

# Quality of life after primary septorhinoplasty in deviated- and non-deviated nose measured with ROE, FROI-17 and SF-36\*

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## Abstract

**Background:** Quality of life measurements are gaining in importance. The present study was conducted with the aim to compare patient satisfaction after septorhinoplasty according to their preoperative nasal deformity.

**Methods:** The patients completed two disease-specific questionnaires before their surgery: the Functional Rhinoplasty Outcome Inventory (FROI-17), the Rhinoplasty Outcome Evaluation (ROE) and as a general instrument, the Short Form 36 Health Survey (SF-36). The second measurement was taken during an outpatient examination 12 months after their primary septorhinoplasty. Patients were grouped in nasal axis deviation (NAD), nasal hump deformity (NHD) and NAD plus NHD. Additionally the patients with preoperative NAD and NAD+NHD were combined as "deviated nose" and compared to the "non-deviation group."

**Results:** One hundred and two patients (51 male and 51 female) underwent primary septorhinoplasty. The ROE- and the FROI-17 overall score including all three subgroups showed significant postoperative improvements. Regarding the SF-36, the postoperative score improved significantly only in two scales (role-functioning physical and mental health). Looking at the the different QoL questionnaires, there were significant postoperative differences in regards to deviated versus non-deviated nose in the FROI-17 overall- and FROI-17 subscores (nasal and general symptoms) and in three scales of the SF-36 (vitality, social functioning, role-functioning emotional), showing a greater postoperative satisfaction in the "deviated-nose patient."

**Conclusion:** Patients with and without nasal deviation showed improved QoL after their surgery, as measured with the ROE, the FROI-17 and the SF-36. The patients with a nasal deviation showed a significantly better outcome, as measured with the FROI-17, in comparison with the "non-deviated group."

**Key words:** Rhinoplasty, quality of life, deviated nose, FROI-17, ROE

## Introduction

Quality of life measurements are gaining in importance. The aim of a septorhinoplasty is to increase patients' quality of life after surgery. For a long time the only validated disease-specific instrument was the Rhinoplasty Outcomes Evaluation (ROE) <sup>(1)</sup>. The ROE focuses on the aesthetic aspects of septorhinoplasty. To evaluate functional and aesthetic aspects of septorhinoplasty the Functional Rhinoplasty Outcome Inventory 17 (FROI-17) was developed and validated <sup>(2)</sup>. The present study was conducted with the aim of comparing patient satisfaction after primary sep-

torhinoplasty depending on their preoperative nasal deformity.

## Materials and methods

The Ethics Committee of the Medical Faculty at the University of Heidelberg granted permission to conduct the study (Project No. 409/2006). Informed consent was obtained from all patients. The patients were evaluated during an outpatient examination usually one day before the surgery. They were asked to fill out questionnaires including two disease-specific questionnaires, the Functional Rhinoplasty Outcome Inventory (FROI-17),

the Rhinoplasty Outcome Evaluation (ROE) and as a general instrument, the Short Form 36 Health Survey (SF-36). The second measurement was taken during an outpatient examination 12 months after the primary septorhinoplasty.

Regarding the disease-specific questionnaires, the ROE contains six items. Five of the six items are related solely to aesthetic aspects and only one item has a functional alignment. Each response can be graded between zero and four. The total score may therefore vary between zero and 24. The score is then transferred into a 0-100 scale (divided by 24 and multiplied by 100). The higher the score, the greater the satisfaction of the patient regarding his or her septorhinoplasty.

The second disease-specific questionnaire, the FROI-17, detects more functional aspects than the ROE <sup>(3)</sup> and includes 17 items, which can be graded between zero (no problem) and five (as bad as it can be). The overall score is then transformed to a 0-100 scale by dividing the sum of the raw scores of the items by the sum of ranges of the items followed by a multiplication by 100.

The SF-36 Health Survey consists of 36 items, grouped into eight aspects: physical functioning, role-functioning physical, bodily pain, general health, vitality, social functioning, role-functioning emotional and mental health. Rules for item scoring and scales are available in the SF-36 scoring manual. Higher scores indicate a more positive rating.

General information (age, gender, allergies, medication, medical and surgical history) from all patients was obtained. Patients were classified preoperatively by the surgeon into three groups according to their nasal deformity: nasal hump deformity (NHD), nasal axis deviation (NAD) and NAD + NHD. Additionally the patients with preoperatively NAD and NAD+NHD were combined as "deviated nose" and compared to the "non-deviated" group (NHD). All patients in this study underwent primary septorhinoplasty.

The statistical analysis was performed using the statistical software JMP version 12.0.0. (SAS Institute Inc., Cary, NC, USA). Testing for significant differences between two groups of patients was performed using Wilcoxon-test (nonparametric). The significance level was set at  $p < 0.05$ . Moreover, the pre- and postoperative scores of the ROE, the FROI-17 and SF-36 were calculated.

## Results

One hundred and two patients (51 male and 51 female) underwent primary septorhinoplasty and were operated by two of the authors (F.W. and I.B.). Our response rate was 67%. The patients were  $28.7 \pm 11.4$  years old. They were classified into three groups: NHD (24 patients), NAD (28 patients) and NAD + NHD

(50 patients).

The ROE overall score across NHD, NAD and NHD+NAD increased from  $42.2 (\pm 15.7)$  preoperatively to  $63.9 (\pm 18.9)$ ,  $p=0.0001$ , postoperatively, indicating a greater satisfaction postoperatively.

The FROI-17 across NHD, NAD and NHD+NAD showed significant postoperative improvement of subjective assessments by the patients. The overall score decreased from  $32.5 (\pm 18.2)$  preoperatively to  $20.3 (\pm 18.4)$ ,  $p=0.0001$ , postoperatively. All subscores (nasal symptoms preoperatively  $32.4 (\pm 16.1)$  to  $20.9 (\pm 19.3)$ ,  $p=0.0002$ , postoperatively; general symptoms preoperatively  $32.8 (\pm 24.8)$  to  $20.6 (\pm 21.5)$ ,  $p=0.003$ , postoperatively and self confidence  $32.2 (\pm 27.5)$  preoperatively to  $17.1 (\pm 21.8)$ ,  $p=0.0005$ , postoperatively) showed significant improvement. Lower scores indicate greater patient satisfaction in this questionnaire.

Regarding the SF-36, the postoperative score improved significantly only in two scales (1. role-functioning physical: preoperatively  $75.4 (\pm 35.5)$  to postoperatively  $90.9 (\pm 22.3)$ ,  $p=0.003$ ; 2. mental health: preoperatively  $62.6 (\pm 19.9)$  to postoperatively  $69.2 (\pm 17.7)$ ,  $p=0.04$ ).

Regarding the different preoperative nasal deformities (NHD, NAD and NHD+NAD), there was an improvement in all three subgroups measured with the ROE and the FROI-17 (Table 1).

In our study an influence of postoperative QOL in regards to open versus closed approach (closed approach 72.8 %,  $n=75$ ; open approach 27.2 %,  $n=28$ ) was not detectable.

To analyze the impact of a deviated nose on QoL, the NAD and NAD+NHD were grouped together and compared with the scores of septorhinoplasty patients without a nasal deviation.

Both, the deviated- and the non-deviated nose patients improved significantly after septorhinoplasty measured with the ROE and the FROI-17. There were no significant differences in the overall ROE score of deviated versus non-deviated noses preoperatively or postoperatively. There were significant differences preoperatively and postoperatively in the FROI-17 overall scores and in the subcategory "nasal symptoms." The patients with a deviated nose had lower overall- and "nasal symptom" scores before and after surgery. Significant differences were found in the "general symptom" postoperative scores of the FROI-17, showing lower scores in the deviated nose patients (Table 2), indicating higher patient satisfaction.

Regarding the SF-36 significant differences were found between the preoperative scores in the scale "physical functioning", with higher scores in the deviated-nose patient.

Table 1. Preoperative versus postoperative scores.

	preoperative	postoperative	p-value
<b>ROE overall score</b>			
NHD	41.3 ± 12	64.4 ± 20.8	<b>0.04</b>
NAD	40.2 ± 15.4	65.2 ± 18.7	<b>0.04</b>
NHD+NAD	43.3 ± 17	63.2 ± 18.9	<b>0.001</b>
<b>FROI-17 overall score</b>			
NHD	42.8 ± 18.1	35.3 ± 22.6	<b>0.04</b>
NAD	29.7 ± 19.1	18.8 ± 16.7	<b>0.04</b>
NHD+NAD	30.9 ± 17.2	16.9 ± 16.1	<b>0.003</b>

NHD: nasal hump deformity; NAD: nasal axis deviation

Significant differences between the postoperative scores were found in the scales "vitality", "social functioning", and "role-functioning emotional." The deviated nose patients showed significant higher scores in those scales (Table 2).

## Discussion

Septorhinoplasty is among the most common surgeries performed by facial plastic surgeons worldwide<sup>(4)</sup> and subjective evaluation of postoperative results with regard to patients' satisfaction is a growing challenge<sup>(5)</sup>. Different studies have shown postoperative improvements of the ROE- and FROI-17 score after rhinoplasty<sup>(3,6,7)</sup>. To our knowledge only three articles in the literature have described postoperative outcomes according to nasal deformity. All of these articles described their assessment results with the ROE<sup>(7-9)</sup>. As the ROE focuses mainly on the cosmetic outcome, we have added another validated disease-specific questionnaire the FROI-17, emphasizing both functional and aesthetic outcome of septorhinoplasty, as well as the non-rhinoplasty-specific instrument SF-36. This is the first study looking at quality of life outcome according to preoperative nasal deformity with the ROE, FROI-17 and SF-36.

Facial symmetry and proportions have been recognized as important determinants of attractiveness<sup>(10)</sup>. Arima et al.<sup>(8)</sup> found that the mean ROE satisfaction score of patients who underwent rhinoplasty due to a crooked nose increased from 24.6 ± 11.3 to 76.1 ± 19.5 postoperatively, which is in line with our findings. In our cohort the ROE score in the nasal deviation group (NAD and NAD+NHD) increased from 41.3 ± 12 to 64.4 ± 20.8 after surgery. The FROI-17 decreased in both subgroups indicating an increase in disease specific QoL. In this study significant postoperative improvements regarding the SF-36, were found in the scales: role-functioning physical and mental health. An improved outcome after septorhinoplasty in the scale mental health was also found by Klassen et al.<sup>(11)</sup>. It can be argued that our cohort

was predominantly young and healthy, and that therefore their mental impairment affected their physical conditions<sup>(3)</sup>.

It can be seen that all three subgroups (NHD, NAD and NHD+NAD) improved approximately equally in the disease-specific quality of life questionnaires ROE and FROI-17 scores after surgery. The impairment in QoL measured with the ROE preoperatively is approximately equal in all nasal deformities. Looking at the preoperative FROI-17 scores, NHD deformity starts with a higher score than NAD and NHD+NAD, indicating a significant higher functional impairment preoperatively. As in our sample NHD was the least frequent preoperative deformity, this could be explained as a statistical abnormality due to our limited patients in this category.

In our sample, NAD and NAD+NHD was the dominant nasal deformity. Baykal et al.<sup>(9)</sup> showed an increase in ROE score postoperatively according to different nasal deformities preoperatively. They showed that the ROE score in patients with NHD (from 21 to 89), NAD (from 25 to 72) and NHD+NAD (from 27 to 80) increased postoperatively, indicating higher patient satisfaction, which is in line with our findings.

Regarding the ROE we could not find a significant difference in QoL changes between our subgroups, probably due to a limited number of patients, which can be seen as a weakness of our study. Another reason for our findings could be our predominantly young collective with 28.7 ± 11.4 years in average. Arima et al.<sup>(8)</sup> reported that patients younger than 30 years had lower satisfaction increases compared with patients over 30 years. We found significant differences in the overall FROI-17 score between the deviated and the non-deviated patients and in the subcategory "nasal symptoms," at the time pre- and postoperatively. The non-deviated patients showed, before and after their surgery, a higher nasal impairment and, compared to the patients with a deviation, a lower satisfaction regarding his or her septorhinoplasty. In the subgroup "general symptoms" the patients with a preoperatively deviated nose were more satisfied postoperatively than those without a deviation. Whereas the ROE focuses mainly on the aesthetic side of septorhinoplasty, the FROI-17 detects also the functional aspects of this surgery. As the deviated nose is usually the cause of a trauma, these patients experienced a nasal impairment shortly after their trauma and can therefore possibly compare between the pre- and postoperative results better, leading to a higher satisfaction in the FROI-17 subgroup "nasal problems" and also in the FROI-17 overall score. In addition, in our experience patients with NHD tend to be more critical of their postoperative outcome, leading in our opinion to a lower increase in the QoL questionnaire. Baykal<sup>(9)</sup> reported a higher postoperative satisfaction in the deviated nose. Cingi et al.<sup>(12)</sup> showed an increase in ROE score

Table 2. Pre- and postoperative scores of FROI-17, ROE and SF-36 in regards to deviation vs. non-deviation nasal deformity.

	Deviated		Non-Deviated		p-value
	Mean	SD	Mean	SD	
<b>FROI-17 overall score</b>					
preop	30,5	17,7	42,8	18,1	<b>0,03</b>
postop	17,4	16,2	35,3	22,6	<b>0,01</b>
<b>FROI-17 nasal symptoms</b>					
preop	29,9	14,4	45,2	8,9	<b>0,01</b>
postop	18,0	16,0	36,1	27,5	<b>0,03</b>
<b>FROI-17 general symptoms</b>					
preop	31,5	25,3	39,5	22,3	0,3
postop	17,1	18,8	39,2	25,9	<b>0,01</b>
<b>FROI-17 self confidence</b>					
preop	29,5	26,1	46,4	31,4	0,1
postop	16,7	22,6	19,1	18,1	0,7
<b>ROE overall score</b>					
preop	42,3	16,4	41,3	12,0	0,8
postop	63,8	18,7	64,4	20,8	0,9
<b>SF-36</b>					
<b>physical functioning</b>					
preop	87,9	15,7	71,4	29,4	<b>0,048</b>
postop	93,3	12,5	79,1	29,8	0,15
<b>role-functioning physical</b>					
preop	77,2	35,1	65,9	37,5	0,4
postop	93,5	19,1	77,3	32,5	0,13
<b>bodily pain</b>					
preop	80,3	27,9	69,0	32,1	0,3
postop	87,1	20,3	79,5	27,2	0,4
<b>general health</b>					
preop	68,2	21,5	62,0	27,6	0,5
postop	71,4	20,0	63,1	25,7	0,3
<b>vitaliy</b>					
preop	53,9	19,8	47,3	23,8	0,4
postop	59,1	17,3	45,5	20,4	<b>0,03</b>
<b>social functioning</b>					
preop	77,5	25,8	70,5	25,8	0,4
postop	82,8	20,8	60,2	29,5	<b>0,02</b>
<b>role-functioning emotional</b>					
preop	83,6	30,3	69,7	37,9	0,3
postop	89,7	25,9	63,6	43,3	<b>0,04</b>
<b>mental health</b>					
preop	64,1	19,5	54,5	20,9	0,2
postop	70,1	16,1	64,7	25,1	0,5

SD: standard deviation

in patients with a deviated nose postoperatively, however the non-deviated patients showed a slightly better outcome. It was stated that the slight difference in patient satisfaction is likely due to personal perception and emotional status. In our opinion, the different results in our study are not a contradiction, but due to different QoL questionnaires, which also focuses on functional alignments.

Regarding the SF-36, patients with a deviated nose showed a significantly higher postoperative score indicating a more positive rating in the scales "vitality," "social functioning," and "role functioning emotional." An increase in SF-36 subscores after septorhinoplasty is reported in the literature <sup>(11)</sup>. In our predominantly young collective it is conceivable that patients with a deviated nose after trauma are more impaired in their emotional status and in their personal perception, resulting in a greater satisfaction for a non-deviated nose after their rhinoplasty.

The significant differences in the deviation versus non-deviation patients in the FROI-17 and three scales of the SF-36 indicate a stronger correlation of the FROI-17 with the SF-36, than the SF-36 with the ROE, which did not show significant differences in the overall score in regards to deviated versus non-deviated patients. Correlation analysis revealed that the correlations between the scales of the SF-36 and the FROI-17 were significantly more pronounced than the correlations between the SF-36 and the ROE <sup>(3)</sup>, due to the fact that the FROI-17 focuses also on the functional aspect of septorhinoplasty, which supports our findings.

Looking at the literature, there has been limited published data about the role of patient satisfaction according to the preoperative nasal deformity. To our knowledge this is the first study to examine QoL with three different questionnaires (two of them disease-specific) with a one-year follow-up showing an increase in patient satisfaction according to different preoperative nasal pathologies. The weakness of our study is the limited number of patients, a predominantly young sample and our main nasal deformity being the "deviated nose." Our study contributes to the thesis that rhinoplasty improves QoL in patients with and without a deviated nose. Further prospective studies with larger

samples and with disease-specific QoL questionnaires, which concentrate on the functional aspect of septorhinoplasty are necessary to evaluate the degree of patient satisfaction in different deformities.

## Conclusion

QoL improves significantly in patients with NHD, NAD and NHD+NAD after surgery.

The ROE score including all three subgroups increased, indicating a greater satisfaction after surgery. The FROI-17 including all subgroups showed significant postoperative improvement of subjective assessments by the patients. Regarding the SF-36, the postoperative score improved significantly only in two scales (role-functioning physical and mental health). Patients with and without nasal deviation showed improved QoL measured with the ROE and the FROI-17. Regarding the different QoL questionnaires, there were significant postoperative differences in deviated versus non-deviated nose patient, in the FROI-17 overall, FROI-17 subscores (nasal and general symptoms) and in three scales of the SF-36 (vitality, social functioning, role-functioning emotional), indicating a greater postoperative satisfaction in the deviated- nose patient. We attribute this to the fact that the FROI-17 highlights the functional aspects of septorhinoplasty.

## Authorship contribution

All authors made substantial contributions to the study.

OCB: designed and coordinated the study, participated in the data acquisition and analysis, interpreted the data and drafted the manuscript.

FW: participated in the data acquisition and analysis, critically revised the manuscript for important intellectual content.

RH: participated in the data acquisition and analysis

PKP: participated in the data acquisition and analysis, critically revised the manuscript for important intellectual content

IB: designed and coordinated the study, participated in the data acquisition and analysis, interpreted the data, critically revised the manuscript for important intellectual content

## Conflict of interest

None to declare.

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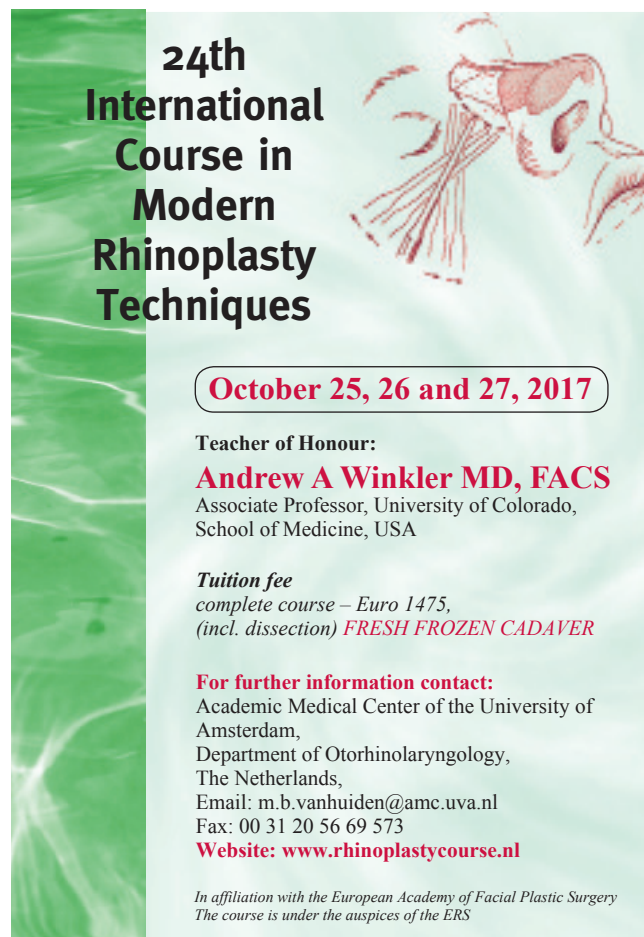
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