DOCTORAL THESIS

CLASSICAL AND MODERN APPROACHES TO
THE CAUSES AND TREATMENT OF EPISTAXIS

ABSTRACT

PhD Supervisor:
Prof. Univ. dr. ELENA IONIȚĂ

Doctor:
GEORGETA OSMAN

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**INTRODUCTION**

The PhD thesis represents a retrospective study and analysis, focused on the etiopathogenesis, occurrence and treatment of epistaxis in patients that were admitted during 2008 and 2012 in the ENT ward of the Clinical County Hospital in Craiova.

**CURRENT STATE OF KNOWLEDGE**

This part of the thesis is divided into five chapters containing the following: the vascularization of the nasal fossae, hemostasis and its pathophysiology, the etiopathogenesis of nasal bleeding, the positive diagnosis of nasal bleeds and the management plan for the subject issue.

**The first chapter** describes the rich vascular system of the nasal fossae, which is represented by blood and lymph vessels. The blood vessels span mostly from the two major arteries leading up to the skull: the internal carotid artery and the external carotid artery. The venous system is richly represented as well.

**Chapter II** describes the process of hemostasis and its pathophysiology. Hemostasis is the physiological process through which hemorrhage of any nature (traumatic – caused by internal or external factors, or caused by changes in the endothelium) is stopped. Hemostasis is an elaborate process containing complex stages and varied chemical reactions; cellular, tisular and molecular factors contributing to certain pre-established stages. Our findings have brought up connections between the factors involved in hemostasis and other self-defense processes taking place in the human body like inflammation or the immune response.

**The third chapter** contains an ample description of the etiopathogenesis of epistaxis. The causes of nasal bleeds are divided into two main categories: local and general. Amongst the local causes we quote: infectious rhinosinusal diseases, inflammatory disease, anatomical malformations of the nose and sinuses, benign or malign tumors, trauma or iatrogeny. General causes include: age, sex, hematological, hepatic, cardiovascular, endocrinological or renal disease or even undetermined causes.

**The fourth chapter** details the positive diagnosis of nasal bleeding, symptom which may present a variable degree of gravity and a plethora of causes. The positive diagnosis of epistaxis is achieved through three separate stages: differentiating nasal bleeds from other types of bleeding, recognizing the source of the bleeding and its intensity (gravity diagnosis), assessing the impact of
the bleeding on the patient’s current state and also determining the causes behind the symptom (diagnosing the ethology).

Within the fifth chapter we present the management plan and treatment plan of epistaxis. The treatment usually aims at three key points: stopping the hemorrhage, stabilizing the patient, and treating or removing the cause thus future recurrence is limited.

Depending on the type of bleeding, the patient’s state and the cause of the bleeding, therapeutical intervention may be classified as follows:

1. **Minor therapeutic maneuvers:** applying local pressure, local injections of vasoactive substances, chemical or electrical cauterity, radiofrequency cauterization, nasal packing performed with sponges, gauze or inflatable devices.

2. **The secondary intervention uses** posterior nasal packing performed with gauze or with inflatable cathethers.

3. **The third line of treatment** implies surgery and embolization.

**PERSONAL RESEARCH**

Chapter VI opens up the 2nd part of the thesis, a part dedicated to personal research. It contains a retrospective study and analysis based on patients admitted in the Clinical Country Hospital in Craiova (the ENT ward), during 2008 and 2012. All the patients considered for this study were diagnosed with epistaxis (either as primary or secondary cause of admittance). The patients received a full clinical examination, doubled by an endoscopic examination of the nasal fossae. We meticulously searched for any correlations between any of the findings and the current state and symptoms of the patient. We also sought to correlate the degree of nasal obstruction, certain particularities regarding the vascularization of the nasal cavities with the onset of the hemorrhage.

The patients who did not respond to medical treatment were further investigated by means of X-ray computed tomography or magnetic resonance imaging or underwent surgery. A special attention was given to chronic pathology present in these patients, as certain diseases may cause or facilitate the onset of nasal bleeds.

The study had multiple objectives:

- Understanding the way anatomical particularities may influence the onset and evolution of nasal bleeds;
- Finding new common grounds between classical descriptive anatomy and the endoscopic procedures;
- Correlations between imaging results and the present pathology;
• Follow-up on patients’ evolutions under treatment or after leaving the hospital;
• The study of each chronic disease present alongside epistaxis and how other pathologies may influence the management plan;
• Deciding which the best course of treatment is based on the findings above – debating and choosing between a classical or a modern (endoscopic) surgical approach;
• Comparing our results with findings already present in related studies; discovering new potential ideas for further studies;
• The elaboration of a general therapeutic plan for patients with epistaxis, based on our experiences.

The method used to conduct this study was by assessing each patient based on a personal case-file that contained all the relevant data belonging to the patient, the treatment he underwent, and also the patient’s evolution whilst under treatment.

The clinical ENT exam underwent the following stages:
1. The inspection of the face and neck – facial or nasal deformity was noted, as well as changes to skin color (note anemia);
2. The palpation of certain trigger points (areas of palpation in sinus disease), or of any tumoral mass (if present);
3. The inspection of the nasal vestibule was useful in describing large tumors of the nose that would often deform the whole nasal pyramid and even infiltrate nearby tissue.
4. Anterior rinoscopy (performed before and after the instillation of decongestants) often revealed blood or crusting within the nasal cavities, the presence of pus or even foreign bodies. The degree of nasal obstruction could easily be evaluated this way – septal deviation or spurs, tumors or polyps being the most frequent reasons for nasal obstruction.
5. Posterior rinoscopy may also lead to identifying blood or crusting or pus along the rim of the posterior nasal apertures or a chronic hipertrophic rhinitis. Ocassionally nasopharyngeal tumors were also found through means of posterior rinoscopy.
6. The examination of the pharynx may also reveal important elements – blood or clots, pus or it may help assess the extension of certain tumors.
7. The examination of the cranial nerves was also mandatory;
8. Last but not least rhinosinusal endoscopy was performed.

Paraclinical tests used are as follows:
1. Standard lab tests – blood groups (Rh included), full blood cell count, ESR, blood sugars, LFT, fibrinogen levels, PT, PT-INR, platelet count, bleeding time and phrotrombin time;
2. Imaging results – classical radiology incidences (sinus scans, Tcheboul and Blondeau or Hirtz), CT scans or MRI;

3. Tumoral biopsy followed by the histology and/or immunological work-up;

4. Bacteriological exams where applicable;

5. Other exams performed by doctors of other specialities – we often solicited the help of cardiologists, ophthalmologists, neurologists and neurosurgeons, dermatologists or facial reconstruction surgery experts.

The treatment applied was most often complex, consisting of medical and surgical procedures (classical or endoscopic techniques).

In the sixth chapter of the thesis we have run an analysis based on patients which were admitted in our clinic with the primary (or secondary) diagnosis of epistaxis. A number of 705 patients were selected out of a total of 10832 admissions. The study has taken into account a 5 year period (2008 – 2012). Comparing the case files for each patient we came to the conclusion that nasal bleeding was more frequent in male patients over 50 years of age, while there were no meaningful difference between patients residing in either rural or urban areas. The statistical results we obtained in the ENT ward in the Clinical County Hospital in Craiova (6.5%) were comparable to the results of a study conducted in the USA (5-14%).

By further analysing the patients’ case files we observed that nasal bleeding associates with the following illnesses:

1. Malformations of the nose – 74 patients – 10.5%
2. Rhinosinusual trauma – 138 patients – 19.5%
3. Rhinosinusual inflammatory diseases – 64 patients – 9%
4. Benign rhinosinusual tumors – 28 patients – 4%
5. Malign rhinosinusual tumors – 21 patients – 3%
6. Cardiovascular diseases – 352 patients – 50%
7. Hematological diseases – 5 patients – 0.7%
8. Endocrinological disorders – 7 patients – 1%
9. Renal and liver diseases – 16 patients – 2.3%
The frequency of illnesses that associate epistaxis

1. Malformations of the nose

The most common nasal malformation that we have found to be associated with epistaxis is the septal deviation (10.5% of the patients admitted). In these patients the local findings often indicated significant septal spurs that would often come in contact with the lateral walls of the nasal fossae or with the turbinates. In most patients the hemorrhage originated in the anterior part of the nasal cavity, an area known as Kisselbach’s plexus (76% of patients) whilst in the rest of the cases (24% of patients) the hemorrhage was localized in the posterior part of the nasal fossae, its origin probably represented by ramifications of the sphenopalatine artery. Having in mind these two areas we classified nasal bleeds into two large categories: anterior and posterior epistaxis.

The anterior epistaxis had a higher frequency mainly due to the local conditions found in the anterior part of the nasal septum – the Kisselbach plexus. This is a region in the anteroinferior part of the nasal septum where four arteries anastomose to form a vascular plexus of that name. The arteries are: anterior ethmoidal artery (from the ophthalmic artery), the sphenopalatine artery (terminal branch of the maxillary artery), the greater palatine artery (from the maxillary artery) and the septal branch of the superior labial artery (from the facial artery). An anatomical particularity of
these blood vessels is the reduced quantity of elastine in their endothelium, thus making them susceptible to ruptures.

![Endoscopic view of a typical hemorrhage from the Kisselbach’s plexus](image)

Endoscopic view of a typical hemorrhage from the Kisselbach’s plexus

The posterior expistaxis was encountered less frequently than the anterior one (24% of patients). Bleeding was most often abundant in these cases and its management often required a complex approach.

2. Rhinosinus trauma

Trauma has been the leading to cause to epistaxis in 19.50% of the admitted patients. Depending on each type of aggression, on the amount of pressure used and how that force interacted with the bony parts of the nose and face, trauma has led to open or closed lesions often with fractures of the nasal bones or other facial bones.

Contusions, cuts, fractures of the nasal bones, of the sinusal walls or of the cartilages have in almost all cases generated epistaxis. Appropriate management was adopted for each case. Various wounds were sutured, reduction was performed in several fractures, and in some select cases the repositioning of the nasal septum was required.

Nasal bleeds caused by foreign nasal bodies or septoturbinate synechiae were also included in this category.

3. Rhinosinus inflammatory diseases

Nasal bleeding was often encountered in the course of acute rhinosinusitis as well as during flare-ups of chronic rhinosinusitis (9%). The clinical exam as well as the patient’s personal file were extremely important because they led to the quick discovery of certain key symptoms like: nasal obstruction, rhinorheea, headaches, loss of smell and other key symptoms required for a positive diagnosis. We were quick to discover which sinuses were affected through means of nasal endoscopy and CT scans. The management plan here was slightly different as antibiotics, antiinflammatory medication, or even surgery played the main parts.
4. Benign rhinosinusal tumors

Benign tumors were the cause of the epistaxis in 4% of the patients included in our study. The most frequent type of tumors were hemangiomas of the nasal septum. This tumor usually originates in the anterior part of the septum around Kisselbach’s vascular area. This type of tumors usually appear during of after puberty, especially in female patients. They may also appear after septal trauma or local surgery. The symptoms that may lead to such a tumor being identified are repeated nasal bleeding in female patients, headaches and various degrees of nasal obstruction.

The treatment applied was mostly surgical – the tumors were removed with the surrounding subcutaneous tissue and also a small portion of the septal cartilage.

5. Malign rhinosinusal tumors

Malign rhinosinusal tumors are rare to come across (less than 1% of the total diagnosable forms of cancer). Among the malign tumors of the head and neck the malign tumors of the nose and sinuses represent just 3 to 5%, the most frequent usually affecting the maxillary sinus (80%). The ethmoid sinus follows hosting 5 to 19% of such tumors.

Malign tumors have various non-specific clinical manifestations, most of them are slow to manifest any symptoms at all. The gradual extension and erosion of the tumor into surrounding tissues does however trigger certain clinical manifestations which can be divided into 3 syndromes: the nasal syndrome, the orbitary syndrome and the facial-algic syndrome.

Many of the patients who presented malign rhinosinusal tumors were diagnosed during late stages of the disease when a full surgical removal of the tumor was no longer an option. The treatment plan for these patients was linked mainly to palliation surgery and/or radio-/chemotherapy.

6. Cardio-vascular causes

From the total number of patients hospitalized for nose bleeding, 362 patients representing 50% of the total number of patients, would associate a cardio-vascular disease. High blood pressure and anticoagulation therapy were the most frequent causes.

Most of the patients with nose bleeding caused by cardio-vascular problems were overweight, between 60 and 65 years of age and presented various degrees of facial congestion. The epistaxis was the main reason for admission and in most cases there had been multiple admissions for the same person as symptoms would reoccur due to the lack of proper treatment, poor dietary habits and physical effort.

During the examination (excluding the changes present in the ENT sphere), patients would complain of occipital headache, pressure in frontal area, hematemesis (blood vomiting), paleness, cold sweat and fatigue.
The management plan took into consideration the type of epistaxis (anterior or posterior), the intensity of the bleeding and the age of the patient. More than one type of procedures were performed depending on the local findings and on the patient’s current state: chemical or electrical cauterization, anterior nasal packing (with gauze or Merocel), posterior nasal packing (with gauze or inflatable nasal balloon catheter), external carotid ligature and embolism of the sphenopalatine artery.

7. Endocrinological causes

Endocrinological causes were mostly encountered in young people during puberty and women during pregnancy and menopause. Nasal bleeding may appear due to the increase of estrogens and progesterone hormones levels, which lead to an increase in the blood flow, especially in the nasal mucosa. Due to the increased numbers of blood vessels at this level, the nasal mucosa becomes congested and fragile, often susceptible to bleeding even after minor traumas (nose picking). Usually these nose bleeds are of reduced intensity and quantity and tend to stop without requiring treatment.

During pregnancy the growing vascularization in the pituitary gland was associated with the onset of gravidarium granuloma, nasal haematoma and/or nasal tumors, all of these being accompanied by epistaxis as first symptom. These hyper-vascular lesions appear in the nasal fossae as well as in the oral cavity. They may evolve during pregnancy or may decrease in size to the point of disappearing during the post-partum period.

In our study only seven patients representing 1% of the total number of patients were admitted with nose bleeding of endocrinological causes. Only two of them needed surgical treatment such as radio-frequency cauterization of a hemangioma near the vascular plexus and an excision of a bleeding polyp of the nasal septum.

8. Hematological diseases

The epistaxis caused by hematological diseases is the result of altering one of the three steps of hemostasis. In these cases the epistaxis is extremely frequent and difficult to stop. The nasal mucosa bleeds abundantly either spontaneously or after minor trauma. Usually, the spontaneous stopping of the bleeding cannot be taken into account as it is non-existent. The only efficient treatment is aimed at the hematological disease itself.

The nose bleeding appears due to the alteration of certain stages of hemostasis, as well as the alteration of normal blood clotting. In most of the cases, the patients presenting hematological diseases were admitted in other wards. In the ENT ward only five patients (0.7%) of the total of 705 patients have been admitted with epistaxis of such causes. They accused frequent nose bleeding and they needed an intensive therapeutical approach and close observation. The epistaxis in the case of
leukemia was stopped by means of anterior nasal packing or, more frequently, a posterior packing. Chemotherapy doubled by blood transfusions and ENT procedures worked best for these patients.

9. Renal and liver causes

The epistaxis can appear in kidney failure, usually in its final stages, in chronic diffuse or hemorrhagical glomerulonephritis with albuminuria (Bright disease).

Patients with chronic kidney failure have various clinical symptoms among which blood loss can be found. These appear especially when the patient’s current state deteriorates. We encountered a tendency for developing ecchymosis after minor trauma or, sometimes, without any trauma at all. Various types of bleeding may occur: urinary tract hemorrhage, gastric hemorrhage, gum bleeding or epistaxis.

Epistaxis can also appear in liver diseases, especially in cirrhosis, chronic hepatitis or passive liver congestion due to heart diseases. Cirrhosis is characterized by high portal blood pressure, edemas, jaundice and neuroendocrinological symptoms. We also encountered various types of hemorrhages among which nasal bleeding was quite common. The most frequently used procedure on hospitalized patients (16 patients – 2.3% of total admissions) was the anterior nasal packing with expandable non-resorbant sponges (Merocel). This procedure is less traumatizing and easy tolerable by the patient. The anterior nasal packing was maintained up to 72 hours and often backed up by antibiotic prophylaxis.
CONCLUSIONS

1. The epistaxis is the most frequent ENT symptom in the ER associated with various other pathologies. It requires a thorough examination, as well as paraclinical investigations in order to establish a correct diagnosis and plan of management.

2. The statistical results we have come to reveal that out of all the patients admitted in our hospital during the years taken into study 6.5% were admitted for epistaxis (as a primary or secondary diagnosis). This result is comparable to other statistics already existent in medical studies.

3. Nose bleeding was encountered especially in heart diseases, followed by trauma, malformative pathology, inflammatory diseases, tumors and renal and endocrinological diseases.

4. The most affected group of patients were men over 60 years of age. Environmental conditions do not seem to play a deciding role in the onset of epistaxis.

5. Patients with epistaxis also presented the following symptoms: nasal obstruction, congenital or gained malformities of the nose and face, head aches, rhinorrhea, local anesthesia of the maxilar/ethmoidal areas (tumoral pathology).

6. While confirming the diagnosis of epistaxis is relatively easy, establishing where the source of the bleeding can be found (the anterior or posterior part of the nasal cavity) takes an endoscopic ENT examination and a skilled examiner, as foregoing management depended most of the time on dividing epistaxis into two categories: anterior and posterior.

7. Diagnosing the etiology of the symptom as well as planning surgery in advance often required numerous imaging investigations. X-rays, CT scans and MRI imaging results proves extremely helpful during this stage of the management plan. This enabled us to see the aspect of the nasal mucosa, nasal cavities and the paranasal sinuses and to study the affected region or discover tumors and tumoral invasion.

8. The therapeutic management of the diseases, epistaxis included, involved medical and/or surgical approaches.

9. The treatment of epistaxis is related to the causes which generated it.

10. Taking into account the multitude of causes which can generate epistaxis (malformation, trauma, tumors, cardiovascular diseases, renal, liver or endocrinological diseases), the richness of the accompanying symptoms, the many possibilities of paraclinical investigation, we were able to correctly identify and treat the symptom. Studying each epistaxis generating pathology gave us the opportunity to combine the medical approach with the surgical one (classical procedures or modern endoscopic ones). This experience has lead to the elaboration of a therapeutical diagnosis guide applied to the patients in the ENT ward of the Clinical County Hospital in Craiova.
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