

# Accessible Diagnostic Tools in Nasal Functionalism for Plastic Surgeons

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## Abstract

In the preoperative consultation of the plastic surgeon, there are often no accessible or cost-effective tools for conducting nasal functional studies.

**Objective:** To propose a preoperative evaluation system as a diagnostic tool for nasal functionalism in patients undergoing aesthetic rhinoplasty who attended the Dr. Miguel Pérez Carreño Hospital in Caracas, in the period January 2018 to April 2019.

**Methods:** Experimental, prospective, longitudinal, observational, descriptive, whose sample was represented by all patients with aesthetic rhinoplasty desires who attended the plastic surgery clinic of the Dr. Miguel Pérez Carreño Hospital-Caracas, in the period from January 2018 to April 2019.

**Results:** The results obtained from the NOSE survey were correlated with each of the items evaluated during the physical examination, demonstrating the validity of the NOSE survey and preoperative physical evaluation in the diagnosis of nasal functionalism.

**Conclusion:** The integral evaluation of preoperative nasal functionalism directly influences the outcome and postoperative evolution of the patient.

**Keywords:** Nasal functionalism; Rhinoscopy; Nasoendoscopy

## Introduction

Rhinoplasty is among the most commonly performed cosmetic procedures in the United States, with more than 200,000 procedures reported annually [1]. As facial cosmetics improve it has become more routine and socially acceptable, the procedure has increased in popularity in the United States and worldwide. In Latin American countries, rhinoplasty is the most commonly performed facial cosmetic procedure [2].

Rhinoplasty is more than a cosmetic procedure because it often seeks to improve function by improving nasal breathing and relieving congenital or acquired obstruction. This double function is reflected in the following qualification statements for the term rhinoplasty:

- Rhinoplasty is defined as a surgical procedure that alters the shape or appearance of the nose while preserving or improving the nasal airway. The change in appearance may be a consequence of addressing a functional abnormality (for example: deviated septum, nasal valve involvement) and for cosmetic purposes (for example: an incidental cosmetic procedure).
- The main reason for the surgery may be aesthetic, functional or both, and may include adjuvant procedures in the nasal septum, nasal valve, nasal turbinates or sinuses.

The precise diagnosis of nasal alterations is the most important step of a rhinoplasty, and the most complex, and consists of a thorough

analysis of the nose and face.

When we analyze a nose we must see it as an integral part of the facial assembly, where any change produced in one of the parts affects all the others.

The aim of a rhinoplasty will be to achieve the balance of proportions and angles not only of the nose but also of the other facial structures: lips, forehead, cheekbones and chin.

The nose is a complex structure consisting of a solid support frame and a covering, whose greater or lesser elasticity is proportional to its thickness and age.

Any change in these support structures will affect nasal morphology in a variable way, depending on the thickness of the skin and subcutaneous cellular tissue, as well as its degree of retraction, that is, the intensity of the scar reaction.

The three-dimensional conception and analysis of each of the structures: support, filling and coverage, in isolation and as a whole, will help a more accurate pre-operative evaluation.

We must always assess nasal respiratory function and possible anatomical alterations that hinder it. Moreover, we must not accept the response of patients when asked how they breathe, but we must resort to objective tests on the state of the nostrils, deviations of the septum, hypertrophy of the turbinates and presence of polyps

or vegetations, by direct inspection with a rhinoscope, nasal video endoscopy, radiographs, Computed Tomography (CT), Magnetic Resonance Imaging (MRI), rhinomanometry or acoustic rhinometry [2].

In this work the following question is posed: If a patient with a desire for rhinoplasty has a preoperative evaluation of nasal functionalism easily accessible and inexpensive equipment, will this result in better pre, trans and postoperative management?

In the preoperative consultation of the plastic surgeon, there are often no accessible or cost-effective tools for carrying out studies of nasal functionalism.

## Methods

### Type of study

Experimental, prospective, longitudinal, observational, descriptive study.

### Population and sample

Represented by all patients with desires for cosmetic rhinoplasty who attended the plastic surgery office of Dr. Miguel Pérez Carreño Hospital-Caracas, in the period from January 2018 to April 2019.

### Inclusion criteria

- Patients over 18 years old
- Approve the procedure and sign the informed consent

-If you cannot decide, have a representative who approves the procedure and signs the informed consent

### Exclusion criteria

- ASA III-IV patients

### Process

In the area of external consultation, directed interrogation of nasal functionalism and NOSE survey is performed, reporting the data in the patient's medical history. Next, 10% spray topical nasal administration of pharmacaine was practiced, 10 minutes prior to the study, with the patient sitting in the office with his back at 90° from the horizontal, the nasal pyramid is inspected physical examination, anterior rhinoscopy assisted with Smartphone and, after disinfection of the flexible endoscopic equipment with quaternary ammonium solution for 30 minutes, its solution is removed and the head is introduced through both nostrils for endoscopic inspection, and the distal end connected Samsung Galaxy Note II model smartphone, obtaining video and photo images, which were stored in the computer database.

In patients in whom endonasal pathology was ruled out, a surgical procedure was performed without additional preoperative requirements. Those who were diagnosed with some type of obstructive, inflammatory, hemorrhagic or perforative pathology were referred to ENT specialists for their relevant management.

## Results

The results obtained from the NOSE survey were correlated with each of the items evaluated to the physical exam. In the item 'nasal congestion' (Table 1), a statistically significant difference was found in the finding of erythema in nasoendoscopy ( $p=0.006$ ). In the item 'nasal blockage or obstruction' (Table 2) a difference was obtained statistically significant to the positive Cottle maneuver finding ( $p=0.006$ ). Upon evaluation of the item 'problems breathing through

the nose' (Table 3), a statistically significant difference was obtained from the positive Cottle maneuver finding ( $p=0.006$ ). In the item 'sleeping problems' (Table 4) no results were obtained with statistically significant differences. In the item 'shortness of breath during exercise or sleep' (Table 5) no statistically significant differences were obtained (Graph 1).

Figure 1 shows that the two main causes of ENT reference were inflammatory diseases (4 patients-14.3%), followed by obstructive diseases (2 patients-7.1%), where, in figure 2, we show that the four patients with inflammatory pathologies received preoperative medical

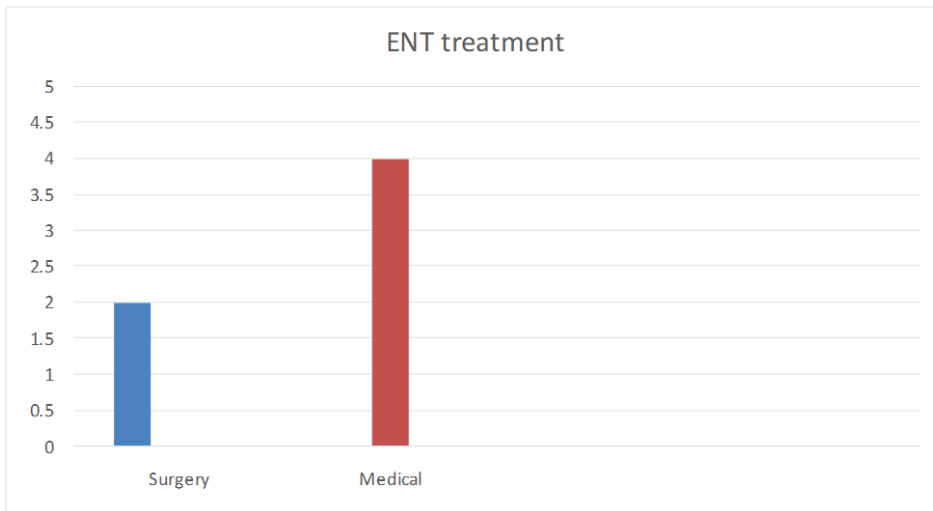
	No problem	Mild problem	Moderate problem	Severe problem	Very severe problem
Nasal congestion	0	1	2	3	4
Blockage or nasal obstruction	0	1	2	3	4
Problems breathing through the nose	0	1	2	3	4
Problems to sleep	0	1	2	3	4
Shortness of breath during activity or exercise	0	1	2	3	4

**Figure 1:** NOSE: Septoplasty effectiveness scale in nasal obstruction. During the last month you have submitted.

**Table 1:** Distribution of patients according to findings on physical examination and nasal congestion by NOSE survey.

Nasal congestion					
	Not a problem		Mild problem		
Variable	n	%	n	%	p
<b>Inspection</b>					
Secretion	0	0.0	2	50.0	0.264
Nasal deviation	2	7.1	0	0.0	1.000
Bleeding	0	0.0	0	0.0	n/a
Tumor	0	0.0	0	0.0	n/a
<b>Palpation</b>					
Selective occlusion	2	7.1	0	0.0	1.000
Cottle maneuver	2	7.1	2	50.0	0.602
<b>Anterior rhinoscopy</b>					
Septal deviation	2	7.1	0	0.0	1.000
Erythema	0	0.0	2	50.0	0.264
Congestion	0	0.0	0	0.0	n/a
Bleeding	0	0.0	0	0.0	n/a
Perforation	0	0.0	0	0.0	n/a
<b>Endoscopy</b>					
Erythema	0	0.0	4	100.0	0.006
Edema	0	0.0	0	0.0	n/a
Congestion	0	0.0	2	50.0	0.264
Septal deviation	2	7.1	0	0.0	n/a
Tumor	0	0.0	0	0.0	n/a
Bleeding	0	0.0	0	0.0	n/a
Perforation	0	0.0	0	0.0	n/a

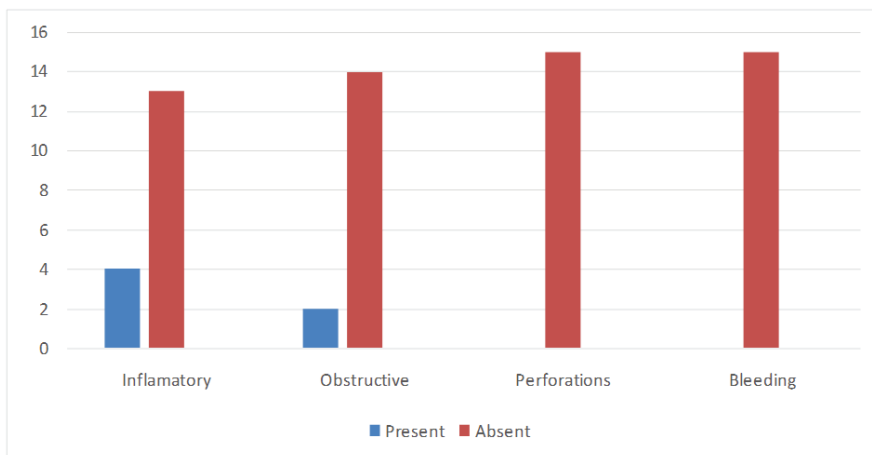
$p \geq 0.006$



**Figure 2:** Preoperative treatment requirement for ENT.



**Figure 3:** Tolerance to procedures performed by analogous pain scale.



**Graph 1:** Identification of frequent preoperative pathologies, reason for ENT reference.

**Table 2:** Distribution of patients according to physical examination findings and nasal blockage or obstruction by NOSE survey.

Blockage or nasal obstruction					
Variable	Not a problem		Mild problem		p
	n	%	n	%	
<b>Inspection</b>					
Secretion	0	0.0	2	50.0	0.264
Nasal deviation	0	0.0	2	50.0	0.264
Bleeding	0	0.0	0	0.0	n/a
Tumor	0	0.0	0	0.0	n/a
<b>Palpation</b>					
Selective occlusion	0	0.0	2	0.0	0.264
<b>Cottle maneuver</b>	<b>0</b>	<b>0.0</b>	<b>4</b>	<b>100.0</b>	<b>0.006</b>
<b>Anterior rhinoscopy</b>					
Septal deviation	0	0.0	2	50.0	0.264
Erythema	0	0.0	2	50.0	0.264
Congestion	0	0.0	0	0.0	n/a
Bleeding	0	0.0	0	0.0	n/a
Perforation	0	0.0	0	0.0	n/a
<b>Endoscopy</b>					
Erythema	2	7.1	2	50.0	0.602
Edema	0	0.0	0	0.0	n/a
Congestion	0	0.0	2	50.0	0.264
Septal deviation	0	0.0	2	50.0	0.264
Tumor	0	0.0	0	0.0	n/a
Bleeding	0	0.0	0	0.0	n/a
Perforation	0	0.0	0	0.0	n/a

p ≥ 0.006

**Table 3:** Distribution of patients according to physical examination findings and problems breathing through the nose by NOSE survey.

Problems breathing through the nose					
Variable	Not a problem		Mild problem		p
	n	%	n	%	
<b>Inspection</b>					
Secretion	0	0.0	2	50.0	0.264
Nasal deviation	0	0.0	2	50.0	0.264
Bleeding	0	0.0	0	0.0	n/a
Tumor	0	0.0	0	0.0	n/a
<b>Palpation</b>					
Selective occlusion	0	0.0	2	0.0	0.264
<b>Cottle maneuver</b>	<b>0</b>	<b>0.0</b>	<b>4</b>	<b>100.0</b>	<b>0.006</b>
<b>Anterior rhinoscopy</b>					
Septal deviation	0	0.0	2	50.0	0.264
Erythema	0	0.0	2	50.0	0.264
Congestion	0	0.0	0	0.0	n/a
Bleeding	0	0.0	0	0.0	n/a
Perforation	0	0.0	0	0.0	n/a
<b>Endoscopy</b>					
Erythema	2	7.1	2	50.0	0.602
Edema	0	0.0	0	0.0	n/a
Congestion	0	0.0	1	50.0	0.264
Septal deviation	0	0.0	2	50.0	0.264
Tumor	0	0.0	0	0.0	n/a
Bleeding	0	0.0	0	0.0	n/a
Perforation	0	0.0	0	0.0	n/a

p ≥ 0.006

**Table 4:** Distribution of patients according to physical examination findings and sleep problems by NOSE survey.

Problems to sleep					
Variable	Not a problem		Mild problem		p
	n	%	n	%	
<b>Inspection</b>					
Secretion	0	0.0	1	100.0	0.072
Nasal deviation	1	7.1	0	0.0	1.000
Bleeding	0	0.0	0	0.0	n/a
Tumor	0	0.0	0	0.0	n/a
<b>Palpation</b>					
Selective occlusion	1	7.1	0	0.0	0.264
<b>Cottle maneuver</b>	<b>1</b>	<b>7.1</b>	<b>1</b>	<b>100.0</b>	<b>0.006</b>
<b>Anterior rhinoscopy</b>					
Septal deviation	1	7.1	0	0.0	1.000
Erythema	0	0.0	1	100.0	0.072
Congestion	0	0.0	0	0.0	n/a
Bleeding	0	0.0	0	0.0	n/a
Perforation	0	0.0	0	0.0	n/a
<b>Endoscopy</b>					
Erythema	1	7.1	1	100.0	0.264
Edema	0	0.0	0	0.0	n/a
Congestion	0	0.0	0	0.0	n/a
Septal deviation	1	7.1	0	0.0	n/a
Tumor	0	0.0	0	0.0	n/a
Bleeding	0	0.0	0	0.0	n/a
Perforation	0	0.0	0	0.0	n/a

p ≥ 0.006

**Table 5:** Distribution of patients according to physical examination findings and difficulty breathing through the nose during exercise/activity by NOSE survey.

Shortness of breath during activity or exercise					
Variable	Not a problem		Mild problem		p
	n	%	n	%	
<b>Inspection</b>					
Secretion	1	7.1	0	0.0	1.000
Nasal deviation	0	0.0	1	100.0	0.072
Bleeding	0	0.0	0	0.0	n/a
Tumor	0	0.0	0	0.0	n/a
<b>Palpation</b>					
Selective occlusion	0	0.0	1	100.0	0.072
<b>Cottle maneuver</b>	<b>1</b>	<b>7.1</b>	<b>0</b>	<b>0.0</b>	<b>1.000</b>
<b>Anterior rhinoscopy</b>					
Septal deviation	0	0.0	1	100.0	0.072
Erythema	1	7.1	0	0.0	1.000
Congestion	0	0.0	0	0.0	n/a
Bleeding	0	0.0	0	0.0	n/a
Perforation	0	0.0	0	0.0	n/a
<b>Endoscopy</b>					
Erythema	2	14.3	0	0.0	1.000
Edema	0	0.0	0	0.0	n/a
Congestion	1	7.1	0	0.0	0.264
Septal deviation	0	0.0	1	0.0	0.072
Tumor	0	0.0	0	0.0	n/a
Bleeding	0	0.0	0	0.0	n/a
Perforation	0	0.0	0	0.0	n/a

p ≥ 0.006

treatment, while the patients with obstructive pathology required ENT surgical treatment with septoplasty.

Figure 3 shows that tolerance to procedures performed by analogous pain scale was adequate in 100% of the cases evaluated.

## Discussion

The comprehensive nasal functional evaluation in the preoperative period of every patient to undergo rhinoplasty should be a *sine qua non* condition to consider in them.

Despite the existence of multiple preoperative evaluation of nasal functionalism, there are few published in the preoperative of patients for cosmetic rhinoplasty to be performed by plastic surgeons, and given the heterogeneity of the objectives of those published, the comparison of the results is difficult.

Stefan DE, et al. [3] in their research article developed the Nose-QOL instrument as a reliable tool in pre and postoperative nasal functional analysis.

Using this instrument as a method of collecting preoperative information in the diagnosis of nasal pathologies and when comparing it with the findings obtained on the physical examination, statistically significant results were obtained in the diagnosis of obstructive nasal pathologies (4 patients with allergic rhinitis and 2 patients with septal deviation), identifying the usefulness of this resource together with the different preoperative studies performed in the consultation, which is confirmed by Ishii LE, et al. [4] in its clinical guideline, the only disadvantage being the high cost of the endoscopic study, which is considerably reduced use the flexible endoscope with Smartphone adapter (\$ 34,000 versus \$ 154) [4].

## Conclusions

The NOSE survey is a useful, practical and effective resource in the diagnosis of obstructive nasal pathologies.

The use of the nasoendoscope with smartphone adapter is an economical device that allows the effective evaluation of the nasal cavity.

The diagnosis of nasal pathologies in the preoperative of the patient with desires for rhinoplasty is effective in preventing complications in the trans or postoperative patient, improving the quality of life and the aesthetic quality of the patient.

The comprehensive evaluation of preoperative nasal functionalism directly influences the outcome and postoperative evolution of the patient.

## Recommendations

Use the proposed system in the evaluation of preoperative nasal functionalism for plastic surgeons in our health centers' offices on a regular basis.

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