clinical significance of nasal patency in determining the side of insertion of a transnasal gastric endoscope, in order to decrease the risk of complications during this procedure. Objective measurement of nasal patency could allow easy and comfortable insertion and avoid nasal pain and epistaxis.

DISCLOSURE STATEMENT

The authors have no conflicts of interest directly relevant to the content of this article.

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