

# Quality of life comparison in common rhinologic surgeries

Mohsen Naraghi, M.D.,<sup>1,2,3</sup> Behrooz Amirzargar, M.D.,<sup>2,3</sup> and Alipasha Meysamie, M.D., M.P.H.<sup>4</sup>

## ABSTRACT

Various questionnaires are used in patients who undergo rhinologic surgeries but a unique comprehensive questionnaire is needed to evaluate quality of life (QOL) in rhinologic surgeries. The purpose of this study was to prepare a comprehensive questionnaire and compare QOL among four common rhinologic surgeries including functional endoscopic sinus surgery, septoplasty, septorhinoplasty, and septoplasty with turbinoplasty preoperatively and 6 months postoperatively. This was a prospective interventional before-and-after study. Preoperative and 6 months postoperative evaluations were performed with a Modified Health-Related Quality of Life (HRQL) questionnaire designed to cover all needed QOL aspects and the 22-item Sino-nasal Outcome Test questionnaire to cover all needed QOL aspects. The Modified HRQL included 33 items in six subgroups (nasal symptoms, sleep problems, headache, nonnasal symptoms, and practical and emotional problems) and general feeling. From 202 patients who completed the questionnaire before the procedures, 146 (72% of all patients) who were interviewed 6 months postoperatively were included in this study. Comparing preoperative data between followed up patients and missed patients showed no statistical difference among surgeries ( $p = 0.90$ ). Comparison of patient's pre- and postoperative QOL showed a significant improvement in global QOL and in all questionnaire items ( $p < 0.0001$  in all comparisons). Comparison of QOL changes before and after surgery among different surgeries revealed no statistical difference ( $p = 0.282$ ). Our data showed a significant improvement in each surgery but the amount of improvement in different surgeries was almost constant.

(Allergy Rhinol 3:e1–e7, 2012; doi: 10.2500/ar.2012.3.0020)

Nowadays, quality of life (QOL) is an important assessment in clinical interventions. QOL is a subjective evaluation of the effects of a disease or therapeutic effects of its treatment on patient's health and several patients with the same objective conditions may have different QOLs. It includes not only symptoms of the disease but also a wide spectrum of daily life activities such as social and physical activities, practical and emotional problems, and general feeling of patients related to their disease.<sup>1</sup> Therefore, we need a questionnaire to cover all of the aforementioned items to assess the QOL appropriately.

The effectiveness of rhinologic surgeries has been supported by several studies with different questionnaires on QOL but the questionnaires used in most of these studies do not cover all required aspects of the QOL. The Nasal Obstructive Symptoms Evaluation questionnaire was one of the questionnaires that was

used to evaluate QOL in rhinologic surgeries,<sup>2,3</sup> but it was very brief and only evaluated nasal symptoms of patients. Some other studies have used the 22-item Sino-Nasal Outcome Test (SNOT-22) questionnaire.<sup>4–7</sup> The SNOT questionnaire was originally developed as a rhinosinusitis-specific, health-related questionnaire and combines both symptoms related to the nose and general health. It has been validated in this respect and has many more items than the Nasal Obstructive Symptoms Evaluation questionnaire. Several studies have revealed that it is also a useful tool in other surgeries; *e.g.*, the Buckland *et al.* study<sup>4</sup> showed it was a useful tool in septoplasty. However, it is not a comprehensive questionnaire and symptoms such as headache and practical problems are not included in it.

These limitations made us find and prepare a comprehensive questionnaire that could cover all QOL aspects. The Health-Related Quality of Life (HRQL) questionnaire, which was used by Kramer *et al.*,<sup>1</sup> was the modified version of the questionnaire used by Juniper<sup>8</sup> and included all required aspects of the QOL. In this study, we used the HRQL questionnaire as a basic questionnaire and added some items from the SNOT-22 questionnaire to it. Therefore, we made a Modified HRQL questionnaire as a new comprehensive questionnaire to measure and compare QOL in patients who undergo rhinologic surgeries including functional endoscopic sinus surgery (FESS), septoplasty, septorhinoplasty (SR), and septoplasty with turbinoplasty (ST) preoperatively and 6 months postoperatively.

---

From the <sup>1</sup>Department of Otorhinolaryngology Head and Neck Surgery, Tehran University of Medical Sciences, and <sup>2</sup>Otolaryngology Research Center, Tehran University of Medical Sciences, Tehran, Iran, <sup>3</sup>Rhinology Research Society, Tehran, Iran, and <sup>4</sup>Department of Community Medicine, Tehran University of Medical Sciences, Tehran, Iran  
Funded and granted by the Otolaryngology Research Center of Tehran University of Medical Sciences

The authors have no conflicts of interest to declare pertaining to this article  
Address correspondence and reprint requests to Behrooz Amirzargar, M.D., Rhinology Research Society, No. 5, 4th Street, Saboonchi Street, Beheshti Avenue, Tehran, Iran 15336

E-mail address: amirzargarb@yahoo.com

Published online June 21, 2012

Copyright © 2012, OceanSide Publications, Inc., U.S.A.

## Quality of life in common rhinologic surgeries questionnaire

Patient ID: \_\_\_\_\_

Date: \_\_\_\_\_

### Activities

Below is a list of activities in which most people with nasal symptoms find difficult. Please write your most important activity on the line below and tell us how much you have been troubled by your nasal symptoms during the last week.

1. Bicycling	6. Playing sports	11. Doing regular social activities
2. Reading	7. Using a computer	12. Visiting friends
3. Shopping	8. Talking	13. Going for a walk
4. Doing home maintenance	9. Eating	14. Carrying out your activities at work
5. Watching TV	10. Having sexual relations	

  

	Not a Problem	Mild Problem	Moderate Problem	Severe Problem	Very Severe Problem
.....	0	1	2	3	4

Over the last week, how much of a problem were the following conditions for you?  
Please circle the most correct answer

### Nasal Symptoms

	Not a Problem	Mild Problem	Moderate Problem	Severe Problem	Very Severe Problem
1. Blocked nose	0	1	2	3	4
2. Runny nose	0	1	2	3	4
3. Sneezing	0	1	2	3	4
4. Postnasal drip	0	1	2	3	4
5. Sore nose	0	1	2	3	4
6. Displeasing nose	0	1	2	3	4

### Sleep Problems

	Not a Problem	Mild Problem	Moderate Problem	Severe Problem	Very Severe Problem
7. Wake up during night	0	1	2	3	4
8. Lack of good night sleep	0	1	2	3	4
9. Snoring	0	1	2	3	4
10. Wake up tired	0	1	2	3	4
11. Difficulty falling asleep	0	1	2	3	4
12. Dry mouth sensation during the night or at awakening	0	1	2	3	4

### Headache (If headaches are caused by your nasal symptoms)

	Not a Problem	Mild Problem	Moderate Problem	Severe Problem	Very Severe Problem
13. Frontal Headache	0	1	2	3	4
14. Pressure behind the eyes	0	1	2	3	4
15. Half-site headache	0	1	2	3	4
16. Dizziness	0	1	2	3	4
17. Intensification of headaches by bending your head forward	0	1	2	3	4

*Figure 1. Naraghi-Amirzargar modification of the HRQL questionnaire.*

## MATERIALS AND METHODS

This prospective interventional before-and-after study was conducted at the Department of Otolaryngology, Head and Neck Surgery of Amiralam Hospital affiliated with Tehran University of Medical Sciences. Two hundred two patients who underwent nasal surgeries including FESS, septoplasty, SR, and ST and met the inclusion criteria were enrolled in this study.

We included patients aged  $\geq 18$  years old. The entry criteria for FESS were bilateral sinonasal polyposis

based on the endoscopic examination, computed tomography of paranasal sinuses and chronic or recurrent acute rhinosinusitis with ostiomeatal obstruction that lasted  $>12$  weeks and was refractory to the maximal medical therapy. Inclusion criteria for septoplasty were bony and/or cartilaginous septal deviation and symptomatic nasal obstruction that did not improve by medical therapy. Patients who underwent ST had the same entry criteria for septoplasty but they also had bilateral bony or mucosal inferior turbinate hypertro-

## Non-Nasal Symptoms

	Not a Problem	Mild Problem	Moderate Problem	Severe Problem	Very Severe Problem
18. Poor concentration	0	1	2	3	4
19. Having a sore throat	0	1	2	3	4
20. Loss of smell or taste	0	1	2	3	4
21. Chronic cough	0	1	2	3	4
22. Ear fullness	0	1	2	3	4
23. Ear pain	0	1	2	3	4
24. Facial pain/pressure	0	1	2	3	4
25. Fatigue	0	1	2	3	4

## Practical Problems

	Not a Problem	Mild Problem	Moderate Problem	Severe Problem	Very Severe Problem
26. Inconvenience of having to carry a handkerchief	0	1	2	3	4
27. Need to blow your nose repeatedly	0	1	2	3	4
28. Need to clear your throat repeatedly	0	1	2	3	4
29. Being under medication for your nose on a regular basis	0	1	2	3	4

## Emotional Symptoms

	Not a Problem	Mild Problem	Moderate Problem	Severe Problem	Very Severe Problem
30. Frustrated	0	1	2	3	4
31. Sad	0	1	2	3	4
32. Irritable/Restless	0	1	2	3	4
33. Embarrassed by others' response to your nasal symptoms	0	1	2	3	4

## General Feeling

Please indicate by a vertical line how you feel right now related to your nasal symptoms. A horizontal line from "Excellent" (left) to "Worst" (right) is given below to help you to quantify your situation.



Figure 1. Continued.

phy that was unresponsive to medical therapy. Inclusion criteria for SR were similar to those for septoplasty in addition to the deformity of the nasal appearance. Previous rhinologic surgery did not exclude patients from the study. Exclusion criteria were any history of malignancy or immunodeficiency because these conditions could affect the QOL significantly. However, patients with a clear history of allergic symptoms were not included in the study. From those who met our criteria, 146 patients were revisited for follow-up.

We enrolled patients that received rhinologic surgeries by surgeons of the same rank and experience who performed the same technique (open approach in SR and submucosal approach in turbinoplasty) to decrease the bias effect of multiple surgeons on our results.

Informed consents were obtained from all patients and the study was approved by the Ethics Committee of the Rhinology Research Society and the National Medical Ethics Committee considering the Declaration of Helsinki.

## Modified HRQL Questionnaire

A comprehensive questionnaire including all of the items of the modified Juniper's questionnaire used by Kramer *et al.*<sup>1</sup> and the SNOT-22 questionnaire was used for data collection. Based on a pilot study, the reliability of this questionnaire was assessed and Cronbach's  $\alpha$  was estimated to be 0.75. Our questionnaire contained 33 items divided into six symptom groups: nasal symptoms, sleep problems, headache caused by

nasal symptoms, nonnasal symptoms, and practical and emotional problems. Each item was scored as 0, not a problem; 1, mild problem; 2, moderate problem; 3, severe problem; and 4, very severe problem. Furthermore, we required the patients to choose their most limiting activity by their nasal symptoms from a list of 14 activities and to score the severity of any limiting activity from 0 to 4. These activities were the modification of the activities of the Kramer's questionnaire and we chose activities related to our community and general hobbies. At the end of this questionnaire, there was a visual analog scale of 10 cm (from 0, excellent, to 10, worst) to determine the patients' general feeling related to their nasal diseases.

### Statistical Analysis

SPSS software Version 16 (SPSS, Inc., Chicago, IL) was used for analysis. For comparing patients' pre- and postoperative 6-month values, paired samples *t*-test was used, and to compare mean differences between different surgeries, ANOVA with Dunnett T3 and Scheffe *post hoc* comparison were used.

### RESULTS

Comparison of preoperative data of the followed up patients with missed patients showed no statistical significant difference among symptom groups and different surgeries and also there was no significant difference between two groups in all questionnaire items except snoring (item 9, *p* = 0.02). From 202 patients who completed the questionnaire before the surgeries, 56 patients (28%) were missed to follow-up; therefore, 146 patients (72%) that could be followed up for 6 months after the surgeries were enrolled in this study; they received FESS (45 patients, 31% of all patients), septoplasty (36 patients, 25% of all patients), SR (41 patients, 28% of all patients), and ST (24 patients, 16% of all patients). The mean age of the patients was 31.0 ± 12.9 years (range, 18–70 years). One hundred patients (68.5%) were men and 46 (31.5%) patients were women.

Preoperative data showed that the most limiting activities from a list of 14 activities were playing sports (36 patients, 24.7%), speaking (32 patients, 21.9%) and performing activities at work (27 patients, 18.5%). The most limiting activity in the FESS group was speaking (11 patients, 24.4%) and in other surgeries, playing sports was the most limiting activity (septoplasty, 12 patients, 33.3%; SR, 12 patients, 29.3%; and ST, 6 patients, 25%). Among 33 items, the most annoying symptom was blocked nose (mean score, 3.0 ± 0.8) followed by "dry mouth sensation during night or at awakening" (mean score, 2.6 ± 1.2) and "inconvenience of having to carry a handkerchief" (mean score, 2.5 ± 1.0). The least bothersome symptom was dizzi-

Table 1 Impact of different surgeries on each symptom groups preoperatively and 6 mo postoperatively

Surgery	Nasal Symptoms		Sleep Problems		Headache		Nonnasal Symptoms		Practical Problems		Emotional Symptoms	
	Preop	Postop	Preop	Postop	Preop	Postop	Preop	Postop	Preop	Postop	Preop	Postop
	Difference		Difference		Difference		Difference		Difference		Difference	
FESS	55.1 (18.5)	21.1 (9.8)	50.9 (21.2)	18.8 (9.6)	33.2 (26.2)	13.9 (13.4)	39.3 (17.5)	13.8 (9.9)	65.0 (23.6)	25.6 (14.4)	33.5 (25.9)	8.5 (10.0)
	34.0 (13.3)		32.1 (17.9)		19.3 (16.3)		25.6 (14.9)		39.4 (17.8)		25.0 (21.2)	
S	50.1 (15.4)	18.9 (10.3)	53.0 (16.7)	21.5 (13.2)	26.7 (25.7)	12.1 (11.5)	33.9 (13.5)	11.8 (6.9)	54.5 (15.3)	21.7 (13.7)	35.6 (21.7)	8.0 (9.3)
	31.3 (13.3)		31.5 (11.1)		14.6 (16.6)		22.1 (11.6)		32.8 (15.3)		27.6 (16.7)	
SR	46.4 (10.3)	13.4 (9.2)	47.7 (14.3)	17.1 (11.0)	14.1 (20.0)	5.5 (11.3)	29.8 (13.0)	10.1 (8.6)	48.2 (14.5)	13.1 (14.4)	48.2 (19.6)	15.4 (13.6)
	33.0 (11.4)		30.6 (13.7)		8.7 (12.1)		19.7 (9.9)		35.1 (14.4)		32.8 (15.0)	
ST	54.7 (14.7)	20.1 (12.5)	49.5 (21.4)	17.2 (12.0)	23.1 (26.1)	8.8 (13.9)	39.5 (17.2)	13.8 (8.1)	52.1 (16.0)	17.2 (17.0)	38.5 (21.4)	8.9 (9.9)
	34.5 (10.5)		32.3 (16.7)		14.4 (17.2)		25.7 (16.1)		34.9 (16.5)		29.7 (16.2)	
All patients	51.4 (15.4)	18.2 (10.6)	50.3 (18.3)	18.7 (11.3)	24.6 (25.3)	10.2 (12.8)	35.3 (15.7)	12.3 (8.6)	55.6 (19.2)	19.7 (15.4)	39.0 (23.1)	10.4 (11.3)
	33.1 (12.3)		31.6 (15.0)		14.3 (15.9)		23.1 (13.2)		35.8 (16.1)		28.6 (17.8)	

Data are given as mean (SD); symptom groups are scored from 0 to 100; all *p* < 0.0001.

FESS = functional endoscopic sinus surgery; Postop = postoperatively; Preop = preoperatively; S = septoplasty; SR = septorhinoplasty; ST = septoplasty with turbinoplasty.

Table 2 Changes in quality of life in different surgeries preoperatively and 6 mo postoperatively

Surgery	Preoperative Mean (SD)	Postoperative Mean (SD)	Difference Mean (SD)	<i>p</i> Value
FESS	60.4 (19.7)	22.2 (9.4)	38.2 (13.9)	<0.0001*
S	55.4 (12.0)	20.6 (8.7)	34.7 (7.8)	<0.0001*
SR	50.4 (12.2)	16.2 (9.8)	34.1 (8.6)	<0.0001*
ST	56.8 (17.5)	19.3 (11.2)	37.5 (12.7)	<0.0001*
All patients	55.7 (16.0)	19.7 (9.8)	36.1 (11.1)	<0.0001*
<i>p</i> Value	0.034#	0.037#	0.282#	

QOL of each surgery is scored 0 to 132.

\*Paired samples *t*-test.

#ANOVA.

FESS = functional endoscopic sinus surgery; S = septoplasty; SR = septorhinoplasty; ST = septoplasty with turbinoplasty.

ness (mean score,  $0.8 \pm 1.1$ ). Comparison of the symptom groups is shown in Table 1.

In FESS, septoplasty, and ST surgeries, the most troubling symptom was blocked nose (mean scores,  $3.1 \pm 0.8$ ,  $3.2 \pm 0.8$  and  $3.0 \pm 0.6$ , respectively) but in the SR group, a displeasing nose was the most troubling (mean score,  $3.0 \pm 0.9$ ) and the least bothersome symptom in all surgeries was dizziness (mean scores: FESS,  $1.1 \pm 1.2$ ; septoplasty,  $0.9 \pm 1.1$ ; SR,  $0.4 \pm 0.8$ ; and ST,  $0.5 \pm 1.1$ ). Comparison of the preoperative QOL among four rhinologic surgeries showed that QOL was different between FESS and SR (mean difference, 10.1 [CI 95%, 0.6–19.5]; *p* [Dunnett T3] = 0.031) and that the QOL of SR was better than FESS (Table 2).

Postoperative data revealed similar results to preoperative data. The most limiting activities were playing sports (34 patients, 23.3%), speaking (32 patients, 21.9%), and performing activities at work (27 patients, 18.5%), respectively. Similar to preoperative findings, 33-item analysis after the surgeries also showed that the most troubling symptom was blocked nose (mean score,  $1.1 \pm 0.7$ ), followed by “dry mouth sensation during night or at awakening” (mean score,  $0.9 \pm 0.8$ ) and “inconvenience of having to carry a handkerchief” (mean score,  $0.9 \pm 0.9$ ). The least bothersome symptom was dizziness in all surgeries (mean score,  $0.3 \pm 0.6$ ).

Comparison of postoperative QOL among different surgeries showed similar results to preoperative data. The difference was between FESS and SR (mean difference, 5.9 [CI 95%, 0.1–11.9]; *p* [Scheffe] = 0.045) as the QOL in SR was better than FESS. (Table 2).

On comparison of pre- and postoperative data, a significant improvement was seen in the most limiting activity postoperatively (mean score difference,  $1.8 \pm 0.8$ ; *p* < 0.0001). Comparison of 33 items before and after the surgeries showed that the highest therapeutic effect was in the following symptoms: blocked nose (mean score difference,  $1.9 \pm 0.8$ ; *p* < 0.0001), “dry mouth sensation during night or at awakening” (mean

score difference,  $1.7 \pm 1.2$ ; *p* < 0.0001), and “inconvenience of having to carry a handkerchief” (mean score difference,  $1.6 \pm 1.0$ ; *p* < 0.0001) and the lowest therapeutic effect was seen in dizziness (mean score difference,  $0.4 \pm 0.9$ ) although a significant improvement was seen in this symptom (*p* < 0.0001). A significant improvement was also seen in the general feeling of the patients (mean score difference,  $3.9 \pm 2.1$ ; *p* < 0.0001). Comparison of pre- and postoperative symptom groups revealed that in all surgeries the practical problem improved the most and headache had the least improvement (Table 1). Although the most change in QOL was seen in FESS 6 months postoperatively, statistical analysis revealed that no significant change was noted in QOL among different surgeries (*p* = 0.282). QOL comparison between genders revealed that the QOL improvement in women (mean score difference,  $37.0 \pm 10.2$ ; *p* < 0.0001) was slightly more than men (mean score difference,  $35.7 \pm 11.5$ ; *p* < 0.0001) but this difference was not significant statistically (*p* = 0.524). Finally, comparison between pre- and postoperative QOL showed a significant improvement in all patients (mean score,  $36.1 \pm 11.1$ ; *p* < 0.0001; Table 2).

## DISCUSSION

Our study showed a significant improvement in patients who underwent rhinologic surgeries, which is in accordance with most previous studies that showed these surgeries are effective in QOL of patients. There was no worsening in any item, any subgroup, or any surgery and a significant improvement was seen in all domains. There was no major complication after the surgeries and during the follow-up period.

Many questionnaires are used in evaluating patients who undergo rhinologic surgeries but in the majority of the studies, the questionnaires do not cover all required aspects of the QOL. In this study, we created a

Modified HRQL questionnaire, a comprehensive questionnaire to cover all of aspects of the QOL based on the definition of the QOL.

In our study, the most limiting activity was playing sports, which significantly improved postoperatively. The importance of this finding is that by increasing the duration of playing sports, other aspects of life can be improved and also prevent cardiovascular diseases. Speaking and performing activities at work were other limiting activities that improved significantly. These improvements can help patients in their rehabilitation and enhance their performance.

As mentioned earlier in the Results section, blocked nose followed by “dry mouth sensation during night or at awakening” and “inconvenience of having to carry a handkerchief” were the most troubling symptoms according to our patients. Although they improved significantly after the surgeries, they remained the most bothersome symptoms in our patients. Comparison of the symptom groups showed that the highest therapeutic effects were seen in practical problems followed by nasal symptoms and sleep problems and the lowest therapeutic effect was seen in headache; however, Kramer *et al.* reported that the most change was seen in nasal symptoms, sleep problems, and headache, respectively, and the least change was in emotional symptoms.<sup>1</sup> These differences in subgroups may be caused by the increase in items of our questionnaire or adding ST to our surgeries. However, our general findings were similar to the findings of the study conducted by Kramer *et al.*<sup>1</sup> Displeasing nose was one of the least troubling symptoms in all patients but in patients who underwent SR, it was the most bothersome symptom even more than blocked nose; this could be their main reason for their nasal surgery.

Some studies have investigated the QOL in different rhinologic surgeries such as FESS,<sup>9,10</sup> septoplasty,<sup>11,12</sup> and rhinoplasty<sup>3</sup> but the main problem of these studies was losing a large number of enrolled patients after the surgeries, which could affect their results significantly. In our study, 56 of 202 patients (28%) who were enrolled primarily were lost after the surgeries but unlike other studies, they were excluded from our study and statistical analysis showed no significant difference between these patients and the followed up patients preoperatively; therefore, we can generalize postoperative data of the followed up patients to all patients.

The majority of the previous studies on the QOL showed a significant improvement after different rhinologic surgeries such as FESS<sup>9,10</sup> and ST<sup>11,12,13</sup> but in some studies such as the study conducted by Calder *et al.*,<sup>14</sup> which investigated QOL in patients who received septoplasty with or without turbinoplasty using the Glasgow Benefit Inventory Score questionnaire, only few improvements were noted after the surgeries.

Based on this study, its findings were similar to other studies that used the Glasgow Benefit Inventory Score questionnaire.<sup>14</sup> These results could be caused by insufficiency of the questionnaire to investigate all aspects of QOL.

Although pre- and postoperative QOL of the patients in the FESS and SR groups were different, comparison of changes in QOL among different surgeries revealed no statistical difference. It showed that the improvement of QOL after surgeries was not related to the severity of the symptoms and the amount of improvement in different surgeries was almost constant.

Unfortunately, we could follow patients for only 6 months after the surgeries. Further studies with longer periods of follow-up—similar to a study by Holzmüller who followed patients 7 years after FESS,<sup>15</sup> may be required to evaluate the therapeutic effects of these surgeries, especially in the FESS group, because of the chronic behavior of the background disease and several recurrences. Furthermore, additional studies with more patients could provide us with more accurate evidence regarding the therapeutic effects of rhinologic surgeries. Also, further studies are required to compare the QOL between different surgical techniques to help surgeons find out the best technique for improving the QOL of the patients.

## CONCLUSION

Although a significant improvement was seen in each surgery, there was no difference in therapeutic effect of the different surgeries on patients' QOL. A comprehensive questionnaire such as the Modified HRQL questionnaire with all required aspects of the QOL can help us to evaluate QOL more accurately. This questionnaire could be an ideal questionnaire for future studies on the QOL of patients who undergo rhinologic surgeries.

## REFERENCES

1. Kramer MF, Rasp G, and Kastenbauer E. Health-related quality of life in rhino surgery. *Am J Otolaryngol* 24:97–105, 2003.
2. Stewart MG, Smith TL, Weaver EM, et al. Outcomes after nasal septoplasty: Results from the Nasal Obstruction Septoplasty Effectiveness (NOSE) study. *Otolaryngol Head Neck Surg* 130: 283–290, 2004.
3. Most SP. Analysis of outcomes after functional rhinoplasty using a disease-specific quality-of-life instrument. *Arch Facial Plast Surg* 8:306–309, 2006.
4. Buckland JR, Thomas S, and Harries PG. Can the Sino-nasal Outcome Test (SNOT-22) be used as a reliable outcome measure for successful septal surgery? *Clin Otolaryngol Allied Sci* 28: 43–47, 2003.
5. Browne JP, Hopkins C, Slack R, et al. Health-related quality of life after polypectomy with and without additional surgery. *Laryngoscope* 116:297–302, 2006.
6. Friedman M, Schalch P, Lin HC, et al. Functional endoscopic dilatation of the sinuses: Patient satisfaction, postoperative pain, and cost. *Am J Rhinol* 22:204–209, 2008.

7. Phillips JS, Vowler SL, and Salam MA. Is training in endoscopic sinus surgery detrimental to patient outcome? *J Surg Educ* 64:278–281, 2007.
8. Juniper EF. Quality of life in adults and children with asthma and rhinitis. *Allergy* 52:971–977, 1997.
9. Tabae A, Hsu AK, Shrime MG, et al. Quality of life and complications following image-guided endoscopic sinus surgery. *Otolaryngol Head Neck Surg* 135:76–80, 2006.
10. Poetker DM, Litvack JR, Mace JC, et al. Recurrent acute rhinosinusitis: Presentation and outcomes of sinus surgery. *Am J Rhinol* 22:329–333, 2008.
11. Schwentner I, Dejacum K, Schmutzhard J, et al. Does nasal septal surgery improve quality of life? *Acta Otolaryngol* 126:752–757, 2006.
12. Li H, Lin Y, Chen N, et al. Improvement in quality of life after nasal surgery alone for patients with obstructive sleep apnea and nasal obstruction. *Arch Otolaryngol Head Neck Surg* 134:429–433, 2008.
13. Huang T, and Cheng P. Changes in nasal resistance and quality of life after endoscopic microdebrider-assisted inferior turbino-plasty in patients with perennial allergic rhinitis. *Arch Otolaryngol Head Neck Surg* 132:990–993, 2006.
14. Calder NJ, and Swan IR. Outcomes of septal surgery. *J Laryngol Otol* 121:1060–1063, 2007.
15. Holzmüller A, Gudziol H, and Müller A. Quality of life after functional endoscopic sinus surgery (a long-term study). *Laryngorhinootologie* 88:174–180, 2009. □