



# Endoscopic versus conventional septoplasty: objective/subjective data on 276 patients

Massimiliano Garzaro<sup>1</sup> · Valeria Dell'Era<sup>1</sup> · Giuseppe Riva<sup>2</sup> · Luca Raimondo<sup>3</sup> · Giancarlo Pecorari<sup>4</sup> · Paolo Aluffi Valletti<sup>1</sup>

Received: 17 February 2019 / Accepted: 14 March 2019 / Published online: 20 March 2019  
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## Abstract

**Purpose** Endoscopic approach represents a valid alternative to conventional septoplasty. The aim of this study is to analyze the objective and subjective data on 276 patients, who underwent traditional (147) or endoscopic (129) septoplasty.

**Methods** This is a prospective observational study on 276 consecutive patients affected by deviated nasal septum (DNS), who underwent isolated septoplasty between 2011 and 2018. 147 of them were treated using an “open” approach, while 129 were treated with an endoscopic approach. The two groups were compared 3 months after surgery: the objective results (complications such as bleeding, hematoma, pain, synechia, septal tears and incomplete correction), objective (rhinomanometric data) and subjective measurements (NOSE questionnaires).

**Results** Both techniques are effective in decreasing nasal obstruction and discharge. Complications such as pain, synechia, early postoperative bleeding, septal tears and incomplete correction are less frequent in the endoscopic group ( $p < 0.05$ ). The rhinomanometric analysis reveal improvement in both groups without statistical differences. Subjective questionnaires show a good symptoms relief with an improved quality of life in all 276 patients without statistical difference between the two groups.

**Conclusions** Both techniques are effective in reducing nasal obstruction and related symptoms with fewer overall complications in the endoscopic approach. The endoscope provides improved field of view, less mucosal damages and a more anatomic dissection. Finally, such approach can be a valuable teaching tool for assistants, residents and students.

**Keywords** Endoscopic septoplasty · Septal deviation · Endoscopic septoplasty outcomes · Traditional septoplasty · Comparison

## Introduction

Deviated nasal septum is one of the most common causes of nasal obstruction. It can lead to recurrent infections of the paranasal sinuses and, for some patients, it may be associated with contact point headaches [1].

Septoplasty is the surgical procedure which corrects structural deformities to relieve nasal obstruction. Two main approaches are commonly used: the traditional “open”

septoplasty (TS) by means of an external light source and the endoscopic septoplasty (ES) technique.

In recent years, the endoscopic approach has revolutionized nasal surgery, and septoplasty—alone or as a part of functional endoscopic sinus surgery—became one of the most commonly performed endoscopic procedures.

The main advantage of ES is the better visualization of septal deformities, allowing more conservative and less invasive surgery, even in revision cases. Moreover, the endoscopic view provides an excellent teaching tool [2].

A recent meta-analysis by Hong et al. [3] underlined the ongoing debate regarding which approach had better outcomes and fewer complications. The authors concluded that the endoscopic approach seemed to have some advantages in selected patients. However, the findings were not conclusive, because of the low quality of the included studies.

Among the identified biases, the presence of co-procedures, differences in postoperative management, a short

✉ Valeria Dell'Era  
valeria.dellera@gmail.com

<sup>1</sup> ENT Division, University of Eastern Piedmont, Novara, Italy

<sup>2</sup> ENT Division, Santa Croce Hospital, Moncalieri, Italy

<sup>3</sup> ENT Division, Maria Vittoria Hospital, Turin, Italy

<sup>4</sup> ENT Division, University of Turin, Turin, Italy

follow-up, and the absence of objective (e.g., rhinomanometry) and subjective (e.g., NOSE scores) measurements strongly decreased the reliability of the studies.

The aim of this study was to compare postoperative results and the rate of complications in a case series of 276 patients who underwent either endoscopic or conventional septoplasty without co-procedures. Postoperative results were assessed by means of objective (active anterior rhinomanometry—RMM) and subjective measures (visual analog scale—VAS—for pain, and Nasal Obstruction, and Septoplasty Effectiveness scale—NOSE) [4] at 3 months after surgery.

## Materials and methods

This prospective observational study included 276 consecutive patients who underwent exclusive septoplasty performed in two departments of otorhinolaryngology, University of Turin (2011–2016) and University of Eastern Piedmont (2016–2018), by two surgeons with different experience in nasal surgery. One hundred and forty-seven patients underwent TS (surgeon: GP) and 129 ES (surgeon: MG). Patients with very anterior septal deviations were treated with TS.

Exclusion criteria were: previous septal surgery, need for concomitant turbinates or sinus surgery, previous radiation therapy to the head and neck, and chronic nasal granulomatosis diseases.

Pre- and postoperative assessments included nasal endoscopy, RMM, and NOSE questionnaire. The postoperative evaluation was performed 3 months after surgery. Pain was assessed using a visual analog scale (VAS) during recovery (4 h after the removal of nasal packaging).

TS was performed with headlight illumination, nasal speculum, and Freer dissector or Cottle elevator. After decongestion with oxymetazoline and submucosal injection of local anesthesia (xylocaine 2% with epinephrine), a mucosal hemitransfixion incision was performed with a 15-blade scalpel. Then, an elevator was used to elevate a mucoperichondrial flap and the quadrangular cartilage was incised anteriorly. A contralateral mucoperichondrial flap was then raised. The bony septal deviation was incised carefully with a dovetail scalpel and hammer instrument. The incised cartilage and bone were then removed en bloc using Weil forceps. Elevated flaps were laid back down. Mucosal incision were sometimes fixed with reabsorbable stitches and nasal cavities were packed with finger glove coated Merocel for 24 h.

ES was carried under general anesthesia, using a zero degree 4 mm endoscope. After the infiltration on both sides of the septum with xylocaine 2% with epinephrine, a hemitransfixion incision was made with elevation of the mucoperichondrial flap using the suction elevator under

direct endoscopic visualization. Flap raising continued bilaterally to completely dissect the septal deformity. Cartilage or bone was excised with punches, endoscopic scissors or forceps. The flaps were repositioned back after suction clearance, without sutures, and the nasal cavities were packed with a finger glove coated Merocel that was removed after 24 h.

All patients underwent an endoscopic follow-up at 7, 15, 30, and 90 days after surgery.

Active anterior rhinomanometry was performed using the ATMOS Rhinomanometer 300 (ATMOS MedizinTechnik, Lenzkirch, Germany) with a flow meter integrated in the face mask and a pressure transducer fixed in one nostril. Nasal resistance and flow were measured on both sides, and the total nasal resistance and flow were then calculated. Inspiratory flow was measured at a pressure of 150 Pa, as well as the mean value of total nasal inspiratory resistances ( $\text{Pa}/\text{cm}^3$  per second). RMM is an objective method of evaluation that has been used for years to assess nasal obstruction. It provides dynamic data about nasal airway resistance based on nasal pressure and airflow [5]. Therefore, RMM can be considered the gold standard for the objective assessment of nasal patency [6].

The NOSE scale was used to assess the severity of nasal symptoms, such as nasal obstruction during rest and exercise, nasal stuffiness, trouble breathing, and trouble sleeping. The overall NOSE score (range 0–20) was calculated as the sum of values of the variables (5 items, each with a range 0–4, 0—not a problem, 4—severe problem) [4].

The NOSE scale is adopted because it is brief, valid, reliable, and responsive [7]. There are several other validated instruments available for the rhinologist, including the Chronic Sinusitis Survey (CSS) [8], the Rhinoconjunctivitis Quality of Life Questionnaire (RQLQ) [9], the Rhinosinusitis Disability Index (RSDI) [10], the Sino-Nasal Outcome Tool (SNOT-20) [11], and the Allergy Outcome Survey (AOS) [12]. All these instruments are valid and reliable, but more specific for chronic rhinosinusitis or allergic rhinitis.

The VAS was used to assess the subjective sensation of nasal pain 4 h after the removal of nasal package. It consists of a 10 cm line with at the extremes “no pain” (0 cm) and “unbearable pain” (10 cm).

To compare the outcomes of the two procedures, the following five parameters were collected: bleeding and septal hematoma in the early postoperative period (during the first 2 postoperative weeks); synechia, flap tears or perforations, and incomplete correction of septal deviation at the 3 months evaluation. The assessment of postoperative outcomes was performed by a different surgeon (blind reviewer).

Statistical analysis was performed using SPSS 23.0 (SPSS Inc., Chicago, IL, USA). Chi square or Fisher’s exact test were used for categorical variables. Student’s *t* test for

repeated measures was used for continuous variables, and a *p* value less than 0.05 was considered statistically significant.

All procedures were in accordance with ethical standards of the institutional research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. Written informed consent was obtained by every patient. Institutional Board approval was obtained.

### Results

Two-hundred and seventy-six patients underwent septoplasty in the study period, 147 (52%) using the traditional technique (64% male, age range 18–50 years) and 129 (48%) under endoscopic guidance (61% male, age range 18–54 years).

Table 1 shows the demographic features of the samples.

Regarding the primary outcome (3 months objective and subjective results), there was a statistically significant reduction of total nasal resistances at RMM in both the ES ( $0.39 \pm 0.18$  pre- vs  $0.23 \pm 0.07$  post;  $p < 0.05$ ) and the TS ( $0.38 \pm 0.16$  pre- vs  $0.24 \pm 0.08$  post;  $p < 0.05$ ) group.

NOSE score statistically improved in both groups: mean TS score decreased from  $14.4 \pm 2.37$  to  $5.2 \pm 1.8$  ( $p < 0.05$ ), while in ES group it decreased from  $14.7 \pm 2.14$  to  $4.7 \pm 1.7$  ( $p < 0.05$ ). No statistical difference was observed between the two techniques at pre- and postoperative evaluations, concerning total nasal resistance and NOSE score.

RMM and NOSE results are reported in Fig. 1.

The ES group showed significantly lower pain compared to the TS ( $2.1 \pm 1.6$  versus  $4.7 \pm 2.5$ ,  $p < 0.05$ ).

Surgical complications at 3 months follow-up are presented in Table 2. They were significantly lower in the ES group, except for septal hemorrhage.

### Discussion

The main finding of this study is that both endoscopic and traditional septoplasty approaches are effective in improving postoperative nasal function as well as subjective nasal functionality measured by patient self-assessment at 3 months

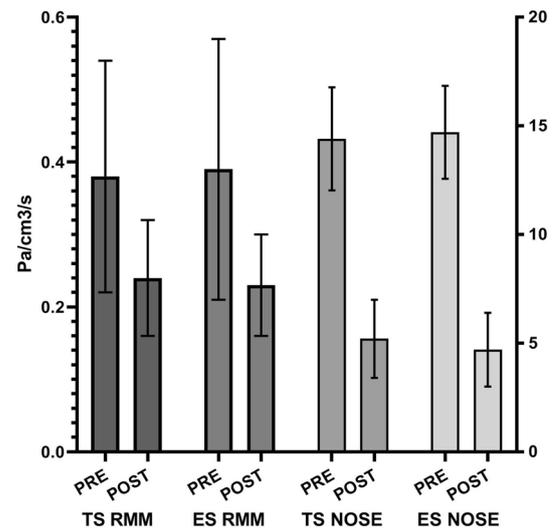


Fig. 1 RMM (left) and NOSE (right) scores before and after surgery for, respectively, traditional (TS) and endoscopic septoplasty (ES). All charts presenting mean and standard deviations

after surgery, in agreement with the recent literature [1, 13–20]. Moreover, endoscopic surgery seemed associated with less complications than traditional surgery at 3 months follow-up.

Open and endoscopic septoplasty are two of the most widespread surgical approaches to correct septal deviations.

The endoscopic approach seems to offer some advantages, such as a more accurate anatomic assessment and a better posterior visualization, leading to a more rigorous correction of the deformities with lower mucosal damage [2, 13, 14].

Concerning the comparison between TS and ES a systematic review by Hong et al. confirmed some advantages for the endoscopic technique, though the low quality of the included studies did not allow obtaining a definitive conclusion [3]. The authors recommend several key points for future studies, including the need of an adequate follow-up, the use of validated disease-specific instruments (e.g., NOSE scale) and objective rhinomanometric measurements.

Table 1 Demographics and preoperative score among the two groups: traditional septoplasty (TS) and endoscopic septoplasty (ES)

	TS (n=147)	ES (n=129)
Mean age (years)	46	45
Gender (M:F)	94:53	79:50
Race	European only	European only
Preop RMM (mean and SD)	0.38 ± 0.16	0.39 ± 0.18
Preop NOSE (mean and SD)	14.4 ± 2.37	14.7 ± 2.14

No statistically significant differences between the two groups

Table 2 Complication/sequelae after traditional septoplasty (TS) and endoscopic septoplasty (ES)

	TS (n=147)	ES (n=129)	<i>p</i> < 0.05
Incomplete correction	18 (12.24%)	6 (4.65%)	*
Septal haemorrhage	4 (2.72%)	0	
Early postop bleeding	10 (6.80%)	1 (0.78%)	*
Synechiae	22 (14.96%)	5 (3.88%)	*
Septal tears/perforation	17 (11.56%)	7 (5.43%)	*

Statistically significant differences between the two groups are shown with\*

To the best of our knowledge, the present is the first comparative study of ES versus TS that analyzes objective and subjective aspects with an adequate follow-up.

The NOSE questionnaire and the rhinomanometric data showed an expected finding: both techniques were effective in improving nasal obstruction and disease-specific quality of life. The differences between pre- and postoperative evaluations were statistically significant in both groups, while no differences were found comparing traditional and endoscopic results. These data are in concordance with the literature [14–20].

The postoperative pain was significantly lower in the ES group, as reported in three studies with a smaller sample size [15, 19, 20].

Our study seems to demonstrate that, together with a less mucosal damage, endoscopy induces fewer peri- and postoperative complications. First of all, an incomplete correction of the deviation was observed in a statistically significant lower percentage of ES versus TS patients (4.65% vs 12.24%). Furthermore, the endoscopic magnification of the entire nasal cavity allows an easier management of posterior deviations that otherwise might go undetected or untreated. Many authors have reported similar findings [15–17, 21–24].

No postoperative hematomas were encountered following endoscopic septoplasty, due to the absence of mucosal flap sutures: the unsutured limb of the incision acts as a drainage pathway for the blood.

Postoperative hemorrhage was found to be more common among patients who underwent open septoplasty in the few studies that reported such complication [18, 24, 25]. Our data strongly confirmed this trend, with a single case (0.7%) in ES, versus ten cases (6.8%) in the TS group.

Another interesting parameter in comparing the techniques is the formation of postoperative synechiae: the percentage of occurrence in the ES group was clearly lower than in the TS group and the difference was statistically significant. Similar outcomes are reported in almost all the studies present in the literature [15–18, 21–23, 25]. The endoscopic visualization allows to obtain a reduced submucoperichondrial dissection in the early steps of the procedure. Moreover, the correct attachment of mucosal flap at the end of septoplasty may be directly verified. Initial limited detachment and final mucosal repositioning represent the most crucial phases to minimize the mucosal damage, and subsequently to reduce the risk to develop synechiae.

The last analyzed complication was the formation of septal flap tears or perforations. We observed a significantly lower occurrence in the ES group; some authors have reported similar findings in their series [22, 24, 25]. The additional benefit of the endoscopic approach seems to be the easiness in preserving at least one mucosal surface side, avoiding those tearings that could lead to a perforation.

The current study highlighted some remarkable advantages in support of endoscopic septoplasty technique. ES approach seemed to be least invasive, with minor tissue handling, leading to less postoperative complications.

Functional objective and subjective results were good and superimposable with those of TS, whereas all the considered complication rates were significantly lower.

Finally, ES could also be considered as an excellent and effective teaching tool [2]: the video assistance allows the junior surgeons to better understand the procedure, acquiring the technique and being supervised by a senior when operating alone [14, 26].

The main limitation of our study is the absence of randomization. The choice of a specific surgical technique might have been influenced, in a number of cases, by pre-existing conditions of the patient such as very isolated or very anterior septal deviations in which the literature suggests a traditional approach to be more effective.

Moreover, we did not collect a series of demographic variables that could have helped us better stratify outcome and prognostic variables.

Future studies should take into consideration these factors (randomization and stratification) to better understand whether the endoscopic approach is superior to traditional surgery.

## Compliance with ethical standards

**Conflict of interest** The authors declare that they have no conflict of interest.

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