

Functional Endonasal Surgery - Concept, Development, Trends -

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ABSTRACT

Aim of study: To analyze the evolution of the concept of functional nasal surgery, first in terms of surgery, and also additional (adjuvant surgery), considering that technical progress, technological and pharmacological changes involve changing the surgeon’s philosophy of work.

Material and method: The study group consisted of patients undergoing functional nasal surgery in the 3rd Department of the IFACF ENT for a period of 10 years (January 2001 – December 2010). The methodology was based on questionnaires applied to each patient tested.

Results: Increasing the number of the nose and paranasal sinuses surgeries, diversification techniques and surgical procedures, along with the application of modern technologies in functional nasal surgery permeability.

Conclusions: The fact that today the surgeon has much more varied surgical technologies has led to the adoption of more complex work philosophies that use combinations of techniques, surgical procedures and technologies in line with the progress in modern practice.

Keywords: functional surgery, nasal obstruction

INTRODUCTION

Over the centuries, new tools, new types of approaches and techniques, advances in materials content aimed to improve nasal interventions.

Known in the specialized literature as “submucous resection of nasal septum type Killian” (1) this intervention was the basis of septal surgery. The principles of the submucous resection were later abandoned because the over resection of cartilage tended to cause unfavorable late sequelae.

Substantial progresses in endoscopic nasal surgery were made after the emergence of the

Hopkins optical system (1959). In 1965, Karl Storz recognizing the potential of innovative medical inventions of Hopkins, has signed a contract with him, and studies of Messerklinger about pathophysiology of the nose and paranasal sinuses were the basis for further development of nasal endoscopic surgical techniques. □

MATERIAL AND METHOD

The study group consisted of patients undergoing functional nasal surgery in section III of the IFACF ENT for a period of 10 years (January 2001 – December 2010).

The methodology was based on questionnaires applied to each patient tested.

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Article received on the 26th December 2011. Article accepted on the 7th June 2012.

Grid I. Updated protocol investigations in patients with nasal obstruction syndrome.

1. History
2. Static and dynamic clinical examination (inhale, exhale): inspection, palpation, anterior rhinoscopy before and after examination, otoscopy / rhinoscopy.
3. Endoscopic examination (rigid, flexible, endoscopic examination during sleep)
4. Imaging examination: classic, CT, CT 3D, MRI (2)

5. Biopsy (if necessary)
6. Bioassays
 - a. bacteriological examination of nasal secretion
 - b. mycological examination of nasal secretion
 - c. cytology: I. nasal epithelium
II. nasal secretion
7. Tests for assessing the condition of the nasal mucosa: contact video endoscopy, mucociliary clearance tests
8. Functional objective tests (3): rhinomanometry, acoustic rhinometry, olfactory tests (subjective, objective) audiometric tests (pure-tone audiogram, impedansmetry)
9. Allergy tests
10. Polysomnography (if necessary)

Nasolabial angle
Columella
Nasal valve
Nasal septum
Inferior turbinates
Middle turbinates
Rhynopharynx
Ostia of the paranasal sinuses
Pharyngeal ostia of the Eustachian tube
Soft palate and uvula
The base of tongue
Quality and degree of impairment of the nasal mucosa

Grid II. Indication and functional objectives of the functional nasal surgery in our institute

The indication of surgery was made after diagnosis of mechanical obstruction of nasal air-

TABLE 1. The main anatomical segments in nasal surgery

Types of surgery	
Single objective	Multiple objectives
Septal surgery (S)	Septal surgery + inferior turbinate surgery (S + CI)
Inferior turbinate surgery (CI)	Septal surgery + valve surgery (S + V)
Concha bullosa surgery (CB)	Inferior turbinate surgery + valve surgery (CI + V)
Valve surgery (V)	Septal surgery + adenoids surgery (S + VA)
Middle turbinate surgery (CM)	Septal surgery + inferior turbinate surgery + valve surgery (S + CI + V)
Middle meatotomy (MM)	Septal surgery + Middle meatotomy (S + MM)
Anterior and posterior etmoidectomy (EA, EP)	Septal surgery + inferior turbinate surgery + Middle meatotomy (S + CI + MM)
	Septal surgery + Concha bullosa surgery (S + CB)
	Septal surgery + inferior turbinate surgery + concha bullosa surgery (S + CI + CB)
	Septal surgery + inferior turbinate surgery + anterior / posterior etmoidectomy + Middle meatotomy (S + CI + EA / EP + MM)
	Inferior turbinate surgery + concha bullosa surgery (CI + CB)
	Inferior turbinate surgery + Middle meatotomy (CI + MM)
	Septal surgery + osteotomies (S + OS)
	Septal surgery + osteotomies + inferior turbinate surgery (S + OS + CI)
	Septal surgery + inferior turbinate surgery + valve surgery + Middle meatotomy (S + CI + V + MM)
	Septal surgery + inferior turbinate surgery + valve surgery + Middle meatotomy + anterior / posterior etmoidectomy (S + CI + V + MM + EA / EP)
	Septal surgery + inferior turbinate surgery + valve surgery + Middle meatotomy + anterior / posterior etmoidectomy + sphenoid surgery (S + CI + V + MM + EA / EP + Sf)
	Septal surgery + inferior turbinate surgery + valve surgery + Middle meatotomy + anterior / posterior etmoidectomy + sphenoid surgery + nasofrontal reces (S + CI + V + MM + EA / EP + Sf + Cnf)

TABLE 2. The main types of endonasal and sinuses surgery

flow and after the identification of the obstructing elements, too.

The objectives of surgery are the recovery of the normal functions of the nose in its relations with the upper airways, the paranasal sinuses and middle ear (4).

Grid III. Types of surgery practiced for the nasal obstruction syndrome in our institute

- Endonasal operations - strictly localized in the nasal passages with a single objective or multiple objectives
- Operations that involve nasal cavities and paranasal sinuses - the task of this surgery is the recalibration of nasal cavities and the patency of sinuses
- Complementary operations - that involve other anatomical segments of the nose (osteotomies and hump removal) and of the upper airway

GRID IV. Operations complementary to endonasal surgery permeability

GRID V. Types of surgical technology used in endonasal surgery permeability

GRID VI. Types of postoperative control techniques

STUDY RESULTS

The analysis and the statistic approach based on the data obtained from applying the before-mentioned grids to the study group showed that the numerical distribution of surgical types within the research period was as follows: 4111 endonasal surgeries (65.52 %) and 2163 nose and sinus surgeries (34.48 %).

As for the complementary surgeries (Grid IV – Table 3),

- 627 cases (15.25 % out of the total number of surgeries) needed: lateral osteotomies +/- medium and hump removal.
- 748 cases (18.20 % out of the total number of surgeries) needed volumetric reduction of the lymphatic tissue from the rhinopharynx, the base of the tongue and the retrovelar area.

The double surgeries of the septum and the turbinates are very frequent (Figures 1 and 2); this is the main objective and time frame of these interventions.

As for the operations involving nasal cavities and paranasal sinuses, in most of the cases sep-

tal and inferior turbinates surgery is combined with various operations on the elements of the medium meatus comprised by the term "middle meatotomy" (uncinectomy, middle meatotomy, anterior or posterior ethmoidectomy) (Figures 2 and 4).

As far as the numerical development within the research period is concerned, the number of solely endonasal surgeries hardly varied between 2001 and 2005; later, between 2005 and 2010 there were fewer surgeries (Figure 3). Simultaneously, the number of nasal and sinuses operations had a continuous growth (Figure 4).

As far as quality is concerned, there were only a few septal surgeries with a single objective (the septum); most of these operations were associated with valve or inferior turbinates surgery. There was also a very limited number of large cartilage or bone resection in favour or septoplasties; the latter aims at preserving as much as possible the septal cartilage (5), reshaping (Figure 5) and repositioning the cartilage, rebuilding the septal and pyramidal unit.

The number of inferior turbinates operations hardly varied in endonasal surgery (Figure 3), but there was a serious growth in the nose and sinus surgery (Figure 4). There are various

Rhinopharyngeal surgery
Uvuloplasty
Uvuloveloplasty
Uvulovelopharingoplasty
Reduction of the base of tongue
Otology: transtimpanic tube type diabolo

TABLE 3. The main complementary operations that involve the nose and the sinuses within the functional endonasal surgery permeability

Types of surgery	Endoscopy assisted
Classical surgery with cold instruments	+ / -
Electrocautery	+ / -
Surgery ultrasound	+ / -
Radiofrequency surgery	+ / -
Laser surgery	+ / -
Powered instruments (Shavers)	+ / +

TABLE 4. The main types of technologies

Endoscopic examination
Contact videoendoscopy
Imaging examination
Function tests (rhinomanometry)
Histopathological results (biopsy, immunohistochemical examination)
Otology: transtimpanic tube type diabolo

TABLE 5. The main postoperative control techniques

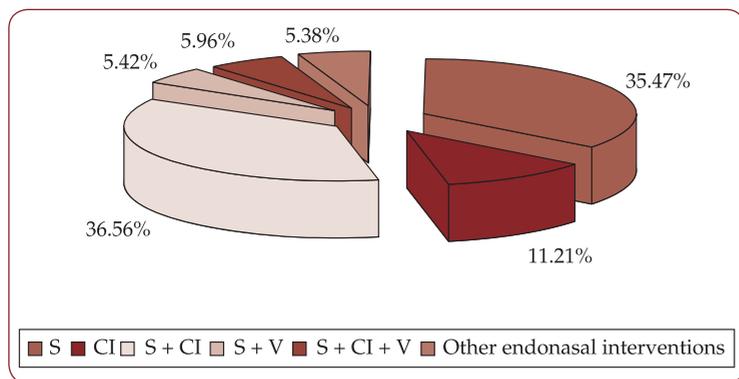


FIGURE 1. Graphical representation of endonasal surgery (S - septal surgery, CI - inferior turbinate surgery + V - valve surgery).

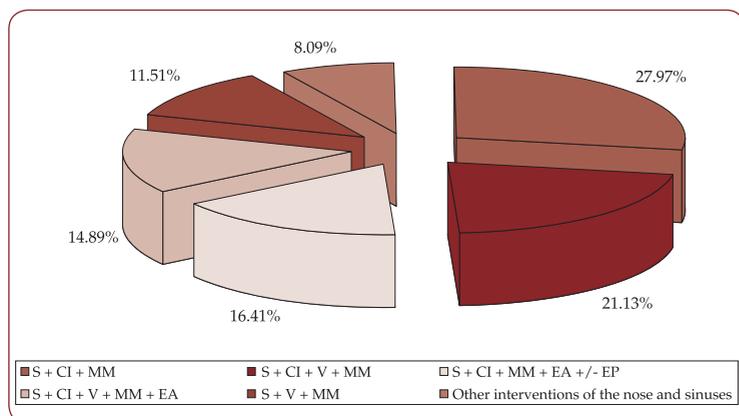


FIGURE 2. Graphical representation of the interventions that involve the nose and sinuses (S - septal surgery, CI - inferior turbinate surgery, V - valve surgery, MM - middle meatotomy, EA - anterior etmoidectomy, EP - posterior etmoidectomy).

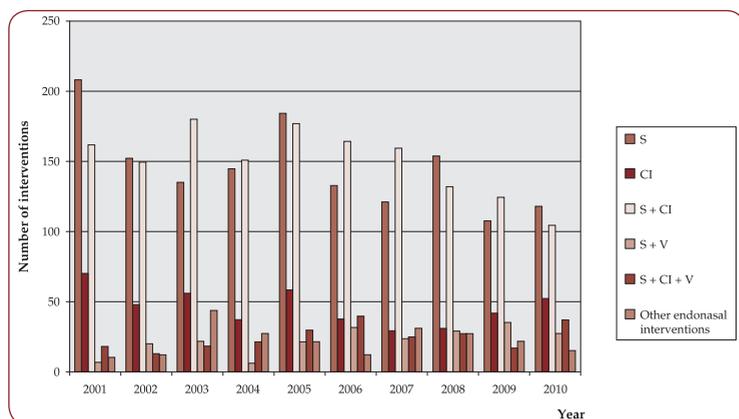


FIGURE 3. Graphical representation of the annual distribution of the main types of endonasal surgery (S - septal surgery, CI - inferior turbinate surgery + V - valve surgery).

volumetric reductions of the turbinates hypertrophic tissue (electrocauterization, mucotomy, radiofrequency, microdebrider, laser, partial turbinate surgery, submucous resection, turbinate plasty).

Nasal valve surgery had the most important development, both from a quantitative perspective (Figure 4) (through more frequent diagnosis of the valve pathology, based on numerous sources of information and functional and endoscopic explorations), and a quantitative perspective (through a variety of operating techniques, considering the anatomic part: triangular cartilage, alar cartilage, septum, inferior turbinates, valve angle).

There are some important elements worth mentioning: endonasal splints, which are used in cases of mucous membrane damage to prevent septal turbinate synechia; tamponade materials developed in time, from lint bandage to expandable Merocel sponge (6) and the remarkable progress of the tools and technology (Grid V – Table 4), as well as the endoscopic nose and sinus interventionist surgery techniques. □

DISCUSSIONS

The first period of the research was characterized by single objective surgery or by operations concerning more endonasal elements, without considering the larger picture made of nose-sinuses-medium ear. The second period was characterized by a visible development of the whole concept regarding all anatomic areas influencing the ventilatory function; therefore, there was an increased number of complex surgeries with multiple objectives.

By analysing the surgical technology with the IFACF ORL (Grid V – Table 4) concerning the operations and the necessary tools, we consider the following comments to be relevant:

- there is no doubt that the large variety of surgical techniques and procedures developed from the technology and the tool development in the last years;
- technological diversity is used especially in surgeries on turbinates and the hypertrophic tissue of the uvula and the velum (7);
- there is an increasing number of endoscopic septoplasties; it is a more accurate intervention than the classical surgeries under the frontal lamp;
- the video and the endoscopic approach of the rhinopharynx (8,9) is a method established and improved within the clinic in the last years; it is meant to expose the hidden parts of the rhinopharynx;

Considering our surgical experience, we believe that the ideal of functional endonasal permeability surgery can be achieved by simultaneously having:

- classical tools (cold tools);
- radiofrequency equipment;
- endoscopic equipment;
- microdebrider.

One has to notice the possibility of the objective postoperative control (Grid VI – Table 5), that allows post operation surgery at the right time, in case of need. It is another important element developed simultaneously with the development of surgical techniques and technology. □

CONCLUSIONS

The quantitative and qualitative variety led in a short time to a new surgical approach of the nasal obstruction syndrome. Thus by minimum surgery with limited tissue trauma and a large preservation of the mucous membrane and the olfactory function one has as a purpose the complete functionality of the ventilating nose-sinus and nose-pharynx-larynx complex.

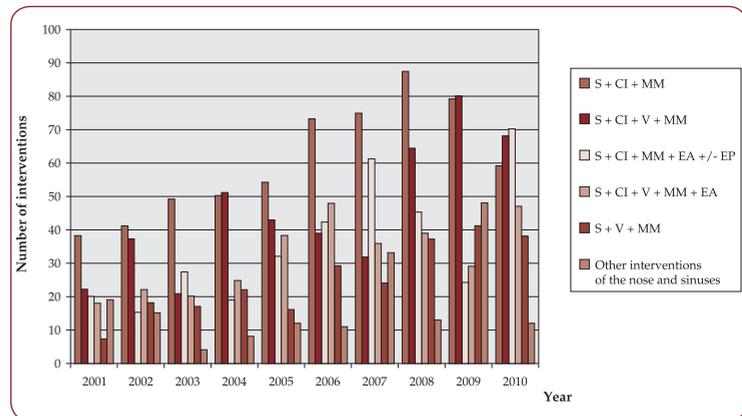


FIGURE 4. Graphical representation of the annual distribution of the main type of interventions that involve the nose and the sinuses (S - septal surgery, CI - inferior turbinate surgery, V - valve surgery, MM - middle meatotomy, EA - anterior etmoidectomy, EP - posterior etmoidectomy).

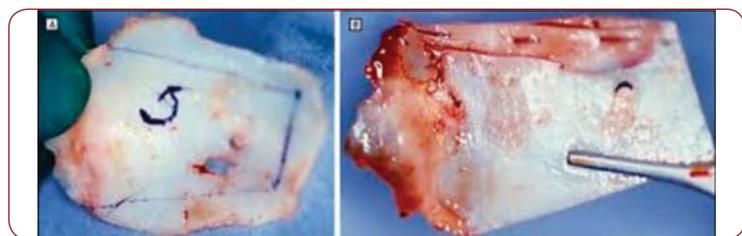


FIGURE 5. Intraoperative element: „ex situ” preparation of the septal cartilage.

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