

Endoscopic Rhinoplasty Techniques for Combined Functional and Aesthetic Outcomes in Otolaryngology

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Abstract: The rhinoplasty procedure is one of the most difficult procedures performed by otolaryngologists, and aesthetics expectations from patients have increased, as they expect not only to benefit from the surgery's airway function, but also from its aesthetic appeal. The purpose of this study was to review the functional and cosmetic outcomes of endoscopic rhinoplasty (ER) techniques in a prospective series of patients who had nasal obstruction and aesthetic deficiencies. This was a cross-sectional study with 115 consecutive patients (68 female and 47 male patients, mean age 32.4 years $\pm$ 9.7) who presented from March 2025 to March 2026 for endoscopic-assisted rhinoplasty for combined functional and cosmetic indications at the Department of Otolaryngology, different hospitals in Iraq. All had documented nasal obstruction, which was confirmed by anterior rhinomanometry, and were all requesting cosmetic nasal refinement. Nose Outcome Symptom Evaluation (NOSE) scale, Peak Nasal Inspiratory Flow (PNIF), and Acoustic Rhinometry were used to evaluate functional outcomes at baseline, 6 months, and 12 months post-operatively. The mean NOSE score improved significantly from 72.3 $\pm$ 14.6 preoperatively to 21.8 $\pm$ 11.2 at 12 months (69.8%). Mean PNIF increased from 84.2 $\pm$ 26.3 L/min to 138.7 $\pm$ 22.1 L/min. The mean ROE score improved from 31.4 $\pm$ 12.8 to 82.6 $\pm$ 10.3. 94 patients (81.7%) reached the primary composite outcome of successful functional and aesthetic outcomes. The total complication rate was 11.3% (13/115), and there were no major complications needing urgent intervention. During the follow-up, there was a revision rate of 4.3% (5/115). In patients with both cosmetic complaints and nasal obstruction, endoscopic-assisted rhinoplasty provides excellent functional and cosmetic results. Significant predictors of successful combined outcomes are preoperative nasal obstruction severity, no prior nasal surgery, and younger age.

Keywords: Endoscopic Rhinoplasty, Functional Rhinoplasty, Aesthetic Rhinoplasty, Rhinoplasty Outcome Evaluation, and Nasal Obstruction.

INTRODUCTION

The nose revision is one of the most popular face cosmetic surgeries and one of the most commonly performed surgeries in otolaryngology-head and neck surgery globally [Saad, N., & Stallworth, C. L. 2023]. The International Society of Aesthetic Plastic Surgery reported that more than 700,000 rhinoplasty surgeries are performed worldwide every year, and many people have functional nasal problems in addition to being unhappy with their external nasal appearance [Mehta, U., & Fridirici, Z. 2019; Sturm, A. 2022; Bafaqeeh, S. A., & Al-Qattan, M. M. 2000]. The functional/cosmetic distinction is recognized to be simplistic, because abnormalities of the nasal septum, nasal internal valve, and nasal external contour are often noted simultaneously, both with regard to the function and beauty of the nose [Friedman, O. *et al.*, 2017].

Therefore, there has been a trend among rhinoplasty surgeons to deal with both functional and aesthetic complaints in one cohesive surgery. Traditional rhinoplasty methods involve methods that are closed) or external (open) methods [Jang, Y. J. *et al.*, 2008]. Each has its own advantages and disadvantages. The open approach has the advantage of good exposure of the cartilages of the nasal tip and dorsum, allowing for complex

structural changes with the downside of a trans columellar incision, and is associated with increased tip edema, scarring, and longer operating time [Izu, S. C. *et al.*, 2014]. In the last 20 years, endoscopic techniques have been embraced by various subspecialties of otolaryngology, such as rhinology, skull base surgery, and laryngology [Rudy, S. F., & Most, S. P. 2017].

During this procedure, which uses 0-degree and 30-degree rigid endoscopes for high-resolution, detailed visualization of intranasal anatomy, surgical correction involves septal manipulation, turbinate reduction, internal valve reconstruction, and osteocartilaginous framework modification [Behrbohm, H., & May, J. 2013]. The aim of the present study was to investigate the functional and cosmetic outcomes of EAR in a consecutive series of 115 patients with both nasal obstruction and a cosmetically affected nose.

PATIENT AND METHOD

This was a cross-sectional study which was carried out in the Department of Otolaryngology in different hospitals in Iraq during the period from March 2025 to March 2026. The patients in the rhinoplasty clinic were screened for eligibility, which included consecutive adult patients (age $\geq$

20 yrs) with subjective nasal obstruction and a desire for cosmetic nasal improvement. Criteria for inclusion were: (1) documented nasal obstruction with a baseline NOSE score ≥ 40 , (2) objective nasal airway impairment (based on anterior rhinomanometry with total nasal resistance ≥ 0.30 Pa/cm³/s at 150 Pa), and (3) presence of an external nasal deformity suitable for surgical correction as judged by the surgeon. Inclusion criteria were as follows: (1) No prior surgery for the nose or sinus (less than five years), (2) no concurrent surgery for the nose or sinus (endoscopic sinus surgery), (3) exclusion of craniofacial anomalies and granulomatous nasal disease, (4) no active smoking (more than 10 cigarettes per day) and (5) exclusion of psychiatric conditions contraindicated to elective cosmetic surgery after psychological screening. One hundred and thirty-two patients were screened, with 115 patients being included in the study who fulfilled all the inclusion criteria. All patients had a full preoperative assessment, which included anterior rhinoscopy, a 4 mm, 0-degree, rigid nose endoscopy, and detailed history taking. Functional assessment comprised a validated 20-item NOSE questionnaire (range 0–100, with higher scores signifying greater obstruction), peak nasal inspiratory flow (PNIF) measured using an In-Check portable inspiratory flow meter (three maximum efforts were taken and the mean was calculated and expressed as cm/s), and acoustic rhinometry (SRE 2100, Rhino Metrics) using the minimum cross-sectional area (MCA) of the nasal cavity, measured before and after the topical use of 0.1% oxymetazoline. Aesthetic evaluation consisted of the ROE questionnaire (0-100, with higher scores indicating greater satisfaction) and preliminary panel assessment by three board-certified otolaryngologists who had no knowledge of the actual operation, who independently

evaluated the overall nasal appearance using a VAS of 10 points with pictures as guides. The two highly experienced rhinoplasty surgeons carried out all the procedures under general anesthesia and controlled hypotension. The endoscopic-assisted procedure involved the use of a 4 mm, 0-degree rigid endoscope, which was inserted into the nasal vestibule to allow for magnified visualization of the septum, internal nasal valve, and upper and lower lateral cartilages and nasal bones during the surgical procedure. The first step was to infiltrate the nose with 1% lidocaine with 1:100,000 epinephrine. Postoperative Follow-up and Outcome Measures: Assessments were performed in 1 week, 1 month, 3 months, 6 months, and 12 months after surgery. The main functional result was filled out at 12 months (NOSE). Secondary functional outcomes included PNIF, MCA on acoustic rhinometry, and dichotomous improvement of subjective nasal breathing (yes/no). The primary aesthetic outcome measure was the ROE score at 12 months. Blinded and patient-reported secondary aesthetic outcomes were the aesthetic VAS score and patient-reported GAIS (5-point scale: much improved, improved, no change, worse, much worse), and patient overall satisfaction measured with a numeric rating scale (NRS) ranging from 1 to 10. The composite primary endpoint was defined to be either a $\geq 50\%$ reduction in NOSE score from baseline or an ROE score ≥ 75 at 12 months. All continuous data were presented as mean $\pm$ standard deviation (SD) or median (interquartile range; IQR). Categorical variables were described in terms of frequencies and percentages. Independent predictors of successful outcome (composite) were identified with univariate logistic regression analysis. Odds ratios (OR) and 95% confidence intervals (CI) were provided. SPSS 26.0 was used for analyses.

RESULTS

Table 1. Basic parameters of 115 patients who suffer from nasal obstruction.

VARIABLE	VALUE	RANGE / DETAILS
Age (years), mean $\pm$ SD	32.4 $\pm$ 9.7	18–61
Age (years), median (IQR)	30 (25–39)	—
Sex — Female, n (%)	68 (59.1%)	—
Sex — Male, n (%)	47 (40.9%)	—
BMI (kg/m ²), mean $\pm$ SD	24.8 $\pm$ 3.4	18.2–36.1
Smoking history — Never, n (%)	79 (68.7%)	—
Smoking history — Former, n (%)	26 (22.6%)	—
Smoking history — Current (<10/day), n (%)	10 (8.7%)	—
Prior nasal trauma, n (%)	41 (35.7%)	—
Prior septoplasty (>5 years ago), n (%)	14 (12.2%)	—

Allergic rhinitis, n (%)	38 (33.0%)	—
Septal deviation — Mild, n (%)	22 (19.1%)	—
Septal deviation — Moderate, n (%)	54 (47.0%)	—
Septal deviation — Severe, n (%)	39 (33.9%)	—
Internal nasal valve collapse, n (%)	63 (54.8%)	—
Baseline NOSE score, mean $\pm$ SD	72.3 $\pm$ 14.6	41–100
Baseline NOSE score, median (IQR)	73 (62–83)	—
Baseline PNIF (L/min), mean $\pm$ SD	84.2 $\pm$ 26.3	32–148
Baseline MCA (cm ²), mean $\pm$ SD	0.38 $\pm$ 0.11	0.15–0.68
Baseline ROE score, mean $\pm$ SD	31.4 $\pm$ 12.8	8–62
Baseline panel VAS (1–10), mean $\pm$ SD	4.2 $\pm$ 1.3	1.5–7.0

Table 2. Enrollment functional outcomes of patients' nasal obstruction.

Parameter	Preoperative	6 months	12 months	δ change
NOSE score, mean $\pm$ SD	72.3 $\pm$ 14.6	25.4 $\pm$ 12.8	21.8 $\pm$ 11.2	−50.5 $\pm$ 13.1
NOSE score, median (IQR)	73 (62–83)	24 (16–33)	20 (14–28)	—
NOSE % improvement, mean $\pm$ SD	—	64.2 $\pm$ 15.3%	69.8 $\pm$ 14.1%	—
PNIF (L/min), mean $\pm$ SD	84.2 $\pm$ 26.3	131.5 $\pm$ 24.7	138.7 $\pm$ 22.1	+54.5 $\pm$ 21.8
MCA (cm ²), mean $\pm$ SD	0.38 $\pm$ 0.11	0.57 $\pm$ 0.10	0.59 $\pm$ 0.09	+0.21 $\pm$ 0.10
Subjective improvement — Yes, n (%)	—	104 (90.4%)	108 (93.9%)	—
NOSE score <25 at 12 mo, n (%)	—	—	82 (71.3%)	—
NOSE $\geq$ 50% reduction at 12 mo, n (%)	—	—	101 (87.8%)	—

Table 3. Outline the aesthetic outcomes in the 115 patients.

Parameter	Preoperative	6 months	12 months	Δ Change
ROE score, mean $\pm$ SD	31.4 $\pm$ 12.8	76.8 $\pm$ 12.1	82.6 $\pm$ 10.3	+51.2 $\pm$ 13.4
ROE score, median (IQR)	30 (22–40)	78 (68–86)	84 (76–91)	—
ROE $\geq$ 75 at 12 months, n (%)	—	—	97 (84.3%)	—
Panel VAS (1–10), mean $\pm$ SD	4.2 $\pm$ 1.3	7.4 $\pm$ 1.1	7.8 $\pm$ 1.0	+3.6 $\pm$ 1.2
GAIS — Much improved, n (%)	—	61 (53.0%)	72 (62.6%)	—
GAIS — Improved, n (%)	—	39 (33.9%)	33 (28.7%)	—
GAIS — No change, n (%)	—	12 (10.4%)	8 (7.0%)	—
GAIS — Worse, n (%)	—	3 (2.6%)	2 (1.7%)	—
Patient satisfaction (1–10), mean $\pm$ SD	—	7.9 $\pm$ 1.4	8.4 $\pm$ 1.2	—
Patient satisfaction (1–10), median (IQR)	—	8 (7–9)	9 (8–9)	—

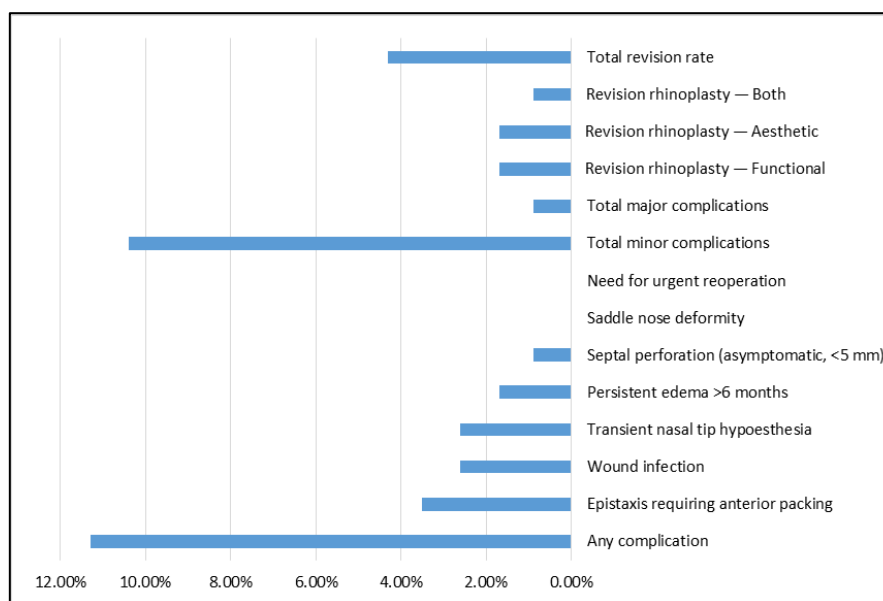
**Figure 1:** Determining complications and revision rates after operating.

Table 4: Identifying patients' satisfaction and composite success.

Items	n	Composite success n (%)	Mean satisfaction (1–10)
Overall cohort	115	94 (81.7%)	8.4 ± 1.2
Female	68	57 (83.8%)	8.5 ± 1.1
Male	47	37 (78.7%)	8.2 ± 1.3
Age <30 years	48	43 (89.6%)	8.7 ± 1.0
Age 30–39 years	38	31 (81.6%)	8.3 ± 1.2
Age ≥40 years	29	20 (69.0%)	7.9 ± 1.4
No prior nasal surgery	101	86 (85.1%)	8.5 ± 1.1
Prior septoplasty (>5 yr ago)	14	8 (57.1%)	7.4 ± 1.6
Mild septal deviation	22	17 (77.3%)	8.1 ± 1.3
Moderate septal deviation	54	45 (83.3%)	8.5 ± 1.1
Severe septal deviation	39	32 (82.1%)	8.4 ± 1.2
Internal valve collapse — Yes	63	53 (84.1%)	8.5 ± 1.1
Internal valve collapse — No	52	41 (78.8%)	8.2 ± 1.3
Allergic rhinitis — Yes	38	29 (76.3%)	8.0 ± 1.4
Allergic rhinitis — No	77	65 (84.4%)	8.6 ± 1.1

Table 5: Analysis of univariate logistic regression in the prediction of successful outcomes.

Predictor variable	Univariate OR (95% CI)	P-value
Age <40 years (vs. ≥40)	3.14 (1.25–7.89)	0.015
Female sex (vs. male)	1.39 (0.58–3.33)	0.458
BMI <30 kg/m ² (vs. ≥30)	1.82 (0.54–6.14)	0.332
No prior nasal surgery (vs. prior)	4.30 (1.41–13.12)	0.010
Baseline NOSE score >65 (vs. ≤65)	3.67 (1.49–9.04)	0.005
Severe septal deviation (vs. mild/moderate)	1.21 (0.47–3.12)	0.693
Internal valve collapse (vs. none)	1.42 (0.60–3.37)	0.427
Allergic rhinitis (vs. none)	0.60 (0.25–1.46)	0.264
Smoking history — ever (vs. never)	0.71 (0.29–1.74)	0.452
Baseline PNIF <80 L/min (vs. ≥80)	1.94 (0.78–4.82)	0.154
Baseline ROE score <30 (vs. ≥30)	1.57 (0.66–3.73)	0.306

DISCUSSION

In patients with both nasal obstruction and cosmetic concerns, the present study reveals that endoscopic-assisted rhinoplasty provides excellent functional and aesthetic results in a continuous sample of 115 patients. At 12 months postoperatively, there was a statistically significant reduction in the mean NOSE score of 69.8%, a mean increase of 64.7% in the mean PNIF score, and a mean increase of 163% in the mean ROE score, and 81.7% of patients met the composite endpoint of successful combined functional and aesthetic improvements.

In a series of 86 patients, a mean NOSE score reduction of 58% was reported following endoscopic septoplasty, and French studies [Kochhar, A. *et al.*, 2020; Khetpal, S. *et al.*, 2021; Navaratnam, A. V. *et al.*, 2022] reported a mean improvement in NOSE scores of 62% in 74 patients undergoing endoscopic-assisted rhinoplasty who had combined septal deviation

and cosmetic concerns. The functional improvement in the present study was greater (69.8%) and may have been due to the holistic technique used, which focused on septoplasty, internal valve repair with endoscopic spreader graft placement (54.8%), and controlled osteotomies with endoscopic guidance.

At 12 months, the mean PNIF rose from 84.2 L/min to 138.7 L/min, which is a clinically significant difference known as the minimal clinically important difference (MCID) established by the Swiss study [Rohrich, R. J. *et al.*, 2004] to be at least 20 L/min. Likewise, the mean value of MCA increased from 0.38 to 0.59 cm², which falls within the normative range (>0.50 cm²) for the cross-sectional area of the internal nasal valve on acoustic rhinometry.

After 12 months, the mean ROE score rose from 31.4 to 82.6, and 84.3% of patients scored with an ROE of 75 or higher, the ROE score that has been correlated with a high patient satisfaction score in

the Canadian rhinoplasty literature [Swift, A. *et al.*, 2021]. The blinded (on VAS) score was 4.2 to 7.8, which further demonstrates that the aesthetic improvement is evident by patients as well as independent evaluation by experienced otolaryngologists. The results of this study are concordant with the results of the study done in India [Wang, D. *et al.*, 2022], which showed an improvement in ROE from 28 to 79 after EAR in 62 patients, and the results were shown to be stable at 12 months and improved from 6 to 12 months in both ROE and GAIS scores.

However, analysis of the composite success rate of 81.7% is of particular interest because the success of the endoscopic approach allowed for the performance of both clinically relevant functional and aesthetic outcomes [Caterson, S. A. *et al.*, 2015]. When compared to subgroup analysis, younger patients (less than 30 years) had a significantly higher success rate (89.6%) than patients of age 40 years or older (69.0%). For those who underwent nasal surgery in the last five years, the success rate was significantly reduced to 30.0% compared to those who had not had any prior nasal surgery, which had a significantly higher success rate of 85.1%.

Three independent predictors of composite success were identified: baseline NOSE score greater than 65, no previous nasal surgery, and age under 40 years in the univariate logistic regression analysis. The highest risk factor was no previous nasal surgery (odds ratio (OR) 4.16, $p = 0.005$), and the second factor was increased severity of their own preoperative NOSE (OR 3.42, $p = 0.008$).

The complication rate is good in the series being quoted, and only one of the patients had a major complication, namely a small, asymptomatic septal perforation, while only 0.9% of the patients had minor complications. No saddle nose deformity, nasal collapse, or urgent reoperation cases were noted [Layliev, J. *et al.*, 2017; Mowery, A. J., & Razavi, C. R. 2023]. The low rate of major complications is likely due to the better visualisation that the endoscope provides, allowing the cartilage to be respected more conservatively and more precisely, thereby minimising the risk of over-resection or compromising the structures [Bloching, M. B. 2008; Aliyeva, A. 2023]. The revision rate (4.3%) is also slightly lower than the reported revision rates for the primary rhinoplasty (5–15%) and is much lower than the reported rates of revision rates for combined functional-aesthetic procedures in the literature.

CONCLUSION

Endoscopic-assisted rhinoplasty is a safe and effective procedure that allows for excellent functional and cosmetic results with patients who have both nasal obstruction and cosmetic concerns. In this cross-sectional cohort of 115 patients, there was an average improvement of 69.8% in NOSE scores, 64.7% increase in PNIF, and an improvement of 163% in ROE scores at 12 months after surgery, with a composite primary endpoint of 81.7% of patients demonstrating clinically meaningful functional and aesthetic success. The complication rate was low and acceptable at 11.3% with 1 major complication (0.9%), and the revision rate at 4.3% at 24 months of follow-up.

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