



Epistaxis: Pathophysiology and Its Management

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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Review Article

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ABSTRACT

Epistaxis means bleeding from the nose and is the most common emergency complaint. It is reported in all groups of age. It may generally be spontaneous or be induced by either nose picking or trauma to the inner tissue lining of the nose. It may also be benign and self-limiting, whereas some can recur time. Epistaxis is a minor problem and can be treated easily, but sometimes it can lead to a life-threatening hemorrhage. Environmental factors can affect the frequency of epistaxis. That is, it increases in the winters as compared to other seasons. It is because of decreased humidity during the winters, which ultimately leads to reduced humidification of the nose. Based on origin, epistaxis can be of two types- Anterior epistaxis and Posterior epistaxis. Anterior epistaxis originates from the Kiesselbach plexus in the frontal part of the nose, whereas the posterior epistaxis originates from the Woodruff plexus lying in the posterior or superior nasal cavity. Various local and systemic factors can cause it. Local factors contributing to nose bleeding are either localized trauma (nose picking) or facial trauma, anatomical abnormalities, inflammatory causes, etc. Systemic conditions that increase epistaxis risk are high blood pressure, cardiovascular diseases, and vascular and bleeding disorders. Epistaxis can often be managed at home or by a primary care general physician. But in cases where it is recurrent, or the bleeding is non-stop, the patient should immediately go to the hospital and take proper treatment.

Keywords: *Epistaxis; ENT emergency; kiesselbach plexus; woodruff plexus; trauma; anterior ethmoidal artery.*

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1. INTRODUCTION

Epistaxis is derived from a word of Greek origin called "epistaxis," which describes "nose bleeding," which is comprised of two words: epi meaning "upon, in addition," and stein meaning "to drip." Epistaxis (nose bleeding) is one of the most common ear, nose, and throat (ENT) emergencies that present to the emergency room [1]. Although it can present itself in all age groups, it is more commonly seen in children (ages 2-10) and older adults (50-80). Bleeding of the nose is widespread because our nose is a very accessible area for any physical trauma as it is situated in the center part of our face and poking out as well; in addition to this, the vessels in the lining of our nose are very near to the surface making them very prone to be affected by the trauma and rupture. Epistaxis can be of two types depending on its origin: anterior epistaxis and posterior epistaxis.

Anterior epistaxis refers to a nosebleed originating from the Kiesselbach plexus (commonly known as Little's area), a network of vessels found in the nasal septum. This plexus is composed of five arteries: Anterior ethmoidal artery, Posterior ethmoidal artery, Sphenopalatine artery, Greater palatine artery, and Superior labial artery. These arteries can be injured easily due to all the environmental changes occurring outside. It is the most common type of epistaxis (90%) with little to no repercussions and can be treated at home by sitting up, tilting your head forwards, and slightly leaning forwards. Or you could even pinch the tip of your nose for 15-20 minutes with any two fingers, and hopefully, the bleeding stops. If the bleeding persists, hospital care is advised to prevent further complications.

Posterior epistaxis is generally a bit more on the serious side than the anterior epistaxis as it involves larger blood vessels. It originates from the woodruff plexus, which lies behind the inferior turbinate on the lateral wall of the nasal cavity. As the blood vessels causing this nosebleed to lie posteriorly and near the throat, blood can flow backward and get swallowed or coughed up. This cannot be treated at home, and immediate medical attention is required. Nose bleeds are also seen in women during their pregnancy; the cause of this is that during pregnancy, the vessels in the nose get enlarged and much nearer to the surface, which makes them more prone to being ruptured.

Although seeing blood coming out of your nose can be alarming, most nosebleeds are not serious and can be managed at home. Some, however, should be checked by your doctor. For instance, if you have frequent nosebleeds, see your doctor. This could be an early sign of other medical problems that need to be investigated. A few nosebleeds start in the back of the nose. These nosebleeds usually involve large blood, vessel resulting in heavy bleeding, and are dangerous. You will need medical attention for this type of bleed, mainly if the bleeding occurs after an injury and the bleeding hasn't stopped after 20 minutes of applying direct pressure to your nose. (Read on to learn the steps for how to stop a nosebleed) [2].

Some studies have shown that up to 60% of the general population experiences epistaxis, and only 6% of them seek medical attention for it [3].

2. OBJECTIVES

- A. To understand the etiology/causes of epistaxis.
- B. To know the related epidemiology of epistaxis.
- C. To know the pathophysiology of epistaxis
- D. How to examine to single out the source and cause of bleeding
- E. To know about the available treatment options for epistaxis.
- F. How to manage a patient in an emergency
- G. Complications caused as a result of epistaxis

3. AETIOLOGY

Epistaxis can have multiple causes, which can be broadly divided into four categories:

3.1 Local Causes

- In children, it is most commonly caused by trauma (nose picking)
- In adults, it is mostly of idiopathic origin.
- Infections can also be one of the causes.
- Tumours are rarely the causative factor, but when a patient (young adults and older patients) comes with a recurrent type of epistaxis, it should be investigated for a tumor.

3.2 Systemic Causes

It can either be caused by a primary or secondary hemostasis defect.

3.2.1 Primary haemostasis defect

- Thrombocytopenia is caused due to decreased production (leukemia, myelodysplastic syndrome) or due to increased destruction (Immune thrombocytopenic purpura, splenomegaly)
- Von Willebrand disease

3.2.2 Secondary haemostasis defect

It is due to a decrease in the number of clotting factors in diseases like-

- Liver diseases
- Chronic alcoholism
- Hemophilia

3.3 Environmental Causes

- Allergic reactions are the most common environmental factors that contribute to epistaxis.
- Environmental dryness during the winter season [1].

3.4 Medication Induced

- NSAIDS – (ibuprofen, aspirin, naproxen)
- anticoagulants (warfarin)
- extensive use of nasal sprays
- clopidogrel
- supplement medication like vitamin E
- illicit drugs like cocaine

3.5 Epidemiology

Only four out of every 2.4 million deaths in the United States are caused by nosebleeds; hence these are rarely fatal. About 60% of people have had a nosebleed at some point [4], yet only 10% of nosebleeds are severe enough to require treatment or some medical intervention. They are most common in youngsters aged 2 to 10 years old and the elderly aged 50 to 80 years old (bimodal distribution).

4. PATHOPHYSIOLOGY

Blood arteries rupturing within the nasal cavity are the reason causing nose bleeding. Ruptures may occur spontaneously due to trauma, certain drugs, or various systemic causes, as mentioned earlier, or different types of cancers. The episode's length can be lengthened if the patient's blood pressure keeps on rising. The population taking an anticoagulant drug or

suffering from bleeding disorders can also lengthen the time it takes for you to bleed. The majority of nose bleeds happen in the frontal area of the nose (Little's area), and the cause of bleeding can be acknowledged by careful nasal examination.

As we stated earlier, anterior bleeds from the Kiesselbach plexus are the most probable cause for the otolaryngologic emergency that we know as epistaxis. Generally, epistaxis occurs spontaneously but can also have traumatic causes. Trauma can be due to any of the following: the habit of nose picking unconsciously leading to recurrent bleeding; barotrauma; various fractures such as naso-orbit-ethmoidal fracture are the most common as it injures the anterior ethmoidal artery.

Posterior bleeding, on the other hand, usually has two points of origin: the Woodruff plexus and the sphenopalatine artery. Woodruff plexus is located posterior and inferiorly to the middle turbinate whereas the sphenopalatine artery is the terminal branch of the external carotid artery [5-12].

In patients under critical care supervision, epistaxis is caused in patients fed through a nasogastric route using tubes, coagulopathic disorders, uninterrupted positive airway pressure, etc. Managing these patients is more burdensome as compared to the general population.

Posterior bleeding may also occur non-traumatically because of the sphenopalatine foramen, out of which the sphenopalatine artery exits itself. This foramen is found posterior to the middle turbinate and is the acknowledged area for the bleeding.

5. MEASURES BEFORE EXAMINATION

Firstly, the ENT instruments, including the nasal speculum, bayonet forceps, headlamp, suction catheter, silver nitrate swabs, cotton, topical anesthetics, and vasoconstrictor, should be sterilized before being used.

Secondly, the physician should be wearing proper personal protective equipment (PPE) before performing the physical examination.

Thirdly, the patient should be made to sit in the examination chair comfortably and with enough suction, to begin with.

6. EXAMINATION

A speculum is introduced into the nasal cavity carefully to find out the source of bleeding in the anterior region.

The headlamp is worn before using the speculum for better visibility and handsfree flexibility.

Sometimes the clot may form a barrier in the route of the bleed, making it invisible to the examiner, and so, it has to be suctioned out and then examined.

For posterior bleed, the source cannot be identified by this simple examination, so the nasal endoscopy is performed.

Various other diagnostic tests are also done to evaluate systemic causes like liver function test (LFT), coagulation tests, complete blood count (CBC), and CT sinus.

7. MANAGEMENT

- i. External pressure should be applied by pinching the nose to block the nares entirely for ten minutes. This is known as the trotter's method. The patient should be sitting in a bending forward position over a sink or bowl. Release the pressure after ten minutes to check if the bleeding has stopped.

Sometimes oxymetazoline may also be used for its hemostatic effect in addition to the manual pressure.

- ii. Source of the bleeding should be found by performing anterior rhinoscopy.
- iii. IV is also given to the patient.
- iv. When the source of bleed is significant, local cautery like silver nitrate (AgNO₃).
- v. Sometimes, due to inadequate care, bleeding may not stop even after using all the above measures, nasal packing is done [6]. Nasal packing can be anterior nasal packing and posterior nasal packing. Anterior nasal packing is done using a gauge or a merocele pack. And posterior nasal packing is done by Foley's catheter inflated with air. It is a highly productive method, and packing should be placed for at least 1-3 days to prevent bleeding again.

- vi. Bleeding, which is not controlled with nasal packing, is done for that ligation of the responsible artery.

Arteries that can be ligated are the sphenopalatine artery at sphenopalatine foramen, anterior ethmoidal artery, maxillary artery, and external carotid artery.

The internal carotid artery should never be ligated.

Ligation of the sphenopalatine artery nowadays gives a 100% result because of endoscopy.

Pinch the nose and make the patient sit bending forward (Hippocratic/Trotter's method):

Also get IV access

Local Cautery (AgNO₃)

Anterior nasal packing (Foley's catheter inflated with air)

Ligation

The sphenopalatine artery at the sphenopalatine foramen

Anterior Ethmoidal Artery

Maxillary artery- Caldwell Luc approach

External carotid artery

8. DRUGS

Treatment of epistaxis is restricted to the following medications-

Oxymetazoline HCl 0.05% – spray one or two times in both nostrils every 12 hours.

Phenylephrine 1% - spray one or two times in both nostrils every 4 hours.

9. BUT WHAT DO WE DO IN AN EMERGENCY SITUATION?

In an emergency case, nasal packing is done without delay and should be done with the the number one priority. It can also be done using commercially available products that are not cumbersome.

This packing is not helpful in the case of posterior bleeding, so posterior packing is done.

In this procedure, a tampon or something like a gauze is routed up towards the part to suck the blood in and put pressure on the affected area, which is also seen in a superficial wound or cut in our day to day lives.

This nasal packing generally is not infective or harmful and very rarely may complicate things further; in any case, the complication remains very local and can be treated pretty simply with antibiotics and removal of the nasal pack.

When anterior bleeding is continuous and non-stop the patient might need to undergo cauterization. A swab of silver nitrate is used but used only on one side of the nostril so that nasal perforation does not occur.

10. COMPLICATIONS OF EPISTAXIS

Complications can rarely occur following epistaxis, but they may sometimes be severe when they occur. Complications can be as follows-

Sinusitis- rhinosinusitis can happen, but it is treated quickly by a miniature antibiotic course and on withdrawal of nasal packing:

Septal hematoma

External nasal deformity

Balloon migration

Hemorrhagic shock

Aspiration

Syncope

Mucosal pressure necrosis

Cerebellar abscess

Toxic Shock Syndrome (TSS)- cured by the instant withdrawal of packing in the nasal area and culture of the necrosis affected group of tissues.

11. MATERIALS AND METHODS

PubMed and Google search engine were used to search the following key terms- "epistaxis," "anterior epistaxis," "posterior epistaxis," "trauma," "drug-induced" epistaxis," "Kiesselbach plexus," "Woodruff plexus," "Epidemiology of epistaxis," "causes of nosebleed" and from the result of these searches, articles were selected

and used for writing this review. Tools from Microsoft word were used to create flowcharts and other illustrations.

12. CONCLUSION

To conclude, epistaxis is a prevalent otolaryngologic emergent situation with a bimodal age distribution (in children and elderly) yet also can be treated at home with conservative care. It is rarely fatal.

As we mentioned earlier, epistaxis can be due to rupturing of vessels in the anterior region (Kiesselbach plexus) and the posterior region (Woodruff plexus) in the nasal antrum. Bleeding from the anterior region is generally more common (90%). It may generally be spontaneous or be induced by either nose picking or trauma to the inner tissue lining of the nose. It increases in the winters as compared to other seasons. It is because of decreased humidity during the winters, which ultimately leads to reduced humidification of the nose.

Usually, epistaxis can have four causes – local factors, systemic factors, environmental and medication-induced epistaxis. Sometimes, there can be a tumor that may compress the vessels in the nasal antrum and cause bleeding.

Local factors that contribute to nose bleeding are either localized trauma (nose picking) or facial trauma, anatomical abnormalities, inflammatory causes, etc. Systemic conditions that increase epistaxis risk are high blood pressure, cardiovascular diseases, and vascular and bleeding disorders.

Trauma can be due to any of the following: the habit of nose picking unconsciously leading to recurrent bleeding; barotrauma; various fractures such as naso-orbit- an ethmoidal fracture, which is the most common as it injures the anterior ethmoidal artery.

Other less common causes of nose bleeding are given as follows:

Alcohol use

Bleeding disorders, such as hemophilia or von Willebrand disease, or leukaemia

High blood pressure

Atherosclerosis

Facial and nasal surgery

Nasal tumors

Nasal polyps

Immune thrombocytopenia

Leukemia

Hereditary hemorrhagic telangiectasia [2]

In patients under critical care supervision, epistaxis is caused in patients fed through a nasogastric route using tubes, coagulopathic disorders, uninterrupted positive airway pressure, etc. Managing these patients is more burdensome as compared to the general population.

Posterior bleeding may also occur non-traumatically because of the sphenopalatine foramen, out of which the sphenopalatine artery exits itself. This foramen is found posterior to the middle turbinate and is the acknowledged area for the bleeding.

In conclusion to this review article, epistaxis, while being an emergency is a minor problem that 60% of the people have suffered sometime in their lives and can be treated with conservative precautions.

It turns out nose bleeding may be something we have dealt with so quickly in our past, and yet on reading about it in detail, it seems complicated. On bleeding around 250 ml in 2-3 minutes is normal, but more than that may require some medical attention.

We read about Epistaxis under various headings given above on how the word was coined, why it is so familiar, easy to occur, and the types and causes of nose bleeding. Further, we read about the management- both at home and in the hospital setting. The complications are infrequent but may occur and be life-threatening.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Tabassom A, Cho J. Epistaxis [Internet]. Ncbi.nlm.nih.gov. 2021 [cited 17 November 2021]. Available: <https://www.ncbi.nlm.nih.gov/books/NBK435997/>
2. Nosebleeds (Epistaxis): Types, Causes, Treatment & Prevention [Internet]. Cleveland Clinic. 2021 [cited 17 November 2021]. Available: <https://my.clevelandclinic.org/health/diseases/13464-nosebleed-epistaxis>.
3. JP W, JK, MJ. Epistaxis: Outpatient Management [Internet]. PubMed. 2021 [cited 17 November 2021]. Available: <https://pubmed.ncbi.nlm.nih.gov/30215971/>
4. Nosebleed - Wikipedia [Internet]. En.wikipedia.org. 2021 [cited 17 November 2021]. Available: <https://en.wikipedia.org/wiki/Nosebleed>
5. Steele N, Thomas J. Surgical Anatomy of the Nose; 2021.
6. Parajuli R. Evaluation of Etiology and Treatment Methods for Epistaxis: A Review at a Tertiary Care Hospital in Central Nepal; 2021.
7. Abbafati, Cristiana, Kaja M. Abbas, Mohammad Abbasi, Mitra Abbasifard, Mohsen Abbasi-Kangevari, Hedayat Abbastabar, Foad Abd-Allah, et al. "Five Insights from the Global Burden of Disease Study 2019." *Lancet*. 2020;396(10258): 1135–59.
8. Abbafati, Cristiana, Kaja M. Abbas, Mohammad Abbasi, Mitra Abbasifard, Mohsen Abbasi-Kangevari, Hedayat Abbastabar, Foad Abd-Allah, et al. "Global Burden of 369 Diseases and Injuries in 204 Countries and Territories, 1990-2019: A Systematic Analysis for the Global Burden of Disease Study 2019." *Lancet*. 2020;396(10258):1204–22.
9. Franklin, Richard Charles, Amy E. Peden, Erin B. Hamilton, Catherine Bisignano, Chris D. Castle, Zachary Dingels V, Simon Hay I, et al. The Burden of Unintentional Drowning: Global, Regional and National Estimates of Mortality from the Global

- Burden of Disease 2017 Study. Injury Prevention. 2020;26(SUPP_1):83–95. Available:<https://doi.org/10.1136/injuryprev-2019-043484>.
10. James, Spencer L., Chris D. Castle, Zachary Dingels V, Jack T. Fox, Erin B. Hamilton, Zichen Liu, Nicholas L. S. Roberts, et al. “Estimating Global Injuries Morbidity and Mortality: Methods and Data Used in the Global Burden of Disease 2017 Study. Injury Prevention. 2020; 26(SUPP_1):125–53. Available:<https://doi.org/10.1136/injuryprev-2019-043531>.
 11. James, Spencer L., Chris D. Castle, Zachary Dingels V, Jack T. Fox, Erin B. Hamilton, Zichen Liu, Nicholas L. S. Roberts, et al. “Global Injury Morbidity and Mortality from 1990 to 2017: Results from the Global Burden of Disease Study 2017.” Injury Prevention. 2020;26(SUPP_1):96–114. Available:<https://doi.org/10.1136/injuryprev-2019-043494>.
 12. Reitsma MB, Reitsma MB, Kendrick PJ, Ababneh E, Abbafati C, Abbasi-Kangevari M, et al. Spatial, temporal, and demographic patterns in the prevalence of smoking tobacco use and attributable disease burden in 204 countries and territories, 1990-2019: A systematic analysis from the Global Burden of Disease Study 2019. Lancet. 2021;397 (10292):2337–60.

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