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EDITORIAL

Morpho-functional, evolutive and medicolegal issues in rhinosinusal endoscopic surgery

Mihail Dan Cobzeanu
University of Medicine and Pharmacy “Grigore T. Popa” Iasi

Rhinocerotic and allergic chronic pathology is constantly increasing in frequency. Therefore, achieving an accurate diagnosis, by detecting any anatomical malformations, presenting the limits and bone rhinosinusal landmarks with vasculo-nervous endo- and exocranial elements, and especially with those of the orbit and of the base of the skull, represent the main conditions in the approach of rhinosinusal minimally invasive endoscopic surgery.

Conventional rhinosinusal surgery, by external or endonasal approach, has represented for many years the “touchstone” of ENT surgeons, due to the risks and complications that may arise through reports of the ethmoid cells with surrounding elements. Dangerous proximity of vasculo-nervous structures and the orbit, their viewing difficulties and haemostasis, often led to intra and postoperative complications, difficult to be prevented and treated. Because of these aspects, we consider useful presenting the main anatomical landmarks, the difficulties of the surgical approach, and also the complications of endoscopic surgery by their medicolegal implications.

IMPORTANT ANATOMICAL LANDMARKS IN RHINOSINUSAL ENDOSCOPIC SURGERY (FESS)

The fronto-ethmoido-spheno-maxillary complex and the lateral wall of the nasal fossa represent the most important anatomic structures when performing a rhinosinusal endoscopic surgery. The insertion area of the middle turbinate can be considered the basic landmark, limiting the pierced lamina of the ethmoid (with the olfactory bulb), its upper wall and the lamina papyracea (inner wall of the orbit). During the surgical intervention, dehiscence of the orbit inner wall may cause injuries of the orbital structures - internal rectus muscle, the anterior and posterior ethmoidal arteries.

Posterior ethmoidal cells are in close relationship with the sphenoid sinus and, through the latter, with the optic nerve, the optic chiasma (if it has posterior location), the vidian nerve and the internal carotid artery. There is also the possibility of bone dehiscence by bulging of the carotid artery in the sphenoid sinus, as well as the optic nerve passing through the sphenoid sinus; hence the importance of performing angio-MRI and a CT scanner preoperatively or intraoperatively1,2.

SURGICAL APPROACH DIFFICULTIES IN RHINOSINUSAL ENDOSCOPIC SURGERY (FESS)

The narrow approach path, the depth of the operative field, the loco-regional anatomotopographic malformations represent surgical approach difficulties; in achieving haemostasis, they are the reason for operative complications and accidents. Endoscopic approach, as compared to the classic one, is superior by preventing loco-regional functional and aesthetic sequelae, presenting however an increased rate of complications, especially for untrained surgeons3.

COMPLICATIONS OF RHINOSINUSAL SURGERY

Complications after rhinosinusal endoscopic surgery have a rate between 2-4% for experienced surgeons,

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email: cobzeanu_dan@yahoo.com
but this percentage can increase with beginners, less experienced. The share of severe, major complications (loss of an eye) or meningoencephalitic ones is nevertheless low\textsuperscript{1,4,5}.

**MINOR COMPLICATIONS**

1. Accidental injury to the lamina papyracea causes an eyelid bruise and protrusion of orbital fat in the nasal fossa; orbital emphysema signals bone fracture and pressure on the eyeball.
2. Closing of the meatotomy and appearance of septoturbinary or meatus synechiae block sinusal drainage; thus, it often requires initial cutting of the synechiae and, sometimes, even partial or complete cutting of the middle turbinate.
3. Supra- and suborbital neuralgia (dehiscence of the bone channel in the superior wall of the maxillary sinus) or dental neuralgia.

**SEVERE COMPLICATIONS**

1. Intraorbital expansive hematoma that, by compression of the optic nerve, can cause blindness. Careful intraoperative monitoring of the eyeball and pupil is necessary in order to early detect a hematoma.
2. Cephalalgic syndrome determined by the frontal recess injury, its obstruction or fibrosis, secondary to stenosis.
3. Lesions of the internal and oblique rectus muscle which determine motility disorders of the eyeball and, secondarily, vision disorders, together with accentuation of the cephalalgic syndrome.
4. The meningoencephalitic clinical features may appear, suggesting lesions of the anterior section of the skull base, with meningitis or even cerebral lesions, and appearance of rhinoliquorrhea.

**MAJOR COMPLICATIONS**

The major complications are, fortunately, rare and are due either to some malformations represented by bone dehiscences or variable trajectories of the optic channel, coupled with the surgeon’s lack of experience. It is worth mentioning the leptomeninges injury, CSF fistula and, very serious, amaurosis by injuries, beginning with transient vascular spasm, compression through orbital hematoma, and less often visual blindness. The supero-external manoeuvres, as well as electrical haemostasis are forbidden in this region.

In case of CSF fistula, the highest and most feared risk is suprainfection causing cerebral lesions. Diffuse encephalitis or purulent meningitis can occur, being hard to handle.

Cataclysmic haemorrhage can occur due to either injury of a large arterial vessel, of an aneurism, or cavernous sinus injury during sphenoidal sinus surgery.

**MALPRACTICE AND MEDICOLEGAL ISSUES**

All these complications can be avoided by performing a CT scanner or an angio-MRI preoperatively, coupled with caution (initially) and a correct technique of the surgeon\textsuperscript{6}.

In order to avoid such complications, the ENT doctor needs to gradually increase the complexity of the surgery interventions, initially under the guidance of a more experienced surgeon, to assist in various endoscopic interventions, to attend postgraduate training courses, with the purpose of both acquiring surgical techniques and, especially, resolving any complications.

It is important to establish from the very beginning the surgical landmarks (if any), and in case of massive bleeding and lack of orientation in the operative field, interruption of the surgical intervention is preferred, even before its completion.

Choosing the appropriate instruments, microscope or certain endoscopic optics for adequate visualization of lesions, may limit complications or possible errors generating medicolegal implications\textsuperscript{7}.

Obtaining the patient’s informed consent is compulsory, taking into account the possibility of complications or of postoperative morphofunctional sequelae. At the end of the surgical interventions, it is absolutely necessary to draw up a complex surgery protocol, by describing the stages of the intervention, specifying the problems appeared intraoperatively, as well as the solutions adopted to solve them (especially those related to haemostasis, discovery of certain malformations or anatomical variants).

**REFERENCES**

Pneumatization of the inferior turbinate - imaging study

Vasilica Baldea¹, M. D. Cobzeanu², Mihaela Moscalu³

¹ENT Ambulatory Service “N. Titulescu”, Buzau, Romania
²University of Medicine and Pharmacy Iasi, ENT Department, “Sfantu Spiridon” Emergency Hospital, Iasi, Romania
³University of Medicine and Pharmacy, Department of Medical Informatics and Biostatistics, Iasi, Romania

ABSTRACT

BACKGROUND. Pneumatization of the inferior turbinate is a very rare intranasal, extrasinusal anatomic variant, usually discovered by imaging. The pneumatization of the inferior turbinates implies the presence of a well-defined aerated cavity, with variable shape and dimensions. Therapeutic attitude depends on symptoms and the relationship between the pneumatization and paranasal sinuses.

MATERIAL AND METHOD. We conducted a retrospective anatomo-imagistic study, for a period of 2 years, on 205 CT scans having as target organ the face sinuses region, in symptomatic adult patients, aged between 18 and 91 years, out of which 97 were women (47.32%), and 108 men (52.68%). The cranio-facial CT scans were made with a spiral, multiplan, high resolution technique.

RESULTS. The research found 10 cases with inferior turbinate pneumatization, with a prevalence of 4.88%, out of which 6 women (29.2%) and 4 men (19.5%). Statistical analysis showed that there is a slight predisposition of females for inferior turbinate pneumatization (RR=1.67). Most of the subjects presented more extrasinusal pneumatizations, anatomic variants of the endoscopic surgical landmarks involved in a possible etiology of rhino-sinusitis or of increased surgical risk. Given its rarity and sporadic reports in the literature, we will describe, by means of a suggestive iconography, all identified cases of inferior turbinate pneumatization.

CONCLUSIONS. Inferior turbinate pneumatization is a rare anatomic variant present in both sexes, with drainage into the inferior meatus, that may or may not communicate with the ipsilateral maxillary sinus. It can be unilateral or bilateral, isolated or associated with pneumatization of one or more nasal turbinates, with other extrasinusal pneumatizations or sinusal hyper-pneumatizations of the rhino-sinusal structures and its diagnosis is entirely imagistic, best on coronal CT.

INTRODUCTION

Pneumatization of the inferior turbinate is a very rare intranasal, extrasinusal anatomic variant, usually discovered by imaging, when an etiologic review of a nasal respiratory failure or of a recurrent chronic rhino-sinusitis is performed.

The inferior turbinate, a triangular bone independent of the ethmoid, inserted into the turbinal crest of the upper jaw through its upper edge, laterally delineates the inferior meatus; it represents an important anatomic landmark for the lacrimonasal duct, which has the nasal opening in the anterior meatal part¹. With a mucosa having a cavernous-type vascular tissue, it is involved in the respiratory physiology, while through its anterior section, it takes part in the formation of the nasal valve, the narrowest region of the nasal passage².

Cranio-facial CT scans reveal the inferior turbinate, on its coronal slices, like a comma with tissue density, centered by a bone lamella, on both sides of the nasal septum; the axial slices are like two elongated ellipses, along the external wall of the nasal fossae, with various degrees of hypertrophy, with tissue density, centered by a bone column.

Pneumatization of the inferior turbinates implies the presence of a well-defined aerated cavity, with variable shape and dimensions, which can communicate...
with the maxillary sinus when it is found in the middle section and presents its own ostium. Otherwise, there is no such communication.

From a pathogenic point of view, pneumatization of the inferior turbinates can result by means of two mechanisms:

a) invagination and loculation of a fragment of embedded intraturbinal epithelium („vase clos”) in the turbinate and isolated by ossification of the lamellas that represent the inferior turbinate;

b) extension of the pneumatization in the inferior turbinate starting from the insertion root on the maxillary, or alterations of the adjacent sinus ventilation (maxillary).

Pneumatization can be unilateral or bilateral, isolated or associated with other turbinate and/or extrasinusal pneumatizations or other rhino-sinusal anomalies.

The diagnostic key is represented by the cranio-facial CT, coronal slices, that reveals pneumatization as a cavity with a well-defined contour, of airy density, rounded or having the shape of a comma with a thicker infero-internal end, and of variable dimensions. The pneumatization can be limited or extensive, with a single cell or multicellular, unilateral or bilateral. Using the sagittal reconstruction, one can observe the extent of the pneumatic cavities as compared to the turbinate as a whole. All three research plans emphasize its isolated character or multiple extrasinusal pneumatizations (middle turbinate, superior turbinate, crista galli apophysis).

For the pneumatization of the inferior turbinate, Ozturc and collaborators mention a prevalence of 1/250.

Therapeutic attitude depends on symptoms and the relationship between the pneumatization and paranasal sinuses. If there are no clinical features, refraining from surgery is the rule.

AIM OF THE STUDY

In a retrospective imagistic study including 205 CT scans of the face sinuses region for ENT symptomatic patients, the research had the following objectives:

1. determining the prevalence of the inferior turbinate pneumatization;
2. the correlation between rhino-sinusitis and the inferior turbinate pneumatization;
3. identification of other extrasinusal pneumatizations or of certain anatomic variants of interest for the rhino-sinusal endoscopy.

MATERIAL AND METHOD

We conducted a retrospective anatomo-imagistic study, for a period of 2 years and 6 months (January 2008 - June 2010), on 205 CT scans having as target organ the face sinuses region, in symptomatic adult patients; they presented for an ENT consultation at the “N. Titulescu” Ambulatory, at the emergency room of the Buzau County Hospital or at the ENT Clinic of “Sf. Spiridon” Iasi Hospital and they performed this preoperative imagistic review in the profile centers from the counties of Buzau, Bucharest or Iasi.

We evaluated adult patients, aged between 18 and 91 years (with an average age of 47.61 years), out of which 97 were women (47.32%) and 108 men (52.68%). The results refer to a segment of the population (symptomatic ENT patients) and not to the general one.

For accurate images, the cranio-facial CT scans were made with a spiral, multiplan, high resolution technique, which allows complex bone reconstructions in 3 planes: the coronal plane perpendicular to the hard palate, the axial slices parallel to the hard palate, and the coronal slices perpendicular to the same previously mentioned landmark.

We considered inferior turbinate pneumatization the presence of any aerated cell at this level, regardless of size or location.

RESULTS

The present research found 10 cases with inferior turbinate pneumatization, in the 205 patients, with a prevalence of 4.88% (Table 1, Figure 1), out of which 6 women (6/205, with a percentage of 2.92%) and 4

<table>
<thead>
<tr>
<th>Cranio-facial CT scan</th>
<th>Case no.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Presence of inferior turbinate pneumatization</td>
<td>10</td>
<td>4.88%</td>
</tr>
<tr>
<td>Absence of inferior turbinate pneumatization</td>
<td>195</td>
<td>95.12%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>205</strong></td>
<td></td>
</tr>
</tbody>
</table>
Baldea et al. Pneumatization of the inferior turbinate

Statistical analysis (Table 3, Table 4) showed that there is a slight predisposition of females for inferior turbinate pneumatization (RR=1.67), but one cannot consider that there is a significant association between this anatomic variant and females ($\chi^2=0.687, p=0.4101, 95\% \text{ CI}$).

Unilateral types were represented by 6 cases (2.93\%), and the bilateral ones by 4 cases (1.95\%) (Table 5, Figure 3).

Statistical indicators of the age of patients with inferior turbinate pneumatization are illustrated in Table 6.

The average age of patients with nasal inferior turbinate pneumatization (Table 7, Figure 4) was 42.1 years ± 19. Statistical indicators of the sex of patients presenting this anatomic variant are described in Tables 2-4 and in Figure 2, while indica-

<table>
<thead>
<tr>
<th>Patients</th>
<th>Inferior turbinate pneumatization</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>present</td>
<td>absent</td>
</tr>
<tr>
<td>female</td>
<td></td>
<td></td>
</tr>
<tr>
<td>%</td>
<td>6.19%</td>
<td>93.81%</td>
</tr>
<tr>
<td>male</td>
<td></td>
<td></td>
</tr>
<tr>
<td>%</td>
<td>3.70%</td>
<td>96.30%</td>
</tr>
<tr>
<td>Total</td>
<td>10</td>
<td>195</td>
</tr>
</tbody>
</table>
Table 3
Estimated parameters in associating patients’ sex vs. presence of inferior turbinate pneumatization

<table>
<thead>
<tr>
<th></th>
<th>Chi-square $\chi^2$</th>
<th>$P$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yates Chi-square - $\chi^2$</td>
<td>0.687</td>
<td>0.410465</td>
</tr>
<tr>
<td>Correlation coefficient (Spearman Rank R)</td>
<td>0.3547</td>
<td>0.354412</td>
</tr>
</tbody>
</table>

Table 4
Estimating the parameters of confidence - inferior turbinate pneumatization vs. patients’ sex

<table>
<thead>
<tr>
<th></th>
<th>Estimated value</th>
<th>95% Confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Minim</td>
</tr>
<tr>
<td>PARAMETERS: Odd - based</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Odds Ratio (OR)</td>
<td>1.71</td>
<td>0.41</td>
</tr>
<tr>
<td>PARAMETERS: Risk - based</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Risk Ratio (RR)</td>
<td>1.67</td>
<td>0.49</td>
</tr>
</tbody>
</table>

Table 5
Case repartition according to the type of inferior turbinate pneumatization

<table>
<thead>
<tr>
<th>INFERIOR TURBINATE PNEUMATIZATION</th>
<th>Case no.</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Absence of inferior turbinate pneumatization</td>
<td>195</td>
<td>95.12%</td>
</tr>
<tr>
<td>Unilateral</td>
<td>6</td>
<td>2.93%</td>
</tr>
<tr>
<td>Left</td>
<td>2</td>
<td>0.98%</td>
</tr>
<tr>
<td>Right</td>
<td>4</td>
<td>1.95%</td>
</tr>
<tr>
<td>Bilateral</td>
<td>4</td>
<td>1.95%</td>
</tr>
<tr>
<td>Total</td>
<td>205</td>
<td></td>
</tr>
</tbody>
</table>

Figure 3  Case repartition according to the type of inferior turbinate pneumatization

Type of inferior turbinate pneumatization

Given its rarity and sporadic reports in the literature, we will describe, by means of a suggestive iconography, all identified cases of inferior turbinate pneumatization.
Table 6
Age related statistical indicators according to the inferior turbinate pneumatization

<table>
<thead>
<tr>
<th>Inferior turbinate pneumatization</th>
<th>Mean age</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Absent</td>
<td>47.7</td>
<td>17.6</td>
<td>18</td>
<td>91</td>
</tr>
<tr>
<td>Present</td>
<td>42.1</td>
<td>19.0</td>
<td>23</td>
<td>81</td>
</tr>
<tr>
<td>Total</td>
<td>47.5</td>
<td>17.7</td>
<td>18</td>
<td>91</td>
</tr>
</tbody>
</table>

Table 7
The test comparing age average values and the presence of inferior turbinate pneumatization

<table>
<thead>
<tr>
<th>Age</th>
<th>F (95% confidence interval)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>ANOVA test</td>
<td>0.666551</td>
<td>0.415214</td>
</tr>
</tbody>
</table>

Figure 4  The mean age according with the presence of pneumatized inferior turbinate

CASE 1

It is a 48 year-old female patient (Figure 5), with right inferior turbinate pneumatization, nasal septum deviation, hypoplasia of the left inferior turbinate and deformation of the left maxillary sinus internal wall, without any other nasal turbinates pneumatizations. Other anatomic variants of clinical and therapeutic interest are associated at this level: type VII nasal septum deviation, having the septal crests situated on the left side, with the septum concavity at the level of the inferior turbinate pneumatization; hypotrophic, deformed left inferior turbinate, in contact with in the septal crest; the internal wall of the left maxillary sinus with a distorted “Z” form and an intrasinus septum. As in the concha bullosa case, inferior turbinate pneumatization may also be accompanied by a septal deviation, most often a contralateral one.

Figure 5  CT scan, bone window: 1. Pneumatized right inferior turbinate (green ellipse) 2. hypoplasia of the left inferior turbinate, ipsilateral deviation; 3.”Z”deformity of the external wall of the left nasal fossa; 4. Right naterior and posterior nasal septum deviation (Type VII)
CASE 2
It is a 30 year-old female patient with a bilateral pneumatization of the inferior turbinates (Figure 6a) associated with a right concha bullosa, left type III nasal septum deviation and hypoplasia of the left middle turbinate (Figures 6b-c). Pneumatization of the left inferior turbinate communicates with the maxillary sinus (Figure 6b).

CASE 3
It is a 26 year-old male patient (Figures 7-10) with the pneumatization of the left inferior, middle and superior turbinate (Figure 7), with a pathological process of the left maxillary sinus; due to the right pansinusitis, one cannot make assessments regarding the nasal fossa and the right paranasal sinuses. We have however selected the case for the interesting and rare association of the pneumatization of the three usual left nasal turbinates; this can be observed in Figure 7, in a coronal reconstruction at the level of the turbinates head. The pneumatized left superior turbinate is inserted into the lamina papyracea.

The two successive axial slices (Figure 8) initially show a posterior pneumatization of the left inferior

![Figure 6](image1)

**Figure 6** Cranio-facial CT scan, bone window, axial slice (a) and coronal reconstruction (b, c): a) bilateral inferior turbinate pneumatization (red arrow); on this slice, at this level can’t be identified the communication with the maxillary sinus; maxillary sinus (●); rhinopharynx (☼); b) on the coronal reconstruction (red arrow) the communication with the left maxillary sinus can be seen; the pneumatization of the right inferior turbinate remains isolated by the sinus. c) 1. Right concha bullosa; 2. Left nasal septum deviation, on the other side of the middle turbinate pneumatization; 3. Hypertrophy of the left middle turbinate

![Figure 8](image2)

**Figure 8** Cranio-facial CT, bone window, axial slices. a) 1. pneumatization of the posterior third of the inferior turbinate - one cell; pathological right maxillary sinus (●); left maxillary sinus (▼); b) 2. Pneumatization of the inferior turbinate - 2 cells; 3. Left uncinate process; 4. Communication between the pneumatized inferior turbinate and left maxillary sinus

![Figure 9](image3)

**Figure 9. a, b** Sagital bone reconstructions, bone window: a) 1. Trilocular concha bullosa (formed by three cells); b) 1. Trilocular concha bullosa, over which the left uncinate apophyse is projecting; 2. Pneumatized left uncinate apophyse, elongated; 3. Left agger nasi cell, hyperpneumatized; 4. Hyperpneumatization of the sphenoid sinus; 5. Pneumatization of the ethmoid bulla
turbinate, then a double pneumatization (anterior and posterior), as well as a wide communication with the homolateral maxillary sinus. The unciform apophysis is verticalized, with the distal end in the hook.

The sagittal reconstructions (Figure 9) identify the following associations: extensive trilocular left concha bullosa, left sphenoidal pneumosinus, pneumatized uncinate process.

CASE 4
It is a 56 year-old male patient with medium third pneumatization of the left inferior turbinate associated with (Figures 11-13): contralateral type V nasal septum deviation, pneumatization of the left uncinate process, bilateral extensive concha bullosa, dorsum sellae pneumatization, hyperpneumatization of the right ethmoidal bulla, left sphenoidal pneumosinus dilatans, internal carotid arteries prolapsing bilaterally, sphenoidal intersinus septum inserted into the right internal carotid artery.

CASE 5
38 year-old male patient (Figure 14) with pneumatization of right inferior nasal turbinate, with drainage into the corresponding inferior meatus, without any opening into the maxillary sinus. It associates a bilateral pneumatization of the uncinate process.
Figure 13  Cranio-facial CT scan: 1. Hyperpneumatization of the sphenoid sinuses; 2. Pneumatization of dorsum sellae; 3. Bilateral extensive concha bullosa

Figure 14  CT scan, axial slices. 1. Pneumatization of the right inferior turbinate; 2-3. Communication between the pneumatization of the inferior turbinate and middle meatus; 4. Pneumatization of the right inferior turbinate; 5. Bilateral pneumatization of the uncinate process
CASE 6

It is a 23 year-old male patient (Figures 15-16) with pneumatization of all nasal turbinates, visible on different slices. Pneumatization of the inferior turbinate is bilaterally situated in the medium third, while on the left side it communicates with the maxillary sinus (Figure 15). This anatomic variant associates: bilateral extensive concha bullosa, extensively pneumatized superior turbinates of small dimensions, bilateral supreme turbinate, left hyperpneumatized ethmoidal bulla, type IV nasal septum deviation, accessory ostium of the right maxillary sinus, inflammatory process of the left maxillary sinus (liquid level), supreme right turbinate (Figures 16 a-b).

![Image of CT scan with annotations](image1.png)

**Figure 15.** Cranio-facial CT scan, bone window, axial slice. 1. bilateral pneumatization of the inferior turbinate; 2. right - no communication with the maxillary sinus; left - the drainage of the pneumatized inferior turbinate into the maxillary sinus.

![Image of CT scan with annotations](image2.png)

**Figure 16. a** Cranio-facial CT scan, bone window, coronal reconstruction: 1. Inferior turbinates pneumatization; 2. Pneumatization of the left middle turbinate; 3. Bilateral lamellar concha bullosa

**Figure 16. b** 1. pneumatization of the inferior turbinates; 2. bifid middle turbinate with paradoxal curve; 3. bilateral lamellar concha bullosa; 4. left supreme turbinate; 5. drainage of the superior turbinate concha bullosa; 6. nasal septum deviation (type IV); 7. hyperpneumatized left ethmoidal bulla; 8. accessory right maxillary sinus ostium; 9. bilateral extensive concha bullosa of the middle turbinate; 10. right supreme turbinate; 11. bilateral pneumatization of the superior turbinate
CASE 7

81 year-old female patient (Figures 17-21) with pneumatization of the right inferior turbinate and it associates: bilateral hyperpneumatization of supreme turbinate of type C, sinusal hyperpneumatizations (left frontal pneumatocel and right frontal hypersinus, sphenoidal pneumosinus dilatans) and extrasinusal hyperpneumatizations; pneumatization of the right inferior and left superior turbinates, dorsum sellae pneumatization, anterior clinoid processes, vomer, a hyperpneumatized left Onodi cell, bilaterally hyperpneumatized ethmoidal bulla, as well as paradoxical incurvation of the left superior turbinate.

Hyperpneumatization of the supreme turbinate bilaterally generates a mucosal contact (synechiae) with the supreme turbinate, and also with the nasal septum on the left side (by developing this type of concha bullosa between the nasal septum and the superior turbinate). Hyperpneumatization of the frontal and sphenoidal sinuses might be caused by the pneumatization of the superior and supreme turbinate through sinus drainage disorders. There are physiopathological conditions for an inflammatory process of the anterior sinuses, but imaging provides minimal change in this aspect (thickening of mucus).

Figure 17  Cranio-facial CT scan. 1) pneumatization of the right inferior turbinate without communication with the maxillary sinus; 2) right maxillary sinus

Figure 18  Cranio-facial CT scan, coronal reconstruction. 1. type C supreme turbinate with hyperpneumatization; 2. right superior turbinate; 3. hypertrophic inferior turbinates; 4. paradoxically incurved left superior turbinate; 5. hyperpneumatized type C supreme turbinate with sphenoid sinus communication; 6. hyperpneumatization of the left superior turbinate; 7. type V left nasal septum deviation; 8. hypertrophic middle turbinate; 9. bilateral hypertrophic maxillary sinus mucosa

Figure 19  Cranio-facial CT scan, coronal reconstruction. 1. hyperpneumatization of the left superior turbinate; 2. hyperpneumatization of the frontal sinuses (left - pneumatocel, right - hypersinus); 3. small middle turbinate, elongated; 4. bilateral inflammation of the maxillary sinus

Figure 20  Bilateral hyperpneumatization of the ethmoidal bulla; 2. pneumatization of dorsum sellae; 3. hyperpneumatized sphenoid sinus (pneumosinus dilatans), without intersinusal septum

Figure 21  Cranio-facial CT scan, coronal bone reconstruction. 1. pneumatization of the anterior clinoid process; 2. left hyperpneumatized Onodi cell; 3. hyperpneumatization of the right supreme turbinate - concha bullosa drainage in sphenoid sinus; 4. pneumatization of the vomer
CASE 8

64 year-old female patient presenting pneumatization of the right inferior turbinate in the anterior third, with drainage into the right inferior meatus and communication in the homolateral maxillary sinus (Figure 22). It associates only sinusal hyperpneumatizations (frontal, bilateral posterior ethmoidal and sphenoidal). Study of medical documents reveals complaints of headache and nasal obstruction, while anterior rhinoscopy revealed hypertrophic inferior turbinates. The cause of this increase in volume has been the pneumatization of the inferior turbinate, essentially discovered radiologically.

CASE 9

30 year-old female patient with bilateral pneumatization of the inferior nasal turbinate without communication with the maxillary sinus, drainage being made into the inferior meatus (Figure 23). This anatomic variant also associates: hyperpneumatizations of the paranasal sinuses (bilateral frontal pneumosinus dilatans and sphenoidal hypersinus) and of the extrasinusual ones: pneumatization of the superior nasal turbinates, of the right supreme turbinate of type C, bilocular bilateral concha bullosa, hyperpneumatization of the right agger nasi cell, of the right ethmoidal bulla, hyperpneumatized right Onodi cell (Figures 24-26).

As regards the pneumatization of the supreme turbinate, coronal slices show a double size as compared to the homolateral superior turbinate, thus fitting in type C; it anteriorly insinuates between the right supreme turbinate that is paradoxically incurved and the nasal septum, causing mucosal contact (both at the level of the septum and of the superior turbinate). This situation theoretically leads to potential drainage difficulties of the posterior sinuses and modifications of the ostiomeatal complex. In this case however, one cannot observe by imaging a clear inflammatory reaction in the posterior nasal sinuses. There are nevertheless inflammatory changes (retention cyst) in the right maxillary sinus.

CASE 10

33 year-old female patient with bilateral pneumatization of the inferior turbinate that communicates on the left side with the maxillary sinus (Figure 27). The case associates: pneumatization of vomer, superior and supreme left turbinate, left uncinate process, right anterior clinoid process, left extensive and right linear concha bullosa, bilateral paradoxical incurvation of the middle turbinate.

Table 8 presents the association of other sinusual or extrasinusal pneumatizations, of rhino-sinusitis, of other anatomic variants of interest, in the cases identified with pneumatization of the inferior turbinate:

Study of the correlation of the nasal inferior turbinate pneumatization with rhino-sinusitis is emphasized in Tables 9-11 and in Figure 30.
Figure 24  Cranio-facial CT scan, coronal reconstruction: 1. type C, hyperpneumatized right supreme turbinate; 2. paradoxically incurved right superior turbinate; 3. inflammatory process (retention cyst) in the right maxillary sinus; 4. bilateral inferior turbinate hypertrophy; 5. left supreme turbinate; 6. left superior turbinate; 7. pneumatization of the vomer

Figure 25  Cranio-facial CT scan, coronal reconstruction. 1. frontal sinus (bilateral pneumosinus); 2. Keros type II (6.9 and 6.5 mm) variant of the ethmoid roof; 3. right concha bullosa

Figure 26  Cranio-facial CT scan, bone window, axial slice: 1. hyperpneumatization of the right Agger nasi; 2. bilateral bilocular pneumatization of the middle turbinate (two cells); 3. pneumatization of the right superior turbinate; 4. right Onodi cell; 5. pneumatization of the right supreme turbinate; 6. hyperpneumatization of the sphenoid sinus, with no intersinusal septum; 7. pneumatization of the left superior turbinate

Figure 27  Cranio-facial CT scan, bone window, axial slices: 1. bilateral pneumatization of the inferior turbinate (middle part); 2. pneumatization of the inferior turbinate with inferior meatus drainage; 4. communication with the left maxillary sinus (red line)
Baldea et al Pneumatization of the inferior turbinate

Figure 28  Cranio-facial CT scan, coronal reconstruction: 1. pneumatization of the left inferior turbinate; 2. extensive left concha bullosa; 3. paradoxically incurved middle turbinate; 4. pneumatization of the right supreme turbinate

Figure 29  Cranio-facial CT scan, bone coronal reconstruction: 1. pneumatization of the left anterior clinoid process; 2. pneumatization of vomerului; 3. pneumatization of the left uncinat process

Table 8  Association of other anatomic variants with pneumatizations of the inferior turbinate

<table>
<thead>
<tr>
<th>No.</th>
<th>Age (years)</th>
<th>Sex</th>
<th>Other extrasinusal/sinusal pneumatizations</th>
<th>Other anatomic variants of the surgical landmarks</th>
<th>Association of anterior sinusitis</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>48</td>
<td>F</td>
<td>-</td>
<td>nasal septal deviation, middle turbinate hypoplasia, deformation of the sinus internal wall</td>
<td>+</td>
</tr>
<tr>
<td>2</td>
<td>30</td>
<td>F</td>
<td>right middle turbinate concha bullosa</td>
<td>nasal septal deviation, middle turbinate hypoplasia</td>
<td>+</td>
</tr>
<tr>
<td>3</td>
<td>26</td>
<td>M</td>
<td>middle turbinate, superior turbinate, posterior clinoid, dorsum sella</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>4</td>
<td>56</td>
<td>M</td>
<td>bilateral middle turbinate concha bullosa, posterior clinoid, dorsum sella, ethmoidal bulla</td>
<td>nasal septal deviation, protruding internal carotid arteries, sphenoidal intersinus septum inserted in the vessel</td>
<td>+</td>
</tr>
<tr>
<td>5</td>
<td>38</td>
<td>M</td>
<td>bilateral uncinate process, bilateral agger nasi</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>6</td>
<td>23</td>
<td>M</td>
<td>bilateral middle turbinate concha bullosa, ethmoidal bulla</td>
<td>bifurcate middle turbinate, supreme turbinates, septal deviation, accessory ostium of the maxillary sinus</td>
<td>+</td>
</tr>
<tr>
<td>7</td>
<td>81</td>
<td>F</td>
<td>bilateral supreme and superior turbinate</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>8</td>
<td>64</td>
<td>F</td>
<td>hyperpneumatizations of the ethmoid, sphenoid and frontal sinus</td>
<td>maxillary intrasinus septum, medialized uncinate process</td>
<td>-</td>
</tr>
<tr>
<td>9</td>
<td>30</td>
<td>F</td>
<td>right supreme turbinate, middle turbinate concha bullosa, agger nasi, ethmoidal bulla, Onodi cell</td>
<td>paradoxically incurved superior turbinate</td>
<td>+</td>
</tr>
<tr>
<td>10</td>
<td>33</td>
<td>F</td>
<td>middle turbinate concha bullosa, vomer, superior turbinate, uncinate process, crista galli, clinoid process</td>
<td>paradoxically incurvation of the middle turbinate, right supreme turbinate</td>
<td>+</td>
</tr>
</tbody>
</table>
Table 9
Case repartition according to the presence of the inferior turbinate pneumatization vs. anterior sinusitis

<table>
<thead>
<tr>
<th>Anterior sinusitis</th>
<th>Inferior turbinate pneumatization</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>present</td>
<td>absent</td>
</tr>
<tr>
<td>Present</td>
<td>8</td>
<td>104</td>
</tr>
<tr>
<td>%</td>
<td>80.00%</td>
<td>53.33%</td>
</tr>
<tr>
<td>Absent</td>
<td>2</td>
<td>91</td>
</tr>
<tr>
<td>%</td>
<td>20.00%</td>
<td>46.67%</td>
</tr>
<tr>
<td>Total</td>
<td>10</td>
<td>195</td>
</tr>
</tbody>
</table>

Figure 30  Case repartition according to the presence of the inferior turbinate pneumatization vs. anterior sinusitis

Table 10
Estimated parameters in the association anterior sinusitis vs. presence of inferior turbinate pneumatization

<table>
<thead>
<tr>
<th></th>
<th>(df=1)</th>
<th>Chi-square $\chi^2$</th>
<th>$P$</th>
<th>95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yates Chi-square - $\chi^2$</td>
<td></td>
<td>3.76</td>
<td>0.018471</td>
<td></td>
</tr>
<tr>
<td>Correlation coefficient (Spearman Rank R)</td>
<td></td>
<td>0.4356</td>
<td>0.030547</td>
<td></td>
</tr>
</tbody>
</table>

Table 11
Estimating the parameters of confidence - anterior sinusitis vs. inferior turbinate pneumatization

<table>
<thead>
<tr>
<th>PARAMETERS: Odd - based</th>
<th>Estimated value</th>
<th>95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Odds ratio (OR)</td>
<td>3.50</td>
<td>0.66</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PARAMETERS: Risk - based</th>
<th>Estimated value</th>
<th>95% confidence interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk ratio (RR)</td>
<td>3.32</td>
<td>0.72</td>
</tr>
</tbody>
</table>
In the studied group, there is a significant statistical association between the presence of the inferior turbinate pneumatization and the presence of the anterior rhino-sinusitis (Yates’ Chi-square - $\chi^2=3.76$; $p=0.018471$ and Spearman Rank $R=0.4356$; $p=0.030547$), while estimation of odd and risk parameters shows the following: chance of rhino-sinusitis is 3.5 times higher in patients with inferior turbinate pneumatization vs. patients without this anatomic variant (OR=3,50; RR=3,32 - Table 11).

DISCUSSIONS

From the first description of inferior turbinate pneumatization made in 1988 by Zinreich and collaborators, cases of this anatomic variant have been reported quite rarely. In 2003, Ingram reported a patient each. The last mentioned call into question the case of a 38 year-old woman with rhino-sinusitis and allergic manifestations. Until 2003, only 10 published studies presented this topic.

The prevalence of this anomaly in the studied group was 4.87%, predominantly women (60%), while by type, left unilateral forms prevailed. It is a slightly increased value as compared to Ozturc’s studies. In 2005, the latter performed a radiological analysis extended on a number of 250 CT scans and identified 10 cases (1/250, that is 0.4%), without any significant difference between sexes or age groups (since it can be found at all ages).

Regarding communication with the maxillary sinus, there were only unilateral forms, 3 on the right and 3 on the left, all these cases presenting a localization of pneumatization in the middle section of the inferior turbinate. Most of the cases (9/10) had associations of other extrasinusal pneumatizations, some of them unusual (pneumatization of the uncinate process, of the anterior and posterior clinoid processes), or of other anatomic variants worthy of consideration in a rhino-sinusal imaging review (paradoxical incurvation of middle or superior turbinates, middle turbinate hypoplasia, significant deviation of nasal septum). Also, there were associations of sphenoidal, frontal or posterior ethmoidal sinus hyperpneumatizations. A single case showed no extrasinusal pneumatizations, but hyperpneumatization of the frontal and sphenoidal sinus was present. Nasal inferior turbinate pneumatization associated in several subjects pneumatization of the other turbinates in different combinations.

Concerning rhino-sinusal inflammatory reactions, 8 out of 10 patients with inferior turbinate pneumatization presented signs of rhino-sinusitis. We cannot exactly quantify only the role of this anatomic variant because 8 out of 10 cases presented at least 2 extrasinusal pneumatizations (one of the subjects had 5, another even 7 such pneumatizations). To these we add a number of other variants of surgical landmarks that are important for the therapeutic plan or the surgical approach (between 2 and 5 variants in each case). In this research, the average age of patients presenting inferior turbinate concha bullosa was 42.9 years.

As Richardson and Brynn reported the case of a woman with manifestations of allergic rhino-sinusitis, among the subjects presented for inferior turbinate pneumatization (case 3), we have identified a patient who had symptoms of a recurrent rhino-sinusitis and a clinical aspect of inferior and middle turbinate hypertrophy. The case required an imagistic CT review. This investigation revealed a right pansinusitis which was operated. On CT slices, we identified pneumatization of the three nasal turbinates on the left side. Symptoms corroborated with data provided by imagistic investigation have allowed complete diagnostic with an appropriate therapeutic plan. Nasal obstruction on the left side might benefit from decongestant drug treatment, with local corticoids, and surgical treatment (septoplasty for nasal septum deviation and removal of the middle and inferior turbinate concha bullosa, left uncinecomy for the uncinate apophysis pneumatization; for the inferior turbinate pneumatization the option would be to refrain from surgical attempt).

In 2003 Braun H. and Stammberger H published an unusual case of turbinates pneumatization associated with hyperpneumatization of the paranasal sinuses. The authors reported pneumatization in 5 out of 6 nasal turbinates (only the pneumatization of an inferior turbinate was missing), crista galli apophysis, posterior section of the nasal septum associated with a Haller cell and hyperpneumatization of the frontal and sphenoidal sinus. The studied imaging revealed one case that had all the turbinates pneumatized on the left side (case 3).

Most of the cases identified (7/10, that is 70%) presented significant nasal septum deviation, in agreement with various authors who also report in cases with inferior turbinate pneumatization an association of septum deviation. In 2004, Uzun and Birol Ugur describe a case of unilateral pneumatization of the inferior turbinate associated with a septum deviation and maxillary retention cyst in a 25 year-old man with nasal obstruction.

Case 2 described in our personal study, a 30 year-old woman with bilateral pneumatization of the inferior turbinates associated with a right concha bullosa, left nasal septal deviation of type III...
and left middle turbinate hypertrophy, who presented symptoms of a persistent nasal obstruction, rhinorrhea and headache, resembles as type of naso-sinusual anatomic variants one of the three cases of inferior turbinate pneumatization published in 2004 by Yanaqisawa and Eiji19. Related to age and sex, these authors just like Unlu6, Kantarci and Murat20, find no significant differences between sexes, and this anatomic variant reveals it at all ages. In 2008, Eweiss, Khatwa and Yeitoun21 described an unusual anatomic variant of pneumatized inferior turbinate associated with a trifurcate middle turbinate; it is actually the first case reported in the literature of a middle turbinate split into three parts. In the studied group, we revealed a bifurcation of left middle turbinate, with pneumatization of one of them. Another unusual association of inferior turbinate pneumatization is reported by Sagit, Saka, Kuran and Akin22 who present a case of pneumatization of all the six turbinates in a 17 year-old young man: anterior rhinoscopy only revealed a bilateral hypertrophy of the left middle turbinate and inferior turbinates, associated with a septum deviation. CT scan showed a pneumatization of all six nasal turbinates, the case representing a purely imagistic diagnostic. In our personal group also, we could find a patient, a 23 year-old young man (case 6), with all 6 nasal turbinates pneumatized. He also presents 2 variants of the number of turbinates: a left bifid middle turbinate (in which one of the components is pneumatized) and a right supreme turbinate.

Yang and Chong23 make a 12-year retrospection by studying inferior turbinate pneumatization on CT. They used Bolger’s classification, according to which turbinate pneumatization is of three kinds: bulbous, lamellar and extensive, and they identify a number of 16 cases (14 unilateral, 2 bilateral). In our personal study unilateral cases prevailed too.

Communication of the pneumatized inferior turbinate with the maxillary sinus was present in 6 cases, representing 60% of these (3 on the left side, 3 on the right side), as compared to 8 cases, representing 44%, reported by Yang and Chong23. Existence of a concha bullosa can be clearly identified on CT, imaging being able to enlighten the clinician when differentiating between an inferior turbinate pneumatization and other hypertrophies. Data from the literature show a right prevalence24,25. In our personal research too, the number of registered cases show a right prevalence: 8 right vs. 5 left pneumatizations. Careful imagistic evaluation should provide a differential diagnosis of this anatomic variant with a “pseudo pneumatization of the inferior turbinate”, resulting from the contact of the inferior turbinate edge with the external wall of the nasal cavity. In this case, the external limit of the pneumatic cavity cannot be identified (Figure 31).

The cell that pneumatizes the inferior turbinate may present an inflammatory process (mucocele or “inferior turbinate sinusitis”) through a chronic inflammation caused by ventilation disorders. Such a case is reported in the literature by the Turkish authors, Göçmen H. and collaborators26. In the investigated casuistry, no inferior turbinate pneumatization presented an inflammatory process.

Inferior turbinate pneumatization does not usually present a particular evolutionary profile, except for the cases where there is a functional disturbance of the ostiomeatal complex.

**CONCLUSIONS**

Inferior turbinate pneumatization is a rare anatomic variant (prevalence of 4.87%), present in both sexes, with drainage into the inferior meatus, that may or may not communicate with the ipsilateral maxillary sinus.

It can be unilateral or bilateral, isolated or associated with pneumatization of one or more nasal turbinates, with other extrasinusal pneumatizations or sinusal hyperpneumatizations or other anatomic variants of the rhino-sinusual structures.

The inferior turbinate pneumatization diagnosis is entirely imagistic, best on coronal CT.

There is a significantly statistical association between the presence of rhino-sinusitis and the presence of inferior turbinate pneumatization (Yates Chi-square - \( \chi^2=3.76; p=0.018471 \) and Spearman Rank R=0.4356; OR=3.50; RR=3.32).

There is a slight predisposition of females for inferior turbinate pneumatizations (RR=1.67), but it cannot be said that there is a significant association between this anatomic variant and females (\( \chi^2=0.687, p=0.4101, 95\% \text{ CI} \).
REFERENCES

An epidemiological study of foreign bodies in the respiratory tract - the experience of two ENT departments in Romania

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ABSTRACT

INTRODUCTION. Being one of the most frequent ENT emergency, foreign bodies (FB) could lead to, even if not frequent, potential life-threatening complications.

STUDY OBJECTIVES. To identify the epidemiological aspects of foreign bodies in the respiratory tract (age/sex distribution, type of foreign bodies, complications, type of extraction maneuvers).

STUDY DESIGN. A retrospective clinical study performed using medical records in two ENT Departments from Bucharest, Romania, one of adults, and the other one pediatric, between January 2006 and December 2010.

RESULTS. 467 patients (156 adults and 311 children) were enrolled in the study. Main localization of FB in children was nasal fossae (65,27%) - seeds (24,7%) and plastic fragments (16,39%) were the most frequent FB; mean age was 4.12 years. Fish bones (87,17%) were the majority of FB in adults with localization at oropharynx (56,41%) and hypopharinx (37,82%). No major complications were recorded due to the foreign bodies presence or because of the extraction maneuvers.

CONCLUSIONS. Even if the incidence of foreign bodies in the nose and throat remains relatively low, they could be potentially harmful or even life-threatening to the patients. It is better to prevent aspiration of FB that cure it, so public awareness through needs attention furthermore to prevent foreign bodies inhalation.

INTRODUCTION

Foreign bodies (FB), whether in the upper airway, or the lower airway continue to represent a challenge to physicians who care for children and adults in the acute setting and can lead to important complications¹². According to the literature¹², foreign bodies are responsible, on average, for 11% of otorhinolaryngological emergencies; complications ensue in 22% of cases. With children and infants who have foreign bodies in their upper or lower airway, a high index of suspicion is required in order to make a timely diagnosis. Proper anticipatory guidance and education is the optimal way of reducing the tragic outcomes of choking events. In order to identify the circumstances of accidents and the impact of pathology, the epidemiological aspects are crucial.

This study reviews the most important epidemiological aspects encountered in this pathology and the current principles in the management of children and adults with foreign bodies in their respiratory tracts.

MATERIALS AND METHODS

We performed a retrospective study in two ENT Departments - one of adults and the other one pediatric. The analysis of the cases was made on patients between January 2006 and December 2010. Were enrolled 467 patients (156 adults and 311 children). Each patient was analyzed according to his age, sex, type and localization of the foreign body, symptoms and complications due the FB presence and also type of extraction maneuvers analyzing medical records from both ENT Departments. Study period: January 2006 - December 2010.
RESULTS

Children
- No of cases: 311;
- Ages ranging between 1-17 years, MEAN AGE = 3.68 years;
- Sex Ratio: M/F = 148/163.

The most common localization of foreign bodies in pediatric population were nasal fossae (203 cases, 65.27%) (Figure 1), followed by the tracheobronchial presence (67 patients, 21.54%), oropharynx (24 patients, 7.71%) and hypopharynx (14 cases, 4.50%) (Table 1). Larynx and rhynopharynx are the less encountered sites, with two and respectively one cases.

A very interesting analysis was made according to the type of foreign bodies encountered in the pediatric population. Most of the FB were organic (176 cases, 56.59%) (Chart 1), different types of seeds being the most frequent finding - 47 cases of sun-flower seeds, 23 peanuts, corn - 11 cases (Chart 2). Fish bones were also frequent - 26 cases (8.36%). From the anorganic FB (135 cases, 43.40%), plastic was the most frequent material encountered - 19 cases of toys, 17 cases of plastic marbles, 11 cases of plastic fragments. Also the watch batteries of various sizes (20 cases) and other types of marbles (20 cases) were other frequent recordings.

Adults
- No of cases: 156;
- Ages ranging between 17-84 years, MEAN AGE = 46.04 years;
- Sex Ratio: M/F = 85/71.

Comparative with the children population, in adults the most commune localization of FB was at the level of the oropharynx (88 cases, 56.41%), followed by hypopharynx (59 cases, 37.82%) and far less frequent nasal and laryngeal localization (5 and respectively 3 cases) (Chart 3).

Concerning the most frequent types of foreign bodies, in adult population the vast majorities were organic foreign bodies (151 cases, 96.8%) (Chart 4) being represented mostly by fish bones (136 cases,

<table>
<thead>
<tr>
<th>Localization</th>
<th>Children</th>
<th></th>
<th>Adults</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No. of FB</td>
<td>Percent</td>
<td>No. of FB</td>
<td>Percent</td>
</tr>
<tr>
<td>Nasal fossae</td>
<td>203</td>
<td>65.27%</td>
<td>5</td>
<td>3.20%</td>
</tr>
<tr>
<td>Tracheobronchial</td>
<td>67</td>
<td>21.54%</td>
<td>1</td>
<td>0.64%</td>
</tr>
<tr>
<td>Oropharynx</td>
<td>24</td>
<td>7.71%</td>
<td>88</td>
<td>56.41%</td>
</tr>
<tr>
<td>Hypopharynx</td>
<td>14</td>
<td>4.50%</td>
<td>59</td>
<td>37.82%</td>
</tr>
<tr>
<td>Rhynopharynx</td>
<td>2</td>
<td>0.64%</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>Larynx</td>
<td>1</td>
<td>0.32%</td>
<td>3</td>
<td>1.92%</td>
</tr>
</tbody>
</table>
87.17%). The other types of FB (as showed in Table 2) are encountered sporadically.

Regarding complications encountered due to the presence of the foreign bodies or due to the extraction maneuvers:

• No life-threatening complications were reported in the study period;
• 58 pediatric patients (18.73%) (Chart 5) and 12 adult patients (7.70%) developed inflammatory-infectious local complications (rhinosinusitis, pharyngitis, tracheobronchitis, etc.) (Table 3).

Another interesting aspect of this epidemiologic study was to determine the population at risk using the age parameter. In pediatric population, the majority of foreign bodies were encountered between the ages of 0-5 years (267 cases, 85.85%), as in adults, the most frequent of them were found at young adults - 20-39 years old (71 cases, 45.51%) (Chart 6).

<table>
<thead>
<tr>
<th>Type of foreign body</th>
<th>No.:</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>fish bone</td>
<td>136</td>
<td>87.17</td>
</tr>
<tr>
<td>chicken bone</td>
<td>3</td>
<td>1.92</td>
</tr>
<tr>
<td>seed</td>
<td>3</td>
<td>1.92</td>
</tr>
<tr>
<td>wood fragment</td>
<td>2</td>
<td>1.28</td>
</tr>
<tr>
<td>bay leaf</td>
<td>2</td>
<td>1.28</td>
</tr>
<tr>
<td>insect</td>
<td>1</td>
<td>0.64</td>
</tr>
<tr>
<td>garlic</td>
<td>1</td>
<td>0.64</td>
</tr>
<tr>
<td>metal fragment</td>
<td>1</td>
<td>0.64</td>
</tr>
<tr>
<td>ballpoint pen fragment</td>
<td>1</td>
<td>0.64</td>
</tr>
<tr>
<td>fried potato</td>
<td>1</td>
<td>0.64</td>
</tr>
<tr>
<td>apple piece</td>
<td>1</td>
<td>0.64</td>
</tr>
<tr>
<td>beef bone</td>
<td>1</td>
<td>0.64</td>
</tr>
<tr>
<td>glass piece</td>
<td>1</td>
<td>0.64</td>
</tr>
<tr>
<td>needle</td>
<td>1</td>
<td>0.64</td>
</tr>
<tr>
<td>pill</td>
<td>1</td>
<td>0.64</td>
</tr>
<tr>
<td>TOTAL</td>
<td>156</td>
<td>100</td>
</tr>
</tbody>
</table>
DISCUSSIONS

Foreign objects are commonly placed by young children into their nose (203 patients in present study - 65.27%). The classic presentation - unexplained unilateral and persistent nasal discharge which is common in unwitnessed events. Other less specific symptoms include chronic sinusitis, recurrent epistaxis and halitosis.

Young children comprise the most common age group for foreign body aspiration because of the following:

- they lack molars for proper grinding of food;
- they tend to be running or playing at the time of aspiration;
- they tend to put objects in their mouth or nose more frequently;
- they lack coordination of swallowing and glottic closure;
- lack of surveillance.

In adults, food related foreign bodies are the most frequent reported (151 patients in the present study - 96.8%). Most authors suggest that the most frequent causes are the association between choking on food, excessive alcohol intake and poorly fitted dentures.

Different localization of FB requires different approaches.

FB in nasal fossae can occur usually in children (age <5 years) - they lay between the septum and inferior turbinate and can be easily visible at anterior rhinoscopy but endoscopic examination is a valuable way for diagnosis. The material FB is made of can determine intense inflammatory reaction (this is the case of organic materials like tissue paper, sponge, nuts, and seeds). The methods

<table>
<thead>
<tr>
<th>Complications</th>
<th>Children</th>
<th>Adults</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rhinosinusitis</td>
<td>24</td>
<td>3</td>
</tr>
<tr>
<td>Pharyngitis</td>
<td>15</td>
<td>9</td>
</tr>
<tr>
<td>Tracheobronchitis</td>
<td>18</td>
<td>-</td>
</tr>
<tr>
<td>Laryngitis</td>
<td>1</td>
<td>-</td>
</tr>
</tbody>
</table>
of extraction consist in pulling out the objects with a crocodile forceps and should be done at first attempt, before the child became uncooperative; also small suction catheter may be successfully used to gently withdraw objects. Children should not be allowed to aspirate/swallow from nasal fossae. Anyway, both nasal fossae must be examined before externalization the patient.

Even it is not the most frequent FB, one of them require attentions and a prompt reaction. Watch battery - a history of battery inserted into nasal fossae requires urgent examination and treatment because of leakage from it occurs within hours with dangerous corrosive burns and risk of destruction of nasal septum and inferior turbinate.

Adults usually present unilateral symptomatology - nasal congestion and discharge, sometime acute/chronic rhinosinusitis. Calcium and magnesium compounds deposit around the foreign body forming a rhinolith, which must be extracted under endoscopic surgery with local/general anesthesia.

Patients with foreign bodies localized in throat present with odynophagia (usually on lateral side of neck) and dysphagia. Most patient are adults with small fish bones which are impacted in the tonsil or tongue base; larger bones (chickens, big fishes) lodge in the hypopharynx.

Diagnosis may be established at direct visualization of oropharynx with a good light source; FB situated in hypopharynx or larynx may be visualized with a laryngeal mirror or flexible rhino-laryngo-fibroscope. Conventional radiography may be useless because not all FB are radio-opaque.

FB in the tonsils can be removed with a headlight and a forceps. FB in the tongue base, vallecula and pyriform fossa may be removed using indirect laryngoscopy and extraction with laryngeal forceps. Small FB may be extracted using flexible nasoendoscope equipped with forceps inserted into the instrument port of the endoscope. A good local anesthesia is required.

Tracheobronchial FB - at this level is one of the main causes of accidental death in children. Usually foreign bodies include coins, buttons, beads or organic material (such as nuts and seeds, which may provoke an intense inflammatory reaction). There may be unilateral chest signs (e.g. crepitations). A chest radiography may demonstrate hyperinflation or hyperlucency.

For extraction, a rigid bronchoscope with a selection of forceps, graspers and suckers is needed. Objects usually are found in the right main bronchus because it is larger and more vertical than the contralateral one. Areas of excess secretion or inflammation must be treated with extreme caution and suspicion. Any foreign body must be grasped firmly and slowly withdrawn with the appropriate instrument (grasping forceps, hooks, suction apparatus) under rigid bronchoscopic guidance to prevent it falling deeper into the bronchial tree. There may be more than one foreign body, hence bronchopulmonary segments should be inspected. Adults (and very occasionally cooperative children) can have foreign material retrieved under sedation with the flexible bronchoscope. This has an instrument port allowing the insertion of flexible forceps which may be used to extract the material, thus obviating the need for general anaesthesia. Very occasionally, foreign bodies require thoracotomy for extraction. If there is inflammation of the upper airway due to, for example, an organic laryngeal foreign body, a tracheostomy may be required.

**CONCLUSIONS**

Regulatory changes and increased public awareness have reduced the number of choking deaths, but foreign bodies in the airway still remain a significant problem.

Tragic outcomes will only be reduced when primary care physicians stress to their patients, their patient’s families, and the communities the importance of prevention through anticipatory guidance.

The appropriate maneuvers of relieving foreign body airway obstruction should be taught to parents and caretakers.

In an emergency department setting, laryngoscopy and forceps extraction must be rapidly undertaken when indicated.

Finally, it is important to remember, if one foreign body is found in the respiratory tract, always look for others.

**REFERENCES**

Reconstructive surgery of the nasal pyramid

Elena Latcan, “PRAIN” Medical Center, Bucharest, Romania

ABSTRACT

The author presents her personal experience in reconstruction of the nasal pyramid on 150 cases, children and adults, between 2000-2010.

Reconstruction of the nasal pyramid, regardless of age, was performed in cases of dysmorphias due to congenital malformations, accidents or surgical treatments with great loss of substance (benign or malignant tumors).

The author used the classical methods of reconstruction - rhinocorrection, rhinoplasty; however, she mainly focused on the use of heterografts - implantable silicone implants (endoprostheses), or reconstruction of the nasal pyramid entirely with elastomeric silicone (epitheses), fixed by adhesive, implants, titanium magnets. Silicone, as a synthetic material, is very well tolerated by the body, having been demonstrated that it is a good oxygen carrier. Both nasal silicon and titanium implants are well tolerated, with good aesthetic, functional and psychological results. Patients regain an almost normal appearance, having a good family and social integration an improved quality of life.

KEYWORDS: reconstruction, rhinocorrection, rhinoplasty, heterografts, silicone, titanium implants, magnets, endoprostheses, epitheses.

INTRODUCTION

The nose - the nasal pyramid is an essential anatomical element of the central region of the face, with a mainly aesthetic role, brain protection in case of accidents (traumatic shock attenuation) and functional by its positioning at the beginning of the upper respiratory tract. It has an important role in breathing, smell, taste and protection of the lower respiratory tract (cleans, moistens and warms inspired air).

Generally, an individual, according to sex and age, is more concerned with aesthetic appearance than with the functional aspect. Hence the multitude of surgical techniques that emerged and developed many years ago, depending on the techniques that have appeared and improved, instruments, equipment, doctor’s training. There is no special technique to achieve reconstruction of the nasal pyramid; it mainly differs depending on the anatomic appearance of each patient’s nose.

The doctor, as an objective person and according to his training, must choose the most suitable method for the respective patient, regardless of his subjective wishes. He must also explain by all methods (photographs, measurements, endoscopic examination) what is best to apply in order to obtain the maximum aesthetic and functional result. Patient’s appearance and psychological implications are very important and must be perceived and fought with methods specific to the surgical speciality, since satisfaction of final results, as well as avoidance of medicolegal implications depend on them, both for the doctor and for the patient. The patient needs to be correctly informed and he must justify by signature that he understood everything and agrees with the method applied by the doctor, that it is not always possible to achieve the aesthetic aspect imagined or desired by the patient, that evolution and surgery results can be seen after about 6 months to 1 year, that complications may occur, especially due to lack of doctor-patient collaboration or by failure to follow the post-surgery guidelines for care and check-up.

NASAL PYRAMID RECONSTRUCTION METHODS

Indications:
• congenital malformations;
• accidents;
• after major surgical interventions: benign or malignant tumors.

Nasal pyramid dysmorphia may exist either by lack or surplus of substance: soft parts, cartilages, bones.
Types of nasal pyramid reconstruction:
I) By loss of substance, depending on materials used:
   1. Reconstruction with biological materials: bone or cartilage auto- and homografts;
   2. Reconstruction with inert materials: heterografts, acrylic, polyethylene or silicone external (epitheses) or internal prostheses (endoprosthesis - implant)3.
II) By surplus of substance:
   A) Rhinocorrection:
      • nasal dysmorphias due to acute or chronic trauma or congenital malformations;
      • luxations and fractures (recent or old);
      • mutilations.
   B) Rhinoplasty - nasal hyperplasias - aesthetics.
   Objectives:
      • pyramid height reduction;
      • shortening of the pyramid with possible lobe lifting;
      • narrowing of the pyramid5.

MATERIAL AND METHOD

Silicone, invented in 1970, together with titanium implants, are synthetic materials well tolerated by the body (silicone is even used as a cardiac valve - because it has been demonstrated that it is a good oxygen carrier). Silicone is used for replacement, through methods of prosthetic reconstruction, of various parts of the human body, in cases of great loss of substance, which cannot be replaced by common surgical techniques6.

Titanium implant - invented in 1950 by Prof. Branemark (Sweden), with a very high purity (about 99.75 %), was initially used until 1977 in orthopaedics and dentistry, while beginning with 1977 it has been used in prosthetic cranio-facial and body reconstruction, for fixing prostheses with the Branemark osteointegration method7.

Titanium implant is very well tolerated (even a lifetime), without being toxic or allergic. The process of osteointegration is a process of oxidoreduction that leads to bone growth around the implant, after a period of about 3 to 6 months from the surgical fixation8.

There are many methods and techniques, depending on the defect, doctor’s training and patient’s wishes. Nasal pyramid reconstruction can be performed under local or general anaesthesia. There are traditional and new prosthetic surgical techniques that use silicone and fixation through osteointegration with titanium implants or magnets9.

Traditional surgical techniques:
• incision, lifting;
• reduction of the osteocartilaginous height;
• paramedian osteotomy;
• smoothing of the osseous nasal crest;
• lateral osteotomy;
• shortening of the pyramid;
• reduction of the triangular cartilages height;
• suture of the interseptocolumellar incision;
• internal contention (anterior nasal packing);
• external contention - with splint + adhesive bandages8.

Prosthetic reconstructive surgery using silicone and titanium osseointegrated implants:
I) Silicone epitheses:
They are indicated in great losses of substance, when it is not possible anymore to intervene by conventional surgical methods: in congenital malformations, accidents, after major surgery (benign or malignant tumors)7. A specific technique similar to the dental one is used, obtaining prostheses with the shape, size, colour and elasticity of normal tissues, and with a good anatomical integration in the respective region. These prostheses are light, aesthetic and well tolerated by the organism. They restore human face as close to normal as possible, improving the patient’s quality of life and increasing his self confidence9.

Their fixation can be made either with adhesives or titanium implants, or surgically, with general or local anaesthesia. They ensure greater stability, are easier to care and more aesthetic.

II) Silicone endoprostheses:
Indications - alar insufficiency or nasal dysmorphias with loss of substance, in congenital malformations, accidents, operations.

The technique used is also similar to the dental one, but it uses a special type of implantable silicone after 29 days, well tolerated by the organism and which can remain in the body for the whole life. In the defective area, a cavity is surgically created, where the silicone endoprostheses is introduced10.

Postoperative EVOLUTION and prognostic are generally favorable with aesthetic, functional and psychic RESULTS for the patient.

COMPLICATIONS - multiple and different, both for the surgeon and for the patient, both in the case of classical methods of prosthetic rehabilitation using silicone and titanium implants11. Complications can be - early postoperative, in the first 7 to 10 days, or late postoperative - after several months or years.

IMMEDIATE POSTOPERATIVE COMPLICATIONS (EARLY)

1. General complications:
• shock - rare in prolonged and very traumatic surgery with major blood loss - quick resolution in the Department of Anaesthesia and Intensive Care;
• postoperative resorption fever - insignificant in the first 3 days, but indicating an infection in the following 5-6 days - antibiotic treatment;
• nausea, vomiting dark blood, digested and swallowed during surgery, or intolerance to postoperative anesthetics and antibiotics\(^\text{10}\);
• urine retention - it is reflex.

2. Local complications:
• bleeding, hematoma;
• eyelid, face and forehead edema;
• skin redness;
• skin incision.

3. Septic complications - rare because of the intraperoperative antibiotics use:
• abscess;
• inflammation of the lacrimal sac;
• acute infection of the upper airway tract;
• periostitis\(^\text{3}\);
• necrosis around the titanium implants with their rejection\(^\text{7}\).

LATE POSTOPERATIVE COMPLICATIONS can be aesthetic or functional:
• Vicious scars - physiologic, hypertrophic (keloid), atrophic (retractile), or pigmentation;
• Septoturbinate synechiae - breathing disorders;
• Immune response - prostheses or homografts allergies;
• Lowering of the raised tip;
• Nose widening;
• Movement or curving of the cartilage graft;
• Bone or cartilage resorption in homografts;
• Perichondritis;
• Nasal algiae;
• Nasal pyramid deformities;
• Pharyngeal mycosis;
• Hypoesthesia, paresthesia in the operated region;
• Neuralgia;
• Psychiatric disorders;
• Anosmia\(^\text{2}\).

CASE PRESENTATION

A) Epitheses - accidents:

CASE 1: animal bite mutilation (rat)

![Figure 1](image1.png)

B.C., one and a half years old, Bucharest. At nursery, while sleeping, the child was mutilated by a rat which ate his nose. The nasal pyramid reconstruction has been made with adhesive fixed silicone. After the age of 6, titanium implants and magnets will be used. Aesthetic, functional and social results are very good.

Case 2 - animal bite mutilation (horse)

![Figure 2](image2.png)

C.S., 42 years old, Teleorman. Domestic accident with right nasal wing destruction due to horse bite. A silicone epithesis has been used, with favorable results.
Case 3 - malignant tumors surgery

Figure 3  B.T., 63 years old, Galati. Skin neoplasm of the nasal pyramid. Total rhinectomy was performed, and nasal pyramid reconstruction consisted of adhesive fixed silicone prosthesis. The patient regained his human appearance with the improvement of breathing, sleep and quality of life.

Figure 4  D.V., 55 years old, Sibiu. Destruction of the nasal pyramid due to squamous cell carcinoma, appeared after prolonged exposure to high temperature while working on a construction site in the Middle East. After a failed attempt of flap reconstruction in the Department of Plastic Surgery in Bucharest, a silicone nasal epithesis was fixed over the existing flap with adhesive. But the disease had a fulminant evolution with the invasion of sinuses, orbits, eyes, with brain metastases followed by the patient’s death after categorical refusal of surgical reintervention or of any other treatment.

Figure 5  B.I., 68 years old, Bucharest - right maxillary sinus cancer diagnosed 10 years ago, with invasion of the right orbit and eye, of the nasal pyramid, with numerous surgeries in the Buco-Maxillofacial Surgery Department, Plastic Surgery in Bucharest. In 1999, the doctor suggested prosthetic reconstruction of the affected area (the half upper right hemiface and eye orbit). In 2009, after unfavourable postoperative results, the patient required silicone reconstruction of almost 2/3 of the face.

Figure 6  P.V., 65 years old, Bucharest - with total rhinotomy and resection of the first half of the hard palate for squamous cell carcinoma. The nasal pyramid and the upper lip were reconstructed with silicone, while the hard palate with insertion of an acrylic obturator prosthesis. Aesthetic and functional results were favorable, the prosthesis becoming almost unnoticed by using glasses and a mustache.
Case 7

Figure 7  D.F., 64 years old, Bucharest - Total rhinotomy and left hemimaxillectomy with resection of the first half of the hard palate, surgery performed for squamous cell carcinoma with left narinary starting point. The central part of the face was reconstructed with 2 extraoral prostheses (nose and upper lip silicone epithesis) and one intraoral (acrylic obturator with teeth). The prostheses were fixed together with titanium magnets. The consolidation of the prosthetic assembly was made with progressive glasses which provided to the patient a safer travel environment. There were good aesthetic and functional results (breathing, chewing, eating, speaking) with a good psychological support.

B) Endoprostheses - congenital malformation
1. Nasal valve insufficiency, lack of development of the bilateral alar cartilage during intrauterine life or acquired atrophy.

Case 1

Figure 8  C.V., 38 years old, Bucharest - chronic nasal obstruction with many treatments and surgery interventions. Implantable silicone splints are endonasally inserted with the remedy of all functional deficiencies (breathing, sleep, mood, taste, smell). The patient presented a good tolerance of the endoprosthesis without rejecting it so far (6 years).
2. Congenital facial asymmetry with nasal dysmorphia - saddle nose

Case 2

D.R., 19 years old, Bacau - facial asymmetry due to lack of development of the right hemiface and nasal dysmorphia with loss of substance (saddle nose). A complex reconstruction of the genian region, right cheek and dorsal region of the nose is performed using implantable silicone endoprosthesis, with good aesthetic results.

3. Accidents
   a. Sledding

Case 1

T.L., 34 years old, Brasov. - sledding accident (impact of the skull with a tree trunk) with clogging of the frontal region and the nose base, hypertelorism. The patient underwent repeated unsuccessful attempts of aesthetic reconstruction of the frontal region with acrylate, by the neurosurgeon, and of the nasal pyramid with an iliac crest bone graft, by the ENT specialist. After almost 10 years, a subcutaneous implantable silicone endoprosthesis was used for the frontal region and nasal pyramid. Aesthetic and functional results were very good, the prosthesis fitting perfectly in the area by tissue growth around it. The patient is married now and has two children.
CONCLUSIONS

• Surgical reconstruction of the nasal pyramid with the multitude of surgery techniques, despite accidents or postoperative complications, is a useful technique in the aesthetic and functional reconstruction of the central region of the face.

• It is worth mentioning the modern technique of surgical prosthetic reconstruction in cases of large loss of substance, when the common surgical procedures are inefficient.

• Silicone and titanium implants are well tolerated by the body, without being toxic or allergic.

• Aesthetic role - the patient regains a normal appearance by restoring the normal anatomy of the respective area.

• Functional role - in breathing, mastication, phonation, hearing.

• Psychological implications in socialization and improvement of the quality of life.

REFERENCES

ORIGINAL STUDY

Ear ventilation tubes in children with otitis media with effusion and adenoid hypertrophy

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ABSTRACT

BACKGROUND. Acute otitis media is one of the most frequent diseases of children under 5 years, and most of the cases require sustained medical therapy due to possible complications and the total period of hearing impairment. Early detection of the otitis media with effusion (OME) in children is important for normal speech development.

OBJECTIVE. The aim of the study is to evaluate the efficacy of adenoidectomy versus adenoidectomy with ear tubes fixation at the same time of surgery, in a selected lot of patients diagnosed with adenoid hypertrophy, OME and a history of recurrent OME.

MATERIAL AND METHODS. The study was carried out on 40 selected children in the age range 2-7 years, diagnosed with adenoid hypertrophy accompanied by uni/bilateral recurrent OME. All patients underwent adenoidectomy; tympanotomy with ear tube fixation was performed in 35% cases.

RESULTS. Bilateral conductive hearing loss (CHL) was found in 80% of the patients. In those patients with OME at the time of surgery, who underwent adenoidectomy as single procedure, complete remission of the CHL level was achieved up to 1 month. Immediate remission of CHL was achieved in all patients who underwent tympanotomy and ear tube fixation; remission maintained also at 14 and 30 days. Recurrence of OME and CHL was present in 42.3% patients who underwent adenoidectomy alone; the remission of the recurrences was achieved with medical treatment up to 21 days in most patients. Recurrence of ear discharge on blocked ear tubes was noted in 21.4%; the duration of the ear discharge and CHL until remission was up to 7 days. All recurrences were secondary to acute upper respiratory tract infections (URI).

CONCLUSIONS. Adenoidectomy provides a faster remission of OME and is effective in preventing its recurrences. The recurrences of OME have a much smaller healing period after adenoidectomy. Ear tubes fixation ensures the opportunity of a faster recovery of the ear, immediately reducing the CHL secondary to OME. The duration of CHL is much shorter in recurrences of ear discharge on blocked ear tubes than in patients without ear tubes. Early drainage of the middle ear effusion ensures improvement of the quality of life, both immediately after surgery and on a long term basis, supporting the ventilation of the mastoid air cells, essential for the normal functioning of the ear.

KEYWORDS: otitis media, ear tubes, adenoidectomy

INTRODUCTION

Acute otitis media (AOM) represents one of the most frequent diseases of children under 5 years old, and most of them require sustained medical therapy due to its possible complications and the total period of hearing impairment on the individual. Early diagnosis of otitis media in children has a crucial role in normal speech development, as the most important period to acquire it is between two and four years old.
Otitis media with effusion (OME) represents an accumulation of non-purulent fluid of various viscosities within the middle ear cavity and is a nonspecific inflammation. The inflammation of the middle ear results in metaplasia of the middle ear mucosa, with the proliferation of mucus glands and goblet cells. Pathophysiology of otitis media with effusion usually involves inflammatory conditions of the nasopharynx, any mechanism that causes dysfunction of the Eustachian tube reducing the pressure or aeration of the middle ear. This mechanism causes negative pressure in cavum tympani, leading to formation of serous effusion and metaplastic transformation of the mucosa in time. Mucous effusion is mostly seen in children, while in adults we mostly find the serous effusion. The study performed on children forced us from the beginning to pay attention to the complications that the middle ear diseases may cause: chronic otitis, recurrent acute otitis, inflammation of the mastoid tissue (acute or chronic mastoiditis), retraction pockets and adhesive complication, tympanic membrane perforation, tympanosclerosis, cholesteatoma, toxic labyrinthitis, delay in speech and language development due to the total period of hearing loss.

Literature reminds about the adenoids role in producing IgA, as one of the first mechanisms of protection against invasion of microorganisms and foreign molecules. Adenoid hypertrophy involves abnormal growth of adenoid tissue in the nasopharynx that can entirely block the nasal air flow; 5 is considered the maximum age when middle ear complications accompanying adenoids can occur.

**MATERIAL AND METHODS**

We admitted in this study 40 children diagnosed with adenoid hypertrophy and otitis media with effusion at the time of surgery. The patients presented in our ENT department between April 2010 and February 2011 and were aged between 1 year 11 months and 6 years 11 months at the time of surgery. The mean interval between first visit and surgery was 71 days.

We will comment upon several aspects regarding otitis media with effusion in children with adenoid hypertrophy:

- The opportunity of ear tubes fixation;
- The total period of the conductive hearing loss which accompanies the otitis media with effusion;
- Attempt to make a correlation between the presence of adenoids and repeated otitis media with effusion and conductive hearing loss in children.

Study admission criteria:

- Presence of adenoid hypertrophy;
- Presence of otitis media with effusion at the time of surgery;
- History of recurrent otitis media with effusion.

Study exclusion criteria:

- Absence of adenoid hypertrophy;
- History of previous adenoidecotomy or ear surgery;

Preoperative diagnosis:

- All patients included in the study benefited from:
  - Nasal endoscopy, using a flexible 2.5mm fiberscope;
  - Ear endoscopy, using a 0-degree, 3 mm rigid telescope;
  - Tympanogram and stapedian reflex;
  - Pure tone or behavioral audiogram - where possible, depending on patient’s age;
  - Subjective appreciation by parents of nasal obstruction, hearing level, snoring, quality of sleep, quality of life;
  - Radiological examination was performed in certain cases with repetitive acute otitis media, otitis media with effusion unresponsive to treatment, spontaneous perforation of the tympanic membrane - Schüller’s incidence X-ray, CT/MRI.

Postoperative follow-up:

- Control after 3, 10 days and 1, 3 and 6 months and every time the parents considered it necessary (upper respiratory tract infections, subjective increase of the hearing impairment etc.);
- The same diagnostic procedures as in preoperative diagnosis.

Treatment.

a. Preoperative treatment. All the children underwent nasal lavage with isotones saline nasal sprays at least twice a day at home, from the first visit; those patients with moderate and severe nasal obstruction received topical nasal decongestants for 7-14 days; some patients, especially those who had a history of allergic rhinitis, received nasal corticosteroids once a day after toileting the nose with saline nasal sprays. In acute inflammatory diseases of the ear - acute congestive otitis media, acute supplicative otitis media - the patients received intra-auricular anti-inflammatory therapy for pain relief for a period of 1 to 5 days; in certain patients with acute supplicative otitis media, oral antibiotics were recommended.

b. Surgery. All patients underwent adenoidecotomy with/without tympanotomy and ear ventilation tube fixation in the same conditions involving surgery; the operation was performed under general anesthesia, with resection of the adenoids in the head-extended position (“hanging position”) under endoscopic surveillance. The resected specimens (adenoids) were sent for anatomo-pathological examination. The biopsy samples were formalin-fixed, paraffin-embedded and histopathologically examined; the routine
stain used was Haematoxylin and Eosin for the assessment of the histopathological aspects. Tympanotomy was done under optical microscopy in the same operative sequence as secondary stage. Tympanotomy was followed by the suction of the middle ear discharge and lavage of the middle ear with Dexamethasone 21-phosphate in all the cases. The secretions collected from middle ear mucosa were sent for bacteriological examination.

c. Postoperative treatment. In the post-surgery surveillance period, the children continued nasal cleansing with saline solution and decreased the use of nose drops with vasoconstriction effect only for the periods of acute upper respiratory tract infections. In those cases with recurrence of ear discharge on blocked ear tubes, we performed lavage of the ear tubes with Dexamethasone and active drainage of the effusion through the ear tube; these patients received local antibiotic ear solutions for up to 5 days.

RESULTS

The highest incidence of adenoid hypertrophy accompanied by otitis media with effusion was found in 3 year-old children (Figure 1). At the time of surgery, 72.5% of all children included in this study presented bilateral otitis media with effusion (acute, in remission or chronic otitis media with effusion), 7.5% otitis media with effusion and Eustachian tube dysfunction (ETD) and only 20% unilateral otitis media with effusion. Implicitly, 80% of children had bilateral conductive hearing loss of different degrees at the time of surgery (Figure 2).

The 40 patients included in this study were divided into 2 lots:
- first lot: 26 patients (65%) - treated surgical, only adenoidectomy;
- second lot: 14 patients (35%) - treated also surgical, adenoidectomy and uni- or bilateral tympanotomy with ear ventilation tube fixation.

In the first lot of patients we performed adenoidectomy as a single procedure - on 65% of the children included in this study that presented at the time of surgery:
- otitis media with effusion acute or in a remission phase, and
- a large package of adenoids in the rhinopharynx (Figure 3).

Bilateral ear disease (bilateral otitis media with effusion, otitis media with effusion and Eustachian tube dysfunction) and, implicitly, bilateral conductive hearing loss, were found in 76.9% of the children from the first lot. Taking into consideration the average period of 71 days between the first visit and surgery, we make a special remark on the duration of the conductive hearing loss of different degrees, but in remission, present in these cases (Figure 4).

Remission of the symptoms of recurrent otitis media with effusion and of the conductive hearing loss in patients who suffered adenoidectomy as single procedure was acquired up to 1 month after surgery.

In the second lot of patients we performed adenoidectomy and tympanotomy with ear ventilation
tubes fixation - on 35%\textsuperscript{14} of the children included in this study. Ear tubes fixation was performed only in those children where the additional diagnostic tests (ear endoscopy/microscopy, nasal fibroscopy, tympanometry and stapedian reflex, pure-tone audiometry, radiological examination) revealed both the presence of fluid in the middle ear and a poor response to therapy. The criteria of selection were one or more of the followings:

- chronic otitis media with effusion or acute otitis media with effusion with slow/no response to medical treatment;
- recurrent otitis media with effusion;
- history of repeated acute otitis media with spontaneous perforation of the tympanic membrane;
- unilateral ear disease or a more severe pathology on one ear;
- a medium (non obstructive) rather than a large adenoid hypertrophy.

Ear ventilation tube fixation was performed at both ears on 78.6%\textsuperscript{11} patients and at one ear on 21.4%\textsuperscript{3} children (Figure 5).

Remission of the symptoms of otitis media with effusion and of the conductive hearing loss (recurrent or irresponsive to medical treatment) in patients who suffered \textit{adenoidectomy and ear tubes} was noticed immediately after surgery; remission maintained also after 14 and 30 days on most patients with ear tubes.

Bacteriological examination of the middle ear secretions taken during tympanotomy showed in 71.4%\textsuperscript{10}
growth of bacterial colonies on the mediums seeded: 28.6% Streptococcus pneumoniae, 21.4% Staphylococcus epidermidis and, with the same frequency, 7.1% Pseudomonas aeruginosa, Staphylococcus aureus, Streptococcus viridans. No growth of any bacterial colonies was registered in 28.6% cases (Figure 6).

**Recurrences.** 42.3% of the patients who underwent adenoidectomy as the only surgical procedure presented recurrences of acute otitis media and otitis media with effusion at an average of 74 days after surgery; the symptoms and the conductive hearing loss fully recovered under medical treatment up to 21 days. In most patients, the recurrences were present due to secondary to acute upper respiratory tract infections in the winter/spring seasons of 2010/2011 (November-April) (Figure 7).

Blocked ear tubes with recurrence of effusion/ear discharge were noticed in 21.4% cases, secondary to acute upper respiratory tract infections, in the winter/
spring seasons of 2010/2011 (November-April): 2 of them bilateral and 1 unilateral; the average period of recurrence of ear discharge was at 62 days from surgery (Figure 7). In these cases, the total duration of conductive hearing loss was much shorter than in previous episodes with otitis media with effusion without ear tubes - the dryness of the ear was obtained up to 7 days under local treatment. In Figure 8 we present the evolution of a left ear of a 5 year-old patient with ear tubes and acute ear discharge on blocked ear tube after 60 days from surgery.

45.5% of patients with bilateral ear tubes developed acute upper respiratory tract infections at more than 1 month from surgery but without any affection of the

Figure 6  Result of the bacteriological examination of the ear discharge taken during tympanotomy, n=14

Figure 7  Recurrence of ear effusion in patients with adenoidectomy +/- ear tube fixation (green-patients who underwent the specified procedure, red-reurrence), n=40
ears (as their major common complaint was before surgery), due to the presence of the ventilation tubes.

14.3% of children developed otitis media with effusion secondary to an acute upper respiratory tract infection; after 1 month the ear tubes were spontaneously eliminated; remission of otitis media with effusion was obtained after 1 month of medical treatment.

Two children who suffered adenoidectomy and unilateral ear tube fixation developed at more than 3 months after surgery acute upper respiratory tract infection. The ear with ventilation tube (the one with absence of pneumatization of the mastoid air cells on Schüller’s X-ray) remained unaffected in the acute inflammatory state due to the presence of the ventilation tube, thus the hearing level of the children through the healing period remained almost normal on the operated ear. Remission of the acute otitis media with effusion, secondary to acute upper respiratory tract infections of the non-operated ear, was obtained up to 14 days after medical therapy (nasal decongestants) in both patients (Figure 9).

**DISCUSSION**

Significant improvement of the quality of life (nasal breathing, snoring, sleep apnea, proficiency in school) was reported by parents after surgery. Complete remission of the hearing loss in patients with otitis media with effusion, who suffered only adenoidectomy, was registered up to 1 month after surgery. Significant im-

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**Figure 8** Evolution of a left OME on a 5 years old patient, endoscopic images: a) Enlarged adenoids covered by abundant secretions, obstructing the nasal flow and the Eustachian ostium, right nostril, at the first visit; b) OME, left ear - through the transparency of the tympanum can be seen air bubbles captive in a sero-citrine liquid, first visit; c) Ear ventilation tube, 4 days after surgery - normal tympanic membrane with no secretions in cavum tympani; d) AOM after an URI - ear ventilation tube blocked by thick, sticky secretions; through the semi-transparency of the tympanum can be seen a purulent discharge which is expanding, pushing and thinning the healthy tissues - 60 days from surgery; e) Abortive evolution of the AOM under local treatment - ear tube blocked by dried yellow gummy secretions; through the transparency of the tympanum serous secretions filling the whole cavum tympani can be seen; dried yellow gummy secretions in the external auditory canal - 66 days from surgery; f) Abortive evolution of the AOM - ear tube permeable, through which the serous secretion from the middle ear drains into the external auditory canal - 69 days from surgery (personal library)
Figure 9  Evolution of a 4y2m child diagnosed with adenoid hypertrophy, with left acute suppurative otitis media and history of repeated otitis media with effusion of the left ear who underwent adenoidectomy and tympanotomy with ear ventilation tube fixation on the left ear. First visit (Figures a-b): a) Right ear - normal tympanic membrane, b) Left ear - acute otitis media, pre-perforative stage. After 1 month (preoperative, figures c-d): c) Right ear - normal tympanic membrane, d) Left ear - otitis media with effusion - through the transparency of the relatively aspirated tympanic membrane can be seen a brown-yellowish liquid that fills the whole cavum tympani. 3 months after adenoidectomy and ear ventilation tube fixation on the left ear, in an acute URI (Figures e-f): e) Right ear - acute otitis media with effusion - through the transparency of the tympanic membrane can be seen a serous liquid that fills the whole cavum tympani with a tendency to become purulent, f) Left ear - normal tympanic membrane with ear ventilation tube efficient in the postero-inferior quadrant; no secretion are visible through the transparency of the tympanic membrane nor in the external auditory canal; Figures g-h - Schüller's incidence X-ray of the mastoid bones made at the first visit (equivalent of figures a-b): g) Right ear - moderate pneumatization of the mastoid air cells, h) Left ear - poor pneumatization and cloudiness of the mastoid air cells (personal library)

Improvement of the hearing level was reported postoperatively in those children who underwent tympanotomy with ear ventilation tubes fixation. The total period of hearing loss was smaller in patients with ear tubes.

Recurrences of acute otitis media and otitis media with effusion found in patients who suffered only adenoidectomy were much higher (42.3%) than the recurrences of the ear discharge on blocked ear tubes in patients who suffered adenoidectomy with ear tube fixation (21.4%). Most of the recurrences were secondary to acute upper respiratory tract infections. After adenoidectomy, the ear complications during recurrences were fewer and complete recovery was faster than in the previous episodes of otitis media with effusion acquired before adenoidectomy (up to 21 days, in children who suffered only adenoidectomy). The duration of conductive hearing loss in recurrences of ear discharge on blocked ear tubes was up to 7 days, significantly shorter than in recurrences of the non operated ears.

The efficiency of the ear aeration provided by the ear tube in children with predisposal to ear affections is demonstrated on a short time basis by the evolution of both the healthy ear and also the operated ear, in acute upper respiratory tract infections as shown above: the healthy ear evolved through an acute otitis media with effusion and the impaired, but operated ear, remained unaffected.

For the middle ear lavage during tympanotomy, we preferred using Dexamethasone for its anti-inflammatory effect on the middle ear mucosa and also for a proper grooming of the middle ear with effusion, thus lowering the risk of developing adhesive and atelectatic postoperative complications (as described in literature).

In most children, further daily cleaning of the nose with saline solutions after surgery provided a normal balance of the nasopharyngeal function, lowering the recurrences and minimizing the complications of the disease.

During this study, we observed after surgery a decrease in volume of the palatine tonsils in those patients diagnosed at the first visit with hypertrophy of the palatine tonsils. A possible cause for this situation may be the removal of the inflammatory/infectious
vicinity inflammation and improvement of the respiratory function.

Useful diagnostic procedures in otitis media with effusion are nasal fibroscopy, ear endoscopy or microscopy, tympanometry and stapedian reflex, hearing examination (tuning fork and pure-tone audiometry - when possible taking into consideration the age), microbiology of the nasal cultures and ear discharge (in otitis media with effusion - effusion taken during tympanostomy), Schüller’s X-ray or CT/MRI (acute otitis media with spontaneous perforation of the tympanum, history of repeated acute otitis media/otitis media with effusion especially on one side, otitis media with effusion unresponsive to treatment, chronic otitis media with effusion, mastoiditis).

Most patients with otitis media with effusion at the time of surgery or exacerbations of middle ear diseases after surgery presented a poor pneumatization with cloudiness of the projection area of the mastoid air cells or absence of pneumatization of the mastoid air cells on Schüller’s X-ray. The radiological aspect of the mastoid, found on those patients with poor response to medical therapy, guided us during the clinical surveillance, in taking the decision of performing tympanotomy with or without tube fixation. We consider the mastoid bone the key organ responsible for the functioning of the middle ear.

Also, at this time, there is no strong evidence to support the surgical management of unilateral otitis media with effusion, in specific cases where additional diagnostic tests demonstrated a significant more severe pathology on one ear (for example, great difference of pneumatization between the two mastoids at Schüller’s incidence X-ray), we performed in the same sequence with adenoectomy unilateral tympanotomy with ear ventilation tube fixation on the affected ear, with good results.

We make a special remark for total periods of bilateral conductive hearing loss, especially in recurrent otitis media with effusion - each episode of otitis media with effusion lasts at least 14 days until full recovery. At this age range (2 to 4 years), the plasticity of the brain for speech learning is maximum. Limitation of auditory information will lead to delays in language, often seen by parents as late or wrong pronunciation of letters, then words. Parents often present the child to the doctor, accusing breathing difficulties, although at the first consult most of them have hearing problems, as a consequence of otitis media with effusion due to Eustachian tube dysfunction secondary to a large adenoid hypertrophy. In our study we found important to assess the children during a correct and complete interdisciplinary consultation between ENT specialist, pediatrician and, when necessary, radiologist.

**CONCLUSIONS**

The adenoid hypertrophy plays an important role in the onset and recurrence of the otitis media with effusion in children. Adenoïdectomy provides a faster remission of otitis media with effusion and is effective in preventing its recurrences. After adenoïdectomy, the recurrences of otitis media with effusion have a smaller incidence, healing period and gravity. The frequency, gravity and poor response to medical therapy of otitis media with effusion are higher in those patients who have a poor or no pneumatization of the mastoid bone.

The total period of conductive hearing loss is significantly smaller in those children with otitis media with effusion who underwent adenoïdectomy with ear ventilation tubes fixation. The duration of conductive hearing loss is also shorter in recurrences of ear discharge on blocked ear tubes than in patients without ear tubes. Taking into consideration the total period of the hearing loss - during the remission period of otitis media with effusion after surgery, during the recurrences and the number of recurrences - the total period of hearing loss is significantly higher in those patients who underwent adenoïdectomy without ear tubes. Ear tubes ensure the opportunity of a faster recovery of the ear, immediately reducing the conductive hearing loss secondary to otitis media with effusion, preventing its recurrences. Unilateral surgical management of otitis media with effusion is to be considered in those cases where additional diagnostic tests demonstrated a significantly more severe pathology on one ear.

Early drainage of the middle ear effusion ensures improvement of the quality of life, both immediately after surgery and on a long term basis, supporting the ventilation of the mastoid air cells, essential for the normal functioning of the ear.

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LITERATURE REVIEW

Nasal packing in endonasal surgery - a literature review

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ABSTRACT

Nasal packing is currently used as a step of the nasal surgery in order to prevent hemorrhage and to ensure a normal wound healing process. The range of materials used for this purpose is wide, including both removable and absorbable materials. Because currently there is no standardization in this matter, the choice is in the surgeon’s hand, according to his abilities, beliefs, or technical possibilities. This article reviews the literature on the use of both absorbable and removable materials used for hemostasis after nasal surgery in the last decades, trying to reveal the advantages and also the weak points for both methods.

KEYWORDS: nasal packing, endoscopic sinus surgery, epistaxis, adhesion, wound healing process

INTRODUCTION

Hemostasis, during and after nasal surgery, still raise a lot of debates concerning the most suitable method regarding the efficacy, patient comfort, risks and costs. Each endonasal surgical procedure such as septoplasty, rhinoplasty, as well as endoscopic sinus surgery, especially when combined with turbinatectomy and/or submucous resection of the septum, may produce bleeding and/or postoperative hematoma requiring postoperative hemostatic measures1.

All rhinologic surgeons have the common goal of obtaining excellent hemostasis and good postoperative healing that avoids adhesion formation, together with infection prevention. Even if, the goal is common, how this can be achieved is still debatable.

The most frequent attitude regarding nasal hemostasis during and after nasal surgery is represented by choosing one of the following methods:
• removable nasal packing;
• absorbable nasal packing;
• no packing at all.

Because presently there is no standardization in this matter, the choice is in the surgeon’s hand, according to his abilities, beliefs, or technical possibilities.

Besides of controlling ongoing bleeding after nasal surgeries, nasal packing has been used to prevent adhesion formation and postoperative restenosis. Even if efficient in stopping the bleeding, according to some studies, removable nasal packing has been rated by patients to be the most unpleasant aspect of the ESS surgical experience1,2. This may be the reason why some surgeons advocate not packing the middle meatus3, whereas others continue to use this technique to prevent middle turbinate lateralization4. Controversy still exists about whether to pack or not.

This article reviews the literature on the use of both absorbable and removable materials used for hemostasis after nasal surgery in the last decades, trying to reveal the advantages and also the weak points for both methods.

REMOVABLE NASAL PACKING

Even if it was used long before, the first description of nasal packing in the ENT literature was made in 19515, followed 18 years later (in 1969) by the use of absorbable biomaterials6. The ideal packing would be that which, besides of controlling the hemorrhage and acting as a barrier to adhesion formation, is easily adaptable and reasonably well tolerated by the patient.

Numerous packing agents are available, including:
• vaseline-soaked ribbon gauze;
• fingerstall packs,
• polyvinyl acetate sponge (Merocel);
• various balloon tamponade devices.

Even if, most of them are very effective in what it concerns the hemostasis, these agents cause considera-
ble discomfort for patients, both in terms of pain and bleeding on removal\textsuperscript{1,2,7,9}. Other complications associated with removable nasal packing include\textsuperscript{10,11}:

- septal perforation (due to pressure necrosis);
- pack dislodgement;
- aspiration;
- toxic shock syndrome;
- foreign body granuloma;
- myosphenulosis;
- obstructive sleep apnea secondary to nasal obstruction;
- death.

This is the reason why there are some very important parameters that must be take into account when using a removable nasal packing, including:

- type of the packing material;
- the aggressiveness of the packing maneuvers;
- how long the nasal packing is kept in place;
- correct setting of nasal packing in order to prevent aspiration accidents;
- antibiotic treatment during tamponade to prevent bacterial growth.

One of the most important disadvantages of removable nasal packing could be considered its impact on nasal mucosa, and especially on the ciliated mucosal surface area. Animal studies investigating the mucosal trauma caused by removable nasal packing have shown a 50\% to 70\% loss of the ciliated mucosal surface area in the region of the pack\textsuperscript{12}. Therefore, a transient impairment of the patient’s innate immune system, the mucociliary clearance, may be associated with the use of removable nasal packing\textsuperscript{13}.

The impact on patients’ quality of life and also the possible complications of removable nasal packing have led to the ongoing development and application of absorbable biomaterials that do not require subsequent removal and still achieve positive effects on hemostasis, promote wound healing, and provide middle turbinate support.

**ABSORBABLE MATERIAL NASAL PACKING**

The need of reliable and safe hemostasis materials led to extensively investigations and researches on biomaterials with applicability in the ear, nose, and throat surgery, and consecutively in ESS (endoscopic sinus surgery), and this interest continues today. Both human and animal trials have contributed significantly to the understanding of these products and their role in ESS.

There are two major action mechanisms involved in the hemostasis process made by absorbable biomaterials, respectively they either provide coagulation factors or a substrate to stimulate coagulation. Other important characteristics of these agents include safety and efficacy, absorption kinetics, composition, usability (including form of the agent and delivery device) and cost.

A wide range of absorbable materials with use in nasal surgery were developed in the last years, including:

- absorbable porcine gelatin (Surgiflo, Ethicon Inc) and thrombin combination;
- carboxy-methyl-cellulose (CMC, AthroCare);
- chitosan gel (Department of Chemistry, University of Otago, Dunedin, New Zealand);
- Fibrin glue (Quixil, Omrix Co.);
- FloSeal (Baxter International Inc);
- hyaluronic acid (MeroGel, Medtronic);
- microporous polysaccharide hemispheres (MPH, Medafor Inc);
- Platelet gel (PPAI Medical);
- Surgiflo hemostatic matrix combined with thrombin;
- topical antifibrinolytics such as epsilon-aminocaproic acid (Amicar, Lederle Parenterals Inc) and tranexamic acid (Cyklokapron, Pfizer).

Table 1 summarizes the data on adhesions and wound healing.

MeroGel is an esterified hyaluronic acid found in humans in high concentration in synovial fluid and vitrous humor of the eye that gives it a well-established biocompatibility and wound healing properties. Studies\textsuperscript{1-7} have shown that wounds heal faster and the quality of tissue repair is higher with less fibrous scarring in the presence of hyaluronic acid. This nonwoven biomaterial absorbs about 10 times its weight in blood and drainage and provides a physical matrix for clot formation.

We reviewed some studies regarding the efficacy of hyaluronic acid in what it concerns wound healing and hemostasis and adhesions in nasal surgery. Wormald and colleagues\textsuperscript{14} performed a randomized, controlled blinded study in 42 patients with chronic sinusitis undergoing ESS. The aim of this study was to determine whether there was any benefit or detrimental consequences of placing a hyaluronic acid pack (MeroGel) into the middle meatus after endoscopic sinus surgery (ESS). The patients were randomized to receive MeroGel on one side and no packing on the other side. The reassessment was made at 2, 4, 6 and 8 weeks after surgery and the presence of synechiae, edema, and infection were noted. At no time point was the difference between the packed and unpacked sides statistically significant for any of the measures. The authors’ conclusion was that MeroGel nasal packing has no significant beneficial or detrimental effect in terms of synechiae, edema, or infection when placed in the middle meatus after ESS.

Vaiman and colleagues\textsuperscript{15} compared the hemostatic efficacy of the second generation surgical sealant, fi-
brin glue (Quixil), to that of nasal packing (Merocel) in endonasal surgery in a prospective randomized trial that included 494 patients, showing that fibrin glue is superior to nasal packing in controlling the postoperative hemorrhage (postoperative hemorrhage occurred in 22.9-25% of patients with nasal packing vs. 3.12-4.65% in the fibrin sealant groups (late hemorrhage only)), but with comparable results in the incidence of adhesion formation between the arms. Miller and colleagues compared Merocel pack (5-7 days) and hyaluronic acid (MeroGel). Patients underwent follow-up at 8 weeks postoperatively. Results showed both packing agents were associated with an 8% adhesion rate. This finding contrasts with those of Vaiman and colleagues and Pomerantz and Dutton which showed no evidence of adhesion formation with Merocel packing. Discrepancies between these studies may be related to the timing of pack removal.

The effects of non-absorbable nasal packing (Merocel) on adhesions formation and wound healing process was assessed by Bugten and colleagues in a randomized, partly blinded, controlled clinical trial. Video recordings taken 10 to 14 weeks after surgery

![Table 1](image-url)
showed 7 of 62 adhesions in the Merocel arm versus 29 of 54 adhesions in the no packing arm, a finding that was highly significant ($P = .001$). Other outcome variables assessed in this study were nasal congestion, nasal pain, and headache the first 2 weeks, rated on visual analogue scales (VAS; 0-100). The authors showed that nasal congestion decreased most the first 5 to 7 days postoperatively and the removal of the Merocel caused little pain (mean 23 on VAS) to the patients.

Oxidized regenerated cellulose (Surgicel Nu-knit, Ethicon Inc, USA) has been studied for its effects on hemostasis after ESS. In this regard, Shinkwin and colleagues$^{18}$, in a randomized, prospective trial that included 60 patients, compared Surgicel Nu-knit (placed in one nostril) with Vasolene ribbon gauze and Merocel packs (randomized in the other nostril). Twenty-four hours postoperatively, patients were asked to assess the discomfort experienced in either side of the nose while the packs were in position and on removal. The length of time and estimated amount of bleeding following removal of packs were also assessed. Surgicel Nu-knit caused significantly less discomfort both while in position and on removal than Vasolene gauze ($p < 0.01$, respectively). Compared to Merocel sponges, Surgicel Nu-knit caused significantly less discomfort on removal ($p < 0.01$). Bleeding following removal was also significantly less compared to the other packs.

A multicenter, prospective, single-arm study that included 30 patients$^{19}$, evaluated the success in achieving hemostasis within 10 minutes of application of a combination of Surgifo (sterile, absorbable porcine gelatin) with thrombin in patients undergoing elective primary or revision endoscopic sinus surgery for chronic sinusitis. The results showed that Surgifo hemostatic matrix with thrombin was clinically effective in controlling bleeding in 96.7% of patients (29/30 pts.) and also no complications, such as synechiae, adhesion, or infection, were reported.

FloSeal is a topical hemostatic agent consisting of gelatin matrix (bovine-derived) combined with human derived thrombin. Jameson and colleagues$^{20}$ in an randomized, double-blinded, controlled study, evaluated its effect on bleeding and healing after functional endoscopic sinus surgery. The results showed that the use of this hemostatic agent produced less bleeding, immediately postoperatively, less discomfort and did not increase the incidence of crusting or scarring compared with control.

Carboxymethylcellulose (CMC) nasal packing was developed in 2001, with its postulated ability to promote hemostasis by platelet aggregation. Regarding the hemostatic abilities of CMS, in the literature there are some contradictory results. If Kastl and colleagues$^{21}$ in an investigator-initiated, randomized, single-blinded, controlled, prospective clinical study, comparing CMC nasal packing with no packing at all, did not find any statistical significant difference, Szczygielski and col.$^{22}$ reported that dissolvable CMC foam dressing is associated with very low levels of localised pain and with low levels of postoperative bleeding and synechiae formation.

Platelet gel is a fibrin tissue adhesive product manufactured from centrifugation of autologous whole blood, producing a platelet-rich plasma. In rhinologic applications it is considered an innovative technique that holds many advantages, including comfort, hemostasis, and growth factors that may improve wound healing. Pomerantz and col.$^{7}$, in a cohort study, showed good results in the management of postoperative epistaxis after ESS using platelet gel, so that none of the patients in the study had postoperative epistaxis that required additional packing, and there were no instances of synechiae formation or exuberant granulation tissue.

Other novel absorbable agent is microporous polysaccharide hemispheres (MPH), which is produced from purified potato starch, that is rapidly absorbed and acts to quickly extract fluids from blood, thereby concentrating serum proteins and platelets at the site of injury. Its hemostatic effect was evaluated in several studies in the literature$^{23,24}$, the reports showing less bleeding in the early postoperative period with no increase in pain, obstruction, or nasal discharge, but also no increase in adhesions formation compared with control groups.

A novel chitosan gel has also been recently developed from chitin, a natural biopolymer, and is postulated to achieve hemostasis through aggregation of erythrocytes. It also has been shown to have an inhibitory effect on fibroblast proliferation$^{25,26}$. Chitosan gel has been shown in the CRS sheep model of ESS to have produced rapid hemostasis after application and has been shown to significantly improve the microscopic features of wound healing and reduce adhesion formation after ESS in an animal model.

No published literature has investigated the hemostatic or wound-healing properties of polyethylene glycol (Nasopore, Polyganics B.V., Groningen, The Netherlands) after ESS. All other products have recently been investigated in both human and animal trials, importantly in the area of hemostasis and wound healing.

CONCLUSIONS

The ideal nasal dressing is one that is not affecting the quality of life of the patient, is hemostatic and improves healing. In practice it is very difficult, if not impossible, to find a product that meets all these features, although a number of currently available materials may address some of these characteristics.
Even if efficient in preventing nasal postoperative bleeding, removable nasal packing, regardless of the type of material, is considered by the patient to be the most unpleasant aspect of the endoscopic sinus surgery, producing discomfort and pain during the period it is in place, but also when it is removed.

This may be the reason why lately a lot of researches were conducted to develop an absorbable nasal dressing that is safe and efficient in preventing hemorrhage and adhesions, and ensures a smooth wound healing process. In this regard, important steps have been made.

But, choosing the type of nasal dressing after ESS is in the surgeon’s hand and depends on his abilities, preferences and technical possibilities.

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LITERATURE REVIEW
Vascular head and face algiae

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ABSTRACT

Vascular head and face algiae represent a physiopathological and therapeutic entity, symptomatically polymorphic, due to the numerous structural and topographic variants where they occur. Pathology of any structure representing the face and the head may begin with or be accompanied by algia at this level. The physiopathological mechanism of vascular face algiae develops in three stages: arterial spasm, vasodilation and edema.

The crises should be distinguished from migraine, although it seems that the physiopathological mechanisms are, at least partially, similar. Also, the differential diagnosis should be made between the classical forms of vascular head and face algiae, the atypical and borderline ones. Management of vascular face algiae needs to consider the crisis, the background therapy, nerve blockages and surgical treatment.

KEYWORDS: algiae, vascular, Sluder syndrome, Charlin syndrome, chronic paroxysmal hemicrania

Vascular head and face algiae are included in the great chapter of headaches. Over 80% of the emergency presentations to the ENT Emergency Room are due to different clinical and topographical forms of headaches.

Pathology of any structure representing the face and the head may begin with or be accompanied by algia at this level.

If pain caused by visceral organs of the various functional anatomic systems in this region (brain, eyes, nose, pharynx, ear etc.) are described in detail in the pathology of the respective organs, herein we will make a strict review of vascular origin head and face algiae.

Vascular head and face algiae represent a physiopathological and therapeutic entity, symptomatically polymorphic, due to the numerous structural and topographic variants where they occur.

Vascular-type algia manifests at the level of the face by:
• pain crisis, usually located at the root of the nose;
• pain is strictly unilateral and very precisely located; it regularly repeats in the form of variable length crises (“cluster headache”);
• painful crises are associated with nasal, ocular and vasomotor secretory phenomena.

These crises should be distinguished from migraine, although it seems that the physiopathological mechanisms are, at least partially, similar (there are many similarities). Nevertheless, migraine has clinical manifestations that clearly define it and, in the same time, differentiate it from the other head and face algiae.

Migraine frequently has a prodrome, a strictly fronto-orbital pain topography, the pain being pulsating. The onset of migraine is precocious, in childhood, and especially in adolescence. Pain is accompanied by photophobia and neurovegetative symptoms. They manifest in the ophthalmic, sylvian, basilar areas, in a genetically-prone context.

Vascular head and face algiae are much less common than migraine (0.4% in men and 0.8% in women). They occur most frequently between 20 and 70 years. Their study is necessary in the differential diagnosis of migraine. The common clinical elements of vascular head and face algias are: periodicity, presence of neurovegetative disorders, stress, anxious behaviour.

Periodicity. The painful syndrome occurs most frequently in spring and autumn and it can manifest between one and three months. The frequency of the crises varies from one per week to more crises per day. Pain has a sudden onset, without being accompanied by a prodrome, and it reaches climax in 15 to 20 seconds. Pain is usually unilateral and topographically distributed on one of the branches of the trigeminal nerve. Remission periods generally exceed two years.

Vasomotor disturbances are characterized by parasympathetic hypertonia, manifested by: lacrimal hy-
persecution, conjunctival hyperaemia, unilateral nasal obstruction corresponding to the pain, unilateral rhinorrhea, palpebral miosis and ptosis, bradycardia. Neurovegetative disorders are more frequent and pronounced in shy, emotional individuals.

**Role of stress.** Intense activity, chronic fatigue, tobacco or alcohol are risk factors. Patients with gastric ulcer or gastrointestinal disorders are most prone to painful face crises of vascular type.

During the crisis, the patient tends to isolate, is afraid of light, has reduced professional performance, anxiety, psychomotor agitation and keeps his head in his hands.

The physiopathological mechanism of vascular face algia develops in three stages: arterial spasm, vasodilation and edema. The three stages occur in the vessels of the territory innervated by the trigeminal nerve and histamine acts as a mediator. Cyclicity, duration and intensity of painful crises depend on the hypothalamus which regulates secretions of melatonin, cortisol, beta-endorphins and prolactine, under the influence of several less-known endogenous factors or exogenous ones (stress, toxic, living conditions, etc.). Hypoxia accentuates pain by influencing chemoreceptors in the carotid corpuscle.

### CLINICAL FORMS OF VASCULAR HEAD AND FACE ALGIE

1) **Sluder Syndrome** is an unilateral vascular cephalalgia, pain being located in the root of the nose. Pain occurs in crises and radiates to the mastoid and neck, being accompanied by unilateral nasal congestion, rhinorrhea and tearing on the same side as the pain. Otalgia and clogged ear sensation may also occur, as well as taste changes. In many cases, the painful crisis may be preceded by hypersialorrhea. The clinical phenomena immediately cease as soon as the sphenopalline ganglion is anesthetized.

2) **Charlin Syndrome** is characterized by a pain localized to the internal angle of the eye, and it is associated with tearing, photophobia, blepharospasm, conjunctival hyperaemia, palpebral edema, rhinorrhea with unilateral hyperaemia of the nasal turbinates.

3) **Other pain syndromes in vascular head and face algia**
   a. **Harris’s ciliary neuralgia** is manifested by temporal pain and tearing on the same side with the pain. The other clinical signs described in previous syndromes are absent.
   b. **Vail’s Vidian neuralgia** is characterized by pain at the root of the nose, which radiates to the ear, neck and shoulder.
   c. **Monbrun - Benistry Syndrome** is manifested by a unilateral retro-ocular pain that radiates to the ociput and is accompanied by hemifacial cutaneous vasodilation with profuse sweating and cutaneous hypesthesia.

### ATYPICAL OR BORDERLINE VASCULAR HEAD AND FACE ALGIE

Their clinical manifestation is similar to classical forms of vascular face algia. However, the difference consists in location, periodicity, evolution and therapeutic response. Five clinical entities are more frequent in practice:

- **Cluster tic** is a face neuralgia accompanied by vasomotor changes on the painful territory. It quickly recedes after administration of Carbamazepine.
- **Chronic Paroxysmal Hemicrania** is characterized by short, but very frequent, painful crises (they can reach up to 40 in 24 hours) and it is found most often in women. Crises recede after administration of Indomethacin.
- **SUNCT = short lasting unilateral headache with conjunctival injection and tearing** is characterized by short and very frequent painful crises, accompanied by conjunctival injection and tearing. Crises are sometimes subintrant. Their frequency may vary for one per day to 30 crises per hour. It receded with Indomethacin.
- **Tolosa - Hunt syndrome** is clinically characterized by stabbing pain, ophthalmoplegia, moderate nasal inflammatory syndrome. Symptoms remit after corticosteroid therapy.
- **Raeder’s paratrigeminal syndrome**, also known as “orbital apex” syndrome, is characterized by throbbing pain, deeply located at the back of the orbit, hypoesthesia in the ophthalmic territory. Sympathetic participation highlighted by miosis - Claude Bernard Horner syndrome. In the presence of a painful orbital apex syndrome we should also suspect the possibility of a meningioma in the petrous region.

Management of vascular face algia needs to consider the crisis, the background therapy, nerve blockages and surgical treatment.

Treatment of the crisis consists of the following remedies, in sequence or in combination: oxygen therapy, DHE (ergotamine) - per os or by injection, Sumatriptan (Imijet) injection, moderate, pain-relieving doses of cortisone, including morphine, sometimes associated with anxiolytics.

**Background therapy.** Intermittent administration of antiserotonics (Metysergide) in progressive doses from 60 mg to 140 mg per day, moderate corticotherapy (40 mg per day), lithium, calcium blockers (Verapamil - Isoptin), anti H1 agents (Sibelium), GABA - mimetics at the level of the hypothalamus (Sodium Valproate).
Nerve blockages have the role of reducing the parasympathetic hyperactivity in the sphenopalatine ganglion. There are four ways of making the anaesthesia:

- contact - with an anaesthetic at the bottom of the middle inferior turbinate;
- infiltration - percutaneous infiltration in the orbito-zygomatic angle;
- through the naso-palatine duct - 1 cm inside the penultimate upper molar;
- anaesthetic infiltration of the Arnold nerve at the C2 level.

Surgical treatment is a last resort after failure of all previous ones. Surgical procedures consist of: thermo-coagulation of the Gasser ganglion or simple infiltrations with glycerol, sectioning of the great superficial petrous nerve by intracranial neurosurgical intervention.

BIBLIOGRAPHY

CLINICAL CASE

Unusual case of nasopharyngeal angiofibroma in adult male patient

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ABSTRACT

The juvenile nasopharyngeal angiofibroma is a benign slow-growing tumor with vascular component which affects males in their early puberty and adolescence, and in very few cases men over 25 years of age. The authors describe a case of a nasopharyngeal angiofibroma in a 56 year-old male patient, confirmed by histological and immunohistochemical examination. The CT scan and the selective angiography made before surgery revealed the characteristics of a hypervascular mass occupying the nasopharynx and the posterior part of the nasal cavity. The tumor was successfully removed by lateronasal rhinotomy. The follow-up shows no signs of clinical, endoscopic and imagistic recurrence three years after surgery.

KEYWORDS: nasopharyngeal angiofibroma, adult patient, lateronasal rhinotomy, selective angiography

INTRODUCTION

The juvenile nasopharyngeal angiofibroma is a benign, slow-growing tumor with vascular component, which affects mostly males between 14 and 25 years of age. In very few cases it has been reported in men over 25 years old or females1. The nasopharyngeal angiofibroma is a rare tumor representing about 0.5% of all head and neck tumors2. Although it is a benign tumor, it has a high morbidity and mortality due to its local invasiveness3. Having a slow-growing rate, the patient usually complains about progressive and persistent nasal obstruction, often accompanied by recurrent epistaxis. Diagnosis is based upon patient’s history, physical examination and radiological findings. The complete surgical excision represents the gold standard treatment for this kind of tumors.

CASE REPORT

A 56 year-old male patient presented with progressive and persistent nasal obstruction for the past 12 months, accompanied by intermittent mucous rhinorrhea and headache. There was no episode of nasal bleeding or any other pathology in patient’s medical history.

The anterior rhinoscopy and nasal endoscopy revealed the presence of a white-pink, non-ulcerated tumor, apparently descending from the ceiling of the nasal cavity and occupying the posterior half of the right nasal fossa and one third of the left nasal fossa (causing the obstruction of choanal orifices), the nasopharynx and descending till the margins of the soft palate.

Contrast-enhanced cranio-facial computed tomography (CT) showed an intensely enhancing mass occupying the nasopharynx, both nasal cavities and descending to the margins of the soft palate. The tumor caused the osteolysis of the posterior part of the nasal septum (Figure 1). There were no signs of extension to the sphenoid sinus or invasion of the pterygomaxillary or infratemporal fossa.

Before surgery, a carotid angiography was performed revealing a hypervascular mass with the main blood supply from the anterior internal maxillary artery, branch of the right external carotid artery (Figure 2). Unfortunately, the selective embolization of the main arterial branches during angiography was not possible. We decided that the first step of the surgical procedure must be external right carotid artery ligature. This procedure was performed in order to minimize hemorrhagic complications. Afterwards, the patient underwent open surgery by lateronasal rhinotomy. This classical approach was used because of the tumor’s dimensions (11/5/7 cm) which made intranasal endoscopic resection almost impossible. Using this surgery technique, the tumor was completely removed, in one piece (Figure 3), without bleeding or other complications during surgery or in the following days.

The histological examination of the tumor revealed a highly vascularized, mature, fibrous tissue characteristic for angiofibroma. Also, the immunohistochemistry (IHC) tests confirmed the histological diagnosis. The CD31 and CD 34 antigens were identified in
blood vessels tissue. The CD 34 antigen was also found in the tumor’s stromal tissue (Figure 4).

The patient was discharged 9 days after surgery. The follow-up was made at one month, three months and six months after surgery and then once a year. The patient, still under surveillance, shows no signs of clinical, endoscopic and imagistic recurrence.

DISCUSSIONS

Although extremely rare, the nasopharyngeal angiofibroma can occur in elderly adults. Lukomski et al. presented in their study only 36 cases during a period of 50 years4 and this statistic confirms the low prevalence of this disease.

The pathogenesis of the juvenile nasopharyngeal angiofibroma is still unknown. Because of its high frequency in teenage males, Andrade explained this selectivity by intranuclear accumulation of androgen receptors and by a high number of growth factors (VEGF - endothelial growth factor, TGFß - transforming growth factor beta)5. Moreover, there are some very recent theories which state that the nasopharyngeal angiofibroma could be a vascular malformation due to incomplete regression of the first branchial artery6.

This tumor usually originates from the region of sphenoopalatine foramen, enlarges to fill the postnasal space and frequently extends to the sphenoid sinus, pterygomaxillary and infratemporal fossae, orbit or even to the middle cranial fossa7. The radiologic examinations remain the most important diagnostic tools, because they allow the correct evaluation of tumoral extension and help the surgeon to choose the most correct surgical approach, in order to remove the tumor8,9,10,11.

In order to be able to predict the outcome of the tumor, it is important to know its extent. For that purpose, a staging system must be used. There are many staging criteria developed when evaluating a juvenile nasopharyngeal angiofibroma, like Fisch, Radkowski or Andrews. The Radkowski criteria, based on clinical and radiological criteria, seems to be the most used in modern literature3 and by us also. According to the latter, our case was included in stage IB.

Regardless of the stage or chosen surgical approach, the patient must take a selective angiography on internal and external carotid arteries, in order to evaluate the main arterial branches which ensure the tumor’s blood supply. In some cases, the angiography can be continued with the embolization of the main arterial branches8,10,11. Unfortunately, the embolization could not be performed in our case.

Concerning the surgical approach and considering that most of the patients are still in their growing period, there has been a marked shift towards less invasive surgery. The endoscopic approach is reported having extremely good

Figure 1  CT scan revealing the tumor’s extension in the nasal cavity and osteolysis of the posterior part of the nasal septum (the CT scan was performed while the patient had nasal packing, the arrows revealing the delimitation between nasal packing and tumor)

Figure 2  Selective angiography on right external carotid artery → a hypervascular mass with the main blood supply from the anterior internal maxillary artery, branch of the right external carotid artery

Figure 3  Macroscopic view of the surgical specimen
results and low recurrence rates, even if the tumor has minimal intracranial invasion. In certain selected cases, with very small tumors, Gamma knife has also been used and the reported results have been extremely encouraging.\textsuperscript{12}

External approach, like lateral rhinotomy or midfacial degloving, is used because it ensures a good exposure of the tumor and its extensions, but, especially in children, it may cause undesirably facial growth retardation.\textsuperscript{8,9} If the tumor hasn’t been completely removed, it has a significant tendency to recur, new surgical intervention being sometimes necessary.\textsuperscript{8,9,10,13,14}

CONCLUSIONS

Nasopharyngeal angiofibroma is a benign but locally aggressive tumor and appears extremely rare in adults. Imaging studies are the most important tools in positive and differential diagnosis. Interventional radiology can help in the attempt to cure this tumor. It is partially involved in the process by providing the means of minimizing bleeding trough selective embolization and it can also serve as curing treatment by the use of Gamma knife surgery. However, the surgery remains, up to date, the gold standard treatment for nasopharyngeal angiofibroma. It can be performed by endoscopic or external approach, considering individual anatomy, pathology, blood supply, location and size of the tumor. The surgery allows complete tumor resection and prevents recurrences or other complications.

REFERENCES

Hereditary hemorrhagic telangiectasia (HHT) is an autosomal dominant disorder characterized by recurrent epistaxis, cutaneous telangiectasia, and visceral arteriovenous malformations that affect many organs, including the lungs, gastrointestinal tract, liver and brain. HHT affects varied racial and ethnic groups and occurs in a wide geographic distribution. Men and women are affected equally. Onset of symptoms may be delayed until the fourth decade of life (approximately 90% of patients manifest by age 40 y) or later decades. The HHT diagnosis is classified as definite if 3 criteria are present, possible or suspected if 2 criteria are present, and unlikely if fewer than 2 criteria are present: recurrent epistaxis, telangiectasias - multiple at characteristic sites (lips, oral cavity, fingers, nose), family history, visceral lesions (gastrointestinal telangiectasia with or without bleeding). Laboratory examinations can reveal a low value of hemoglobin, because of chronic bleeding, platelets may have normal value while coagulation is normal. Imaging (CT, MRI) may reveal the existence of vascular-nerve abnormalities. The surgical treatment consists in electrocoagulation or photocoagulation of the telangiectases from the nasal mucos, or arteriovenous aneurysm embolization.

Nasal fibrosarcoma

Fibrosarcoma arising in the sinonasal cavities are very rare. Fibrosarcoma is a tumor of mesenchymal cell origin that is composed of malignant fibroblasts in a collagen background. The tissue of origin seems to be the periosteum rather than mucosal connective tissue. Fibrosarcoma, like other soft-tissue sarcomas, has no definite cause. Current research indicates that many sarcomas are associated with genetic mutations. The most common genetic defects include allele loss, point mutations, and chromosome translocations. Also, their etiology could involve previous trauma, nasal polyposis and a history of radiation therapy. Fibrosarcoma is a malignant tumor with a high cellularity, the tumoral cells are spindly, uniforms, without pleomorphism, with a moderated to high mitotic rate. The most common presentation for sinonasal fibrosarcomas includes epistaxis, nasal obstruction, recurrent sinusitis, cranial neuropathy, sinus pain, facial paresthesia, proptosis, diplopia.

Because of the rarity of these tumors no clear guidelines exist for their therapy. Regarding the treatment, depending on the type and extent of the tumor, surgical, radiotherapeutic measures are appropriate. Inclusion of neoadjuvant chemotherapy in modern therapy regimens may facilitate resection of unresectable tu-

**CLINICAL PHOTOGRAPHS**

**Hereditary hemorrhagic telangiectasias**

![Figure 1 a, b Telangiectasias on the face skin and hands](image1)

![Figure 2 Telangiectasias on the soft and hard palate, on the tongue](image2)

Anterior rhinoscopy and nasal endoscopy revealed a tumor that involves 2/3 of both nasal cavities and affects the superior part of the septum by destroying it. Both middle turbinates were laterally moved and an important pressure was made on lateral walls of the nose.

The CT and MRI scans showed a voluminous tumor that involved nasal cavities, ethmoid, sphenoid, frontal sinuses with invasion of medial walls of maxillary sinuses and orbital cavities and intracranial extracerebral extension.

Surgical approach was endoscopic endonasal with a piece-meal resection. Histopathologic examination and immunohistochemistry test establish the diagnosis of fibrosarcoma. Postoperative the patient received radiotherapy. The endoscopic and imaging (CT scan) reevaluation at 2, 3 and 5 months shows no recurrence.
SYNDROMES AND EPONIMES

Syndromes and eponimes in Otolaryngology

Alport’s syndrome - hereditary disorder marked by progressive nerve deafness, progressive pyelonephritis or glomerulonephritis, and occasionally ocular defects.

Alström syndrome - a hereditary syndrome of retinitis pigmentosa with nystagmus and early loss of central vision, deafness, obesity, and diabetes mellitus.

Barany syndrome - A syndrome of unilateral headache in back of the head with ipsilateral recurrent deafness (alternating with periods of unaffected hearing), vertigo, tinnitus. Periodic recurrence for days or months. May be corrected by induced nystagmus. Beign condition, but danger of possible cranial trauma due to fall.

Barre - Lieou syndrome - characterized by trauma or arthritic changes involving the third and fourth cervical vertebrae or cervical disk lesions with provocation of the cranial nuclei, the fifth and eight cranial nerves being chiefly affected. This causes a disturbance of circulation in the region of the cranial nuclei, affecting especially the fifth and eight nerves. The symptoms are: headache, facial pain, ear pain, vertigo, tinnitus, loss of voice, hoarseness, neck pain severe fatigue, muscle weakness, sinus congestion, sense of eyeball being pulled out, dizziness, fatigue, numbness.

Charlin syndrome (nasociliary neuralgia) - pain localized to the internal angle of the eye, and it is associated with tearing, photophobia, blepharospasm, conjunctival hyperaemia, palpebral edema, rhinorrhea with unilateral hyperaemia of the nasal turbinates.

Concha bullosa - abnormal pneumatization of the middle turbinate that may interfere with normal ventilation of sinus ostia and can result in recurrent sinusitis.

Cottle signe - good nasal breathing after lifting the cheek (sign in nasal valve colaps).

„Cri du chat” syndrome - disorder caused by the loss of part of the short arm from chromosome 5. The syndrome involves severe developmental and mental retardation and a characteristic constellation of congenital malformations which include microcephaly, round face, hypertelorism, micrognathia, epicanthal folds, low-set ears, hypotonia, laryngomalacia, motor and mental retardation.

Crouzon syndrome - genetic disorder characterized by a premature fusion of both coronal sutures resulting in a brachycephalic head. The characteristic features of Crouzon’s syndrome are ocular proptosis (exophthalmos), maxillary hypoplasia, excessive distance between both eyes (orbital hypertelorism), external auditory conduct atresia, conductive hearing loss and a beaked nose resembling a parrot’s beak. Generally, there is retrusion of both the forehead and the eyebrow, with midface hypoplasia and shallow orbits with bulging eyes (proptosis).

Dejean syndrome (orbital floor syndrome) - exophthalmy, diploia, and anesthesia in the areas innervated by the trigeminal nerve, occurring with a lesion in the floor of the orbit.

Garcin’s syndrome - unilateral paralysis of all of the cranial nerves due to a tumor at the base of the skull or in the nasopharynx.

Gradenigo syndrome - lateral rectus palsy (cranial nerve VI), retroorbital pain (cranial nerve V) and otorrhea.

Sclerosteosis - progressive sclerosing bone dysplasia with an autosomal recessive mode of inheritance. Radiologically, it is characterized by a generalized hyperostosis and sclerosis leading to a markedly thickened and sclerotic skull, with mandible, ribs, clavicles and all long bones also being affected. Due to narrowing of the foramina of the cranial nerves, facial nerve palsy, hearing loss and atrophy of the optic nerves can occur.

Styloid syndrome (Eagle syndrome) - Inflammation of the styloid process, a spike-like projection sticking off the base of the skull. The tissues in the throat rub on this structure during the act of swallowing causing pain. The diagnosis of is made by history and an x-ray showing the abnormal styloid process.

Vernet syndrome (jugular foramen syndrome) - involvement of the IX, X, and XI cranial nerves with the fracture. Patients present with difficulty in phonation and aspiration and ipsilateral motor paralysis of the vocal cord, soft palate (curtain sign), superior pharyngeal constrictor, sternocleidomastoid, and trapezius.

Villaret syndrome - ipsilateral paralysis of the IX, X, XI, XII cranial nerves and cervical sympathetic fibers. The clinical manifestations include Horner’s syndrome and paralysis of the soft palate, pharynx, and vocal cords. In some cases there also may be paralysis of the superior constrictors of the pharynx, numbness of the soft palate, fauces, and larynx, loss of taste of the posterior one third of the tongue, and paralysis of the sternocleidomastoid and trapezius muscles.
Instructions for authors

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Acknowledgements should be noticed the persons, organizations that contributed to the study.

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