Current Approaches to Epistaxis Treatment in Primary and Secondary Care

Rafael Beck*, Martin Sorge*, Antonius Schneider, Andreas Dietz

Summary

Background: The lifetime prevalence of epistaxis is approximately 60%, and 6–10% of the affected persons need medical care. In rare cases, severe bleeding calls for the rapid initiation of effective treatment.

Methods: This review is based on pertinent articles that were retrieved by a selective search PubMed, and on the authors' clinical experience.

Results: There are no German guidelines for the management of epistaxis. The available evidence consists mainly of retrospective analyses and expert opinions. 65–75% of the patients who require treatment can be adequately cared for by their primary care physician or by an emergency physician with baseline measures. If there is persistent anterior epistaxis, an otorhinolaryngologist can control the bleeding sastisfactorily in 78–88% of cases with chemical or electrical cauterization. Nasal packing is used if this treatment fails, or for posterior epistaxis. In a retrospective study, surgical treatment was found to be more effective than nasal packing in the treatment of posterior epistaxis (97% versus 62% treatment success). Percutaneous embolization is an alternative treatment for patients whom general anesthesia would put at high risk.

Conclusion: The treatment of severe or recurrent epistaxis requires the interdisciplinary collaboration of the primary care physician, the emergency physician, the practice-based otolaryngologist, and the hospital otolaryngology service. Uniform guidelines and epidemiological studies on this topic would be desirable.

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Mild episodes of epistaxis stop spontaneously or are treated, often successfully, by the primary care physician or by the emergency physician. Only when nosebleeds are recurrent or severe are patients referred to an otorhinolaryngologist or to an accident and emergency department for further diagnostic assessment and treatment. No guideline exists in Germany today on the treatment of epistaxis. The aim of the present article is to provide an up-to-date overview of knowledge regarding its epidemiology, anatomy, and risk factors. Specific recommendations will be given for the treatment of epistaxis at the primary and secondary levels of care.

Learning goals

After reading this article, the reader should:

- Have acquired a general understanding of the epidemiology, anatomy, and causes of epistaxis.
- Know the most important basic elements of the treatment of epistaxis.
- Be familiar with the diagnostic and therapeutic procedures performed by, respectively, general practitioners and emergency physicians, otorhinolaryngologists, and ear, nose, and throat (ENT) hospital departments.

Method

This article is based on a selective literature search of the PubMed database, searching for the terms "epistaxis," "epistaxis anticoagulation," "epistaxis therapy," "epistaxis packing," and "epistaxis embolization" in the title of articles published between 1 January 2000 and 1 February 2017. Some older standard publications, textbooks, and our own clinical experience were also included.

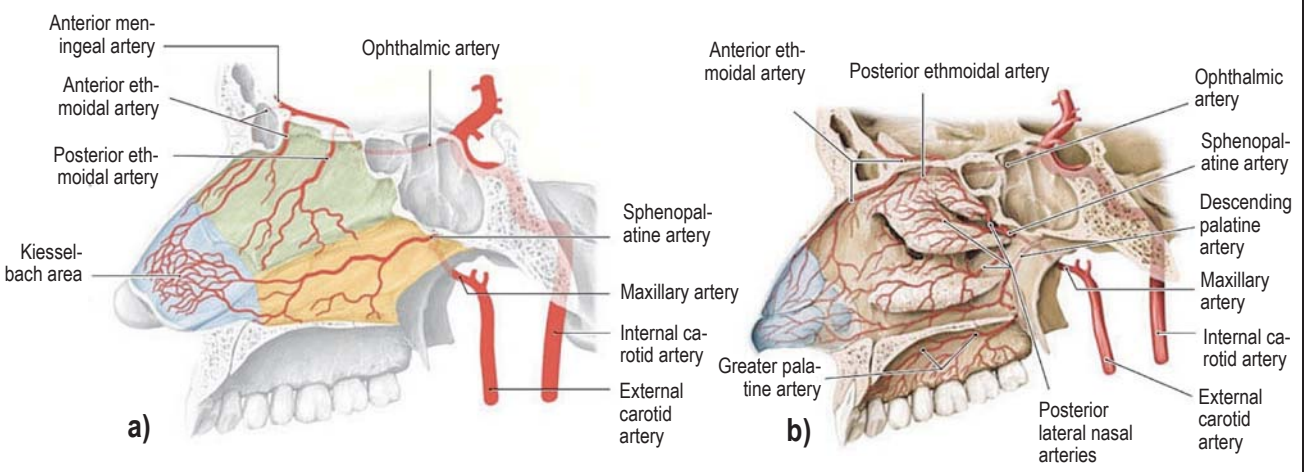
Epidemiology

About 60% of the population experience a nosebleed at least once in their life (1). Precise epidemiological data on incidence are unavailable, because no epidemiological studies have been performed and only about 6% to 10% of the persons affected seek medical help (1, 2). In

Epidemiology

The lifetime prevalence of epistaxis is 60%. Only about 6% to 10% of those affected seek medical help.

FIGURE 1



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Arterial supply of the nasal cavity (e34)

The different territories supplied by the internal carotid artery (green) and the external carotid artery (yellow) are indicated in a). The Kiesselbach area (blue) is supplied by branches of both the main arteries (red).

a) Arteries supplying the nasal septum and

b) the lateral walls of the nasal cavity.

Germany, the only accurate data are those collected by emergency departments. One retrospective study reported an epistaxis incidence of 121 / 100 000 inhabitants treated in two emergency departments in East Thuringia (3).

According to a retrospective study from the United States, 1 to 2 out of 200 visits to the emergency department were due to epistaxis, and about 5% of the patients had to be admitted for inpatient care (4, 5). In Germany, a total of 19 841 patients (11 733 male and 8108 female) received inpatient treatment for epistaxis in 2015. The average hospital stay was 3.6 days (6). Of those who received treatment as inpatients, 71% were aged 65 or over, 18% were between 45 and 65 years of age, 5% were aged from 15 to 45, and 6% were under the age of 15 (6). No figures for treatment of epistaxis by primary care physicians have been published.

Anatomy

The arterial supply of the nasal cavity is shown in *Figure 1*. In 90% to 95% of cases, the bleed occurs anteriorly in the area of the anterior part of the nasal septum, the Kiesselbach area (or Little's area) (7–10), and in 5% to 10% of cases it occurs posteriorly in the posterior region of the nasal cavity (7, 10, 11).

Causes/Etiology

The most frequent cause of epistaxis is trauma due to digital manipulation (nose picking) (12). Other causes are shown in *Box 1*. In 2014, a systematic review reported that most studies described raised blood pressure at the time the epistaxis occurred. However, these studies were unable to show hypertension to be an immediate cause of epistaxis. Confounding stress and, possibly, "white coat syndrome" may have contributed to raised arterial blood pressure in the setting of epistaxis (13). Several studies have shown a relative increase in epistaxis episodes during cold, dry weather or during periods when there are marked variations in air temperature and pressure (14–18).

Ingestion of anticoagulant drugs increases the risk of epistaxis (19). About 24% to 33% of all patients hospitalized for epistaxis take anticoagulants and/or antiplatelet drugs (20, 21). Ingestion of acetylsalicylic acid increases the severity and number of recurrences of epistaxis and the need for surgical intervention (22, 23). A retrospective cohort study in Zurich,

Anatomy

In 90% to 95% of cases of epistaxis, the source of the bleed is in the area of the anterior part of the nasal septum, the Kiesselbach area (Little's area).

Causes

The most frequent cause of epistaxis is trauma due to digital manipulation.

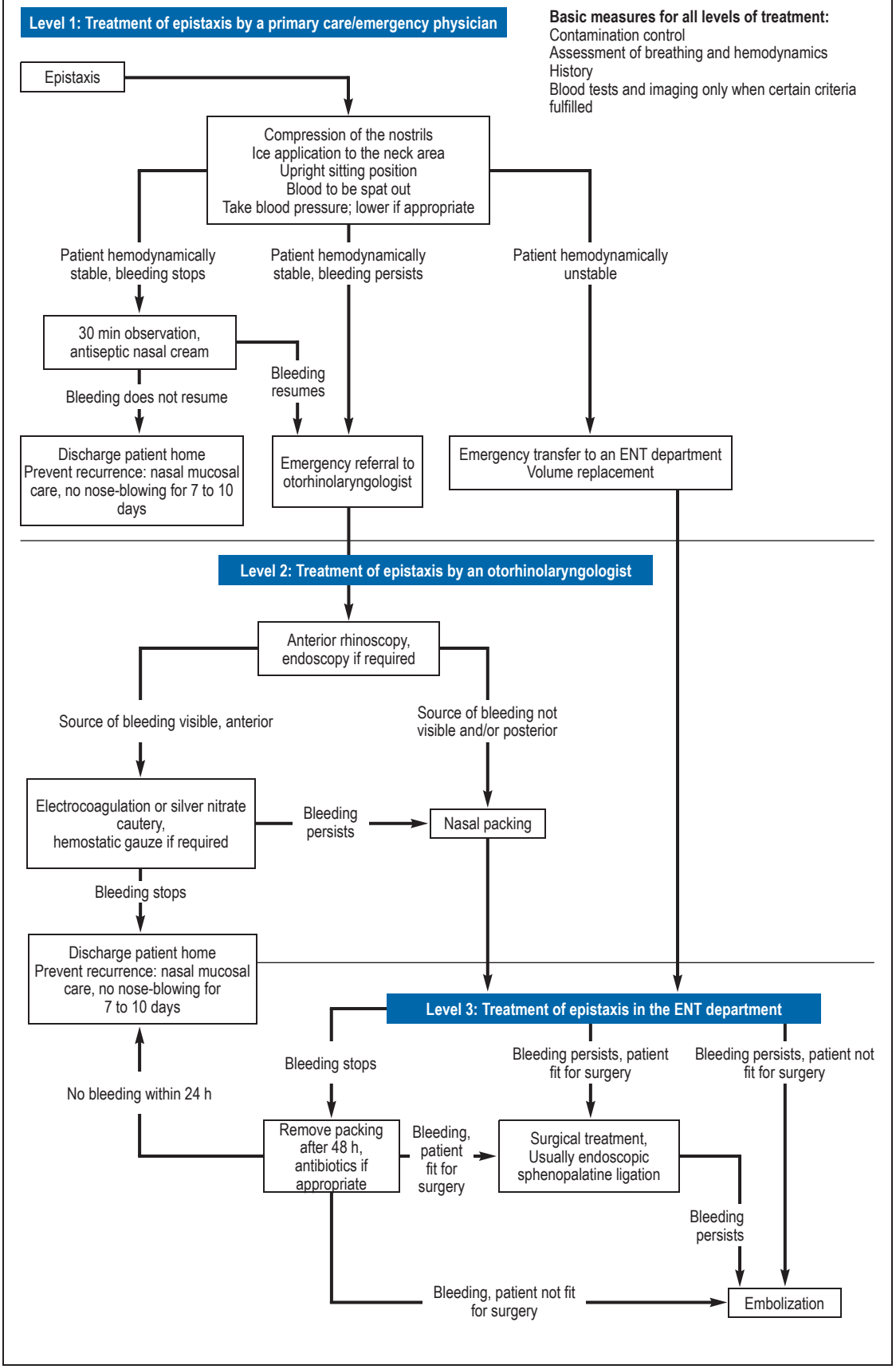
Treatment algorithm

Level 1: By a primary care/emergency physician

Level 2: By an otorhinolaryngologist

Level 3: In the ENT department

FIGURE 2



Switzerland, showed ingestion of vitamin K antagonists to be an independent and significant risk factor for recurrent epistaxis with an odds ratio (OR) of 11.6 (23). Prescription of direct oral anticoagulants for patients is increasing (24). There is currently a paucity of data concerning this group of drugs in relation to epistaxis.

One prospective observational study showed a reduction in the number of cases of severe epistaxis in patients taking dabigatran versus vitamin K antagonists. Hospital stay was longer for dabigatran patients, however, because the lack of an easily available coagulation test and persistent oozing after removal of packing made it necessary to keep the patients under continued observation (25). One retrospective study of epistaxis in patients taking rivaroxaban showed a lower percentage of inpatient admissions (10.4% versus 18.0%, $p = 0.033$) and shorter hospital stay (0.7 ± 2.2 versus 1.5 ± 3.7 days, $p = 0.011$) in comparison to patients taking vitamin K antagonists (26). Another risk factor identified was alcohol (14–16). One randomized, controlled, double-blind study showed that steroid nasal sprays increase the risk of epistaxis within 12 months in comparison to placebo from 8% to 20%. The nosebleeds that occurred were slight to moderate; only 1 of 605 patients suffered a severe nosebleed within 12 months (27). In a meta-analysis of randomized, controlled studies, epistaxis was reported to be the most frequent undesired effect of PDE-5 inhibitors, with a relative risk of 4.701 (95% confidence interval [95% CI]: [1.314; 16.812], $p = 0.017$) (28).

Treatment of epistaxis

No uniform guidelines exist for diagnostic and therapeutic procedures in patients with epistaxis. However, clinically tried and tested treatment paths do emerge in hospitals and doctors' offices, based largely on retrospective analyses, case series, and expert opinion. Only few prospective or randomized controlled studies are available for some discrete areas of epistaxis treatment.

Epistaxis ranges from light nosebleeds that are easy to manage using simple methods to life-threatening bleedings that require hospital admission and may even need surgical treatment.

For a structured overview of the interdisciplinary management of epistaxis, in this article treatment recommendations are given separately for level 1 (primary care physician/emergency physician), level 2 (otorhinolaryngologist), and level 3 care (hospital ENT department). *Figure 2* shows the treatment algorithm developed by ourselves, which includes treatment recommendations from the international literature as well as our department's own in-house standard operating procedures. Some steps are relevant at all three levels of care.

Contamination control

Measures to prevent contamination must always be observed. It is recommended that all who have close contact with patients, e.g., in the course of rhinoscopy or endoscopy, should wear protective eye gear, lab coat, gloves, and a face mask (12).

Initial assessment of breathing and hemodynamics

Especially in cases of severe bleeding, following the ABC approach, security of the *a*irway, *b*reathing, and *c*ardiovascular stability should be assessed (29–31). If symptoms of hypovolemia are found, a peripheral venous access should be placed and volume replacement therapy started. Early blood pressure measurement is an essential part of the diagnostic process.

History taking

The most important parts of the history are first of all the intensity and course over time of the bleed, which allow a judgment to be made about the urgency of treatment (29). The patient should be asked about factors that would predispose to epistaxis (*Boxes 1*, *2*) (12, 29). An important element of the history is what medication the patient is on, especially any anticoagulants or antiplatelet drugs (*Box 2*) (29).

Blood tests

In many cases of uncomplicated epistaxis, no blood tests are required. If the patient is on anticoagulation therapy, however, coagulation testing with International Normalized Ratio (INR) measurement should be carried out.

Imaging

Imaging is not usually necessary. However, in patients with recurrent epistaxis of unknown cause, imaging should be carried out to investigate the possibility of neoplastic disease such as juvenile nasopharyngeal angiofibroma (32).

Management of patients on anticoagulants

In France, guidelines on the management of epistaxis in patients taking anticoagulants have existed since 2016 (33). In acute epistaxis, these recommend screening for

Treatment

The treatment of epistaxis requires a structured interdisciplinary approach by the primary care physician, emergency physician, otorhinolaryngologist, and hospital ENT department.

Contamination control

It is recommended that all who have close contact with patients, e.g., in the course of rhinoscopy or endoscopy, should wear protective eye gear, a lab coat, gloves, and a face mask.

BOX 1

Causes of epistaxis*

- Traumatic
  - Digital manipulation
  - Nasal fracture/contusion
  - Foreign body in the nose
  - Iatrogenic (e.g., nasogastric tube, surgical interventions)
- Neoplastic
  - Juvenile nasopharyngeal angiofibroma
  - Tumors of the nasal cavity and paranasal sinuses
- Hematological
  - Thrombocytopenia
  - Hemophilia A and B
  - Von Willebrand disease
  - Liver failure
- Structural
  - Mucosal dryness
  - Septal perforation
  - Osler–Weber–Rendu disease (hereditary hemorrhagic telangiectasia)
- Drug-related
  - Anticoagulants and antiplatelet drugs
  - Glucocorticoid nasal sprays
  - Nasal consumption of drugs
- Inflammatory
  - Allergic rhinitis
  - Acute infectious diseases

*Modified from (29)

BOX 2

Medical drugs associated with epistaxis*

- Phenprocoumon
- Dabigatran
- Rivaroxiban
- Fondaparinux
- Clopidogrel
- Acetylsalicylic acid
- Glucocorticoid nasal sprays
- Phosphodiesterase-5 inhibitors (relative risk: 4.701)

*Modified from (22, 25, 26, 28, e26, e35, e36)

overdose and assessment of the risk of thrombosis. Anticoagulation therapy should always be continued so long as the bleeding can be stopped or controlled. Only if bleeding is massive and unstoppable, or if an anticoagulation overdose is found, should adjustment of the anticoagulation therapy be considered in consultation with a hematologist and cardiologist.

Antiplatelet drugs

Because it takes up to 10 days for hemostasis to be restored after cessation of antiplatelet therapy, stopping antiplatelet drugs in a patient with acute epistaxis is not useful. If the bleeding cannot be halted, stopping antiplatelet therapy while at the same time giving platelet transfusions is an option (33).

Vitamin K antagonists

For a patients taking a vitamin K antagonist, the drug should be stopped and an antidote given only if the bleeding is uncontrollable. If the vitamin K antagonist has been overdosed and the bleeding can be controlled, the dosage should be altered (33).

Direct oral anticoagulants

Stopping medication with direct oral anticoagulants is recommended only after consultation with a cardiologist. If bleeding is uncontrolled, dabigatran is the only drug for which an antidote (idarucizumab 5 mg in two consecutive 5– to 10-min intravenous infusions) is currently available (33).

Anticoagulation treatment should not be altered in a patient about to undergo endovascular embolization (expert opinion) (33).

Preventing recurrence

To prevent recurrences, intensive care of the nasal mucosa using an antiseptic nasal cream is recommended. A prospective, randomized, controlled study in the United Kingdom in children with recurrent epistaxis compared treatment with an antiseptic cream for 4 weeks versus a wait-and-see policy. A significantly lower recurrence rate was seen in the treatment group (45% versus 71% recurrence rate, relative risk reduction 47% with 95% CI [9%; 69%]) (34). In addition, energetic nose blowing should be avoided for 7 to 10 days (29). Bed rest is not necessary. According to a Danish prospective, randomized study, mobilizing the patient does not increase recurrence in comparison to bed rest (35).

Patients on anticoagulants

If the bleeding can be stopped or controlled, anticoagulation therapy should be continued. Only if bleeding is massive and unstoppable, e.g., due to anticoagulation overdose, should adjustment of the anticoagulation therapy be considered.

Direct oral anticoagulants

Stopping medication with these drugs is recommended only after consultation with a cardiologist. If bleeding is uncontrolled, dabigatran is the only drug for which an antidote is currently available.

Treatment by the primary care physician and/or emergency physician

The first step is to compress both sides of the nose continuously for 15 to 20 min, using two fingers or a nose clip (29, 36, 37). The patient should sit upright and lean slightly forward to prevent the blood from running down the pharynx (12). Local application of ice, e.g., at the back of the neck, is intended to encourage vasoconstriction of the blood vessels of the nose. Its therapeutic value is a matter of debate and has been challenged in the literature (19, 38). No final conclusion can be drawn on the basis of existing publications. In patients with raised blood pressure that is not causing symptoms (>180/120 mmHg, measured several times), the European Society of Hypertension and the European Society of Cardiology recommend oral medication to reduce the blood pressure. The aim is to slowly reduce the blood pressure over a period of 24 to 48 hours (39, 40). In around 65% to 75% of cases, these steps combined with application of a decongestant, oxymetazoline-based nasal spray will succeed in stopping the bleeding (e1, e2). If bleeding does not restart during a 30-min observation period and the patient is hemodynamically stable, emergency specialist ENT treatment is not required.

In the presence of any of the following, we recommend consultation with an otorhinolaryngologist:

- Epistaxis uncontrollable by the measures described above
- Recurrent epistaxis
- Suspected neoplasm as the source of the bleed

Treatment by an otorhinolaryngologist

Anterior rhinoscopy

To locate the source of the bleeding, the first investigation is anterior rhinoscopy with a nasal speculum and headlight (29). Once any clots have been removed by suction or with pincers, the nasal cavity can be inspected, including the Kiesselbach area, where the bleeding often originates. Application of a vasoconstrictor and local anesthetic, e.g., in the form of an impregnated cotton tuft, will enable a better view. Owing to the local anesthetic effect, this step has therapeutic as well as diagnostic value (12, 30, 36).

Endoscopy

Especially in cases where the bleeding is from the posterior nasal cavity, locating the source of the bleeding by anterior rhinoscopy is difficult. In such cases, the French guidelines on treating epistaxis recommend as a supplementary procedure rigid endoscopy of the nasal cavity by a physician experienced in endoscopy (30, 36). Two prospective studies have shown that 80% to 94% of bleed sources can be identified by endoscopy (11, e3).

Cauterization

Most cases of epistaxis from an easily visible anterior source can be effectively treated by cauterization with silver nitrate or electrocoagulation. Before starting the procedure, a vasoconstrictor and local anesthetic should be applied (30). *Figure 3* shows a bleeding from the Kiesselbach area before and after bipolar coagulation. A Swiss retrospective study showed that in terms of therapeutic success, electrocoagulation was superior to chemical coagulation (88% versus 78%) (failure rate 12% with 95% CI [0.09; 0.16] versus 22% with 95% CI [0.14; 0.33]) (evidence level 2b) (e4). A US study of children treated intraoperatively by these same two methods for recurrent anterior epistaxis also found a lower recurrence rate for electrocoagulation than for chemical cauterization during the 2-year period after the procedure (recurrence events 2% versus 18%) (e5). Chemical cautery is described as simpler to use, cheaper, and more widely available (e6). Complications of cauterization include septal perforation, infection, rhinorrhea, and increased bleeding (12). Bilateral cautery in the area of the nasal septum should be avoided if possible, as this risks septal perforation (e7). There are no published studies on the incidence of septal perforation after cautery (e8, e9).

Hemostatic gauze

As a supplement to cautery, local application of gauze made of oxidized regenerated cellulose can be used. As a resorbable hemostyptic, it supports physiological hemostasis. Diffuse mucosal bleedings in particular can often be adequately managed by the application of a thin layer of this gauze (e10).

Nasal packing

If cauterization is unsuccessful, the next step in managing epistaxis is nasal packing. Packing takes different forms for anterior and posterior bleeding. Bilateral nasal packing produces a higher intranasal pressure than unilateral packing and its practice is therefore widespread, although there is little evidence to support this (e11)

Comprehensive overviews of the features and mechanism of action of the most common forms of nasal packing are presented by Beule et al. in their 2004 publication (e12) and by Weber in his 2009

Treatment by the primary care physician and/or emergency physician

Important basic measures are compression of the nostrils, oral medication to reduce blood pressure if appropriate, and use of an oxymetazoline nasal spray.

Treatment by an otorhinolaryngologist

For anterior epistaxis, the treatment of choice is bipolar coagulation. Where bleeding is persistent or from a posterior source, the first step is nasal packing.

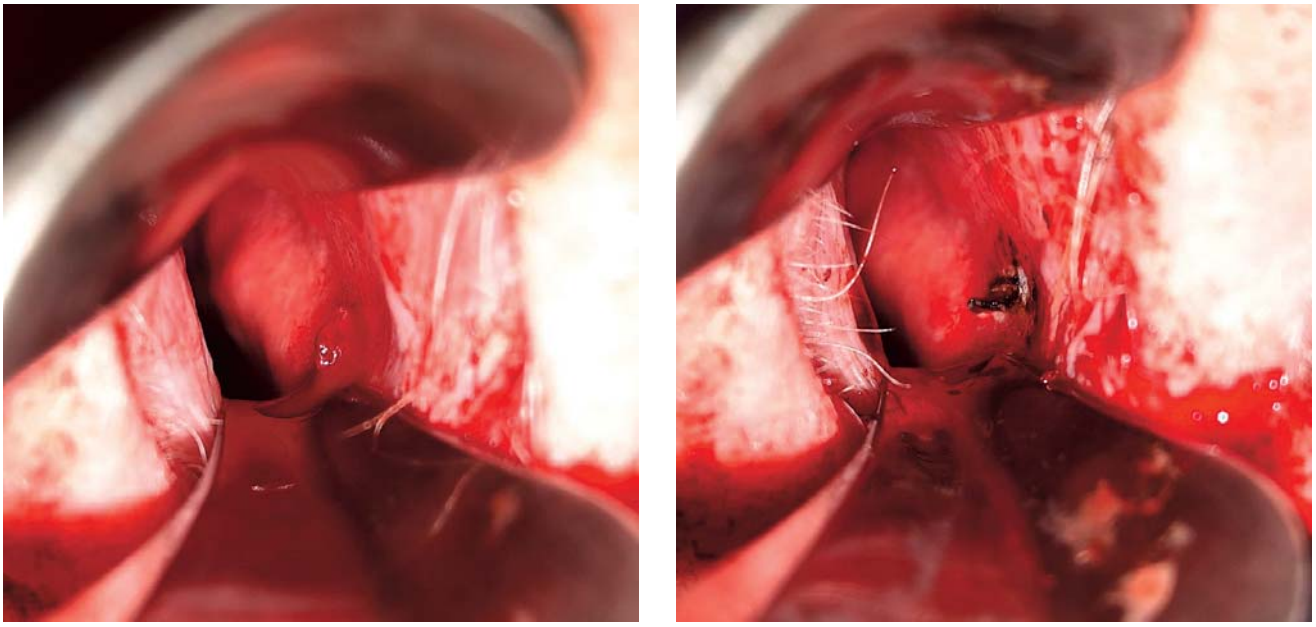


Figure 3: Bleeding in the Kiesselbach area (right side) before and after bipolar cautery

review article (e 10). The *eFigure* shows a selection of items in common use for nasal packing. The main nasal packing products used in Germany are rubber-coated sponge packs or tampons (*Gummifingerlingstamponaden*), expandable sponge packs, and ribbon gauze impregnated with a medical cream (e12) (for more details see *eBox 1*).

Complications of nasal packing—The most serious complication of nasal packing is posterior dislocation. Reports have been published of fatal aspiration of nasal packs (e13). Rubber-coated sponge tampons and cotton ribbon gauze packs are liable to dislocate (e10). To prevent this, all nasal packs must be strongly fixed to the patient's face, e.g., with sticking plaster on the bridge of the nose or the cheek (e7, e12). Additionally, the threads attached to some packs should be tied together in front of the columella. Other reported complications include allergic reaction, mucosal necrosis, foreign body reaction, tube dysfunction, paraffinoma, and decompensation of pre-existing sleep apnea (e7, e10, e12). Nasal packing can also cause discomfort for the patient in the form of pain, obstructed breathing, and a reduced sense of smell (e10). In addition, bilateral nasal packing can result in impaired pressure equalization via the auditory (Eustachian) tube, leading to the patient's discomfort due to negative pressure in the middle ear (e10). There have been case reports of staphylococcal toxic shock syndrome as a serious complication (e14–e16). The release of toxic shock syndrome toxin 1 (TSST1) causes symptoms such as vomiting, diarrhea, fever, myalgia, diffuse erythema, and even septic shock. Treatment consists of immediate removal of the packing, intravenous antibiotics, and transfer of the patient to an intensive care ward (e10).

Prophylactic antibiotics—The role of prophylactic administration of antibiotics with nasal packing has not been adequately studied. Wide variation in practice has been described in England (e17), e.g., prophylactic antibiotics in patients with cardiac anomalies, especially prosthetic heart valves (30). Like some other authors, with anterior nasal packing we recommend prophylactic antibiotics only after the packing has been in place for more than 48 hours, but with posterior packing we recommend it in all cases, with the aim of preventing migration of infection into the sinuses and middle ear and toxic shock syndrome (e18). Preferred antibiotics are amoxicillin–clavulanic acid, amoxicillin alone, and cephalosporins (e17).

Removal of packing—When to remove the packing is variously defined in the literature, ranging

Nasal packing

The main nasal packing products used in Germany are rubber-coated sponge packs, expandable sponge packs, and ribbon gauze impregnated with a medical cream.

Complications of nasal packing

Posterior dislocation, allergic reaction, mucosal necrosis, foreign body reaction, tube dysfunction, paraffinoma, decompensation of pre-existing sleep apnea, and staphylococcal toxic shock syndrome.

from 12 or 24 hours to 3 to 5 days after placement (12, 29, 30). For anterior packing alone, we recommend removal after 48 hours. Where a nasopharyngeal balloon has also been placed, this should be at least partially deflated after 24 hours at the latest. If clinically significant bleeding starts again after packing removal, we advise surgical treatment where possible.

Treatment in the ENT department

From the point of view of the ENT department, for both unilateral and bilateral packing, inpatient admission for observation and packing removal are recommended because of the risk of posterior dislocation.

Other indications for inpatient admission are shown in *Figure 2*.

Surgical treatment

When conservative treatment fails, surgical hemostasis is generally required. A Swiss retrospective cohort study showed surgical intervention to be markedly superior to packing in the management of posterior epistaxis (treatment failure rate 3% [0.00; 0.14] versus 38% [0.30; 0.67]) (e4).

The method of choice is endoscopic clipping or coagulation of the sphenopalatine artery (e19). A British study reviewed the evidence for endoscopic sphenopalatine artery ligation and compared it to alternate methods. The former proved to be superior to the other treatment methods (monopolar cautery, embolization, etc.), controlling the bleeding in 98% of cases (e20). In retrospective cohort studies, recurrence of bleeding, intranasal dryness with crust formation, sinusitis, impaired nasal and palatal sensitivity, formation of intranasal synechiae, unilateral chronic epiphora, and septal perforation have all been reported as complications. One Brazilian retrospective longitudinal study reported a case of amaurosis after the intervention (e21). Taken together, these studies show endoscopic sphenopalatine artery ligation to have few complications (e21–e25). Clinically significant hypoxia of the territory supplied by this artery has not been described and is not anticipated, given the multiplicity of anastomoses between the sphenopalatine and ethmoidal arteries (9). For this reason, the criteria for surgical treatment can be quite wide: recurrence of bleeding after one attempt at packing and where the source of the bleeding is not evident (e19). Surgical hemostasis (*eBox 2*) should also be considered early on in patients with persistent bleeding despite packing. Endoscopic ligation of the anterior ethmoidal artery is indicated mostly in the context of revision surgery. In four retrospective studies, approximately 2.9% to 8.6% of all patients undergoing surgery for severe epistaxis had anterior ethmoidal artery ligation (e21–e23, e26).

Embolization

Another possible method in patients with epistaxis that is difficult to control is percutaneous embolization. This technique has a reported success rate of 87% to 93% (e27–e29). The target vessel is imaged angiographically and then an occluding agent is injected via a percutaneous transarterial catheter (e30). The embolization should be carried out by an experienced interventional neuroradiologist (e31). Because of the potential for complications such as cerebrovascular ischemia, facial nerve paralysis, and soft tissue necrosis, some authors recommend using this technique only in patients who have an increased anesthetic risk because of other comorbidities, or in whom attempted surgical treatment has failed (30). One retrospective cross-sectional study in the US compared embolization with surgical vascular occlusion in terms of morbidity, hospital mortality, and duration of hospital stay. No significant differences were found in relation to blood transfusions (22.8% versus 24.3%), stroke (0.5% versus 0.3%), amaurosis (0.4% versus 0.5%), and hospital mortality. However, surgery is associated with lower hospital costs and a shorter hospital stay (e32).

Treatment of epistaxis in children

An overview of recommended treatment strategies in epistaxis in children is given in a French systematic review by Béquignon et al. (e33). In addition to removal of clots, bidigital compression, and (permissible from the age of 6 onwards) application of a local anesthetic and decongestant, the use of an antiseptic cream is recommended (e33). If bleeding persists, chemical cautery (silver nitrate stick) should be preferred to electrical cautery, as electrical cautery is more painful and would therefore require a general anesthetic (e33).

Conclusions for clinical practice

In 65% to 70% of cases of epistaxis, simple first aid measures provided by the primary care physician or emergency physician stop the bleeding. If bleeding -persists, specialist ENT expertise should be urgently consulted. So long as the source of the bleeding is visible, most cases of epistaxis can be successfully treated using electrical or chemical cautery. In cases

Treatment in an ENT department

For posterior epistaxis, surgical intervention is markedly superior to packing. The method of choice is endoscopic clipping or coagulation of the sphenopalatine artery, which controls the bleeding in 98% of cases.

Embolization

Where surgical treatment fails or the patient has a high anesthetic risk, percutaneous embolization is a reasonable alternative.

where the bleeding source is posterior, or where the bleeding remains refractory to packing, surgery should be considered early on and liberally. Because of its high success rate and comparatively low complication rate, endoscopic ligation or coagulation of the sphenopalatine artery is the method of choice. In cases of severe epistaxis, where surgical treatment fails or the patient has a high anesthetic risk, percutaneous embolization is a reasonable alternative.

Conflict of interest statement
The authors declare that no conflict of interest exists.

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Treatment of children

In a child with persistent bleeding, chemical cautery (silver nitrate stick) should be preferred to electrical cautery, as electrical cautery is more painful and would therefore require a general anesthetic.

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► **Supplementary material**
For eReferences please refer to:
www.aerzteblatt-international.de/ref0118

eBoxes, eFigure:
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Only one answer per question is possible. Please select the answer that is most appropriate.

Question 1

What is the estimated lifetime prevalence of epistaxis?

a) 30%
b) 40%
c) 50%
d) 60%
e) 70%

Question 2

Where is the source of the bleeding most usually found in epistaxis?

a) In the nasal vestibule
b) In the area of the anterior part of the nasal septum
c) In the area of the nasal conchae
d) In the area of the posterior part of the nasal cavity
e) In the area of the nasopharynx

Question 3

What is the commonest cause of epistaxis?

a) Hypertension
b) Tumor
c) Iatrogenic manipulation
d) Digital manipulation
e) Nasal infection

Question 4

A 37-year-old man presents to his family physician with right-sided epistaxis. His blood pressure is 150/85 mmHg. Apart from self-protection, what is the most important first step?

a) Ice application to the neck area
b) Place a peripheral venous access device
c) Lay the patient flat on his back
d) Refer to an otorhinolaryngologist immediately
e) Compress the patient's nostrils

Question 5

An adult man presents to an otorhinolaryngologist with left-sided epistaxis. The source of the bleed is located in the Kiesselbach area. After basic measures, what should be carried out as the next therapeutic procedure?

a) Anterior nasal packing
b) Posterior and anterior nasal packing
c) Intravenous administration of tranexamic acid
d) Electrical or chemical cauterization
e) Surgery

Question 6

When is the use of prophylactic antibiotic treatment recommended in epistaxis?

a) In all cases requiring cauterization
b) When treatment is by anterior packing alone, irrespective of how long it is in place
c) When treatment is by anterior and posterior packing in place for >96 hours
d) When treatment is by anterior packing in place for >48 h and always when posterior packing is placed
e) In all patients under the age of 18

Question 7

Which group of antibiotics should be used for first-line prophylactic antibiotic treatment?

a) Amoxicillin–clavulanic acid, amoxicillin alone, and cephalosporins
b) Aminoglycosides and lipopeptides
c) Fluorquinolones and lincosamides
d) Tetracyclines and glycopeptides
e) Macrolides and sulfonamides

Question 8

Compared with conservative treatment, what is the treatment method of choice in cases of refractory posterior epistaxis?

a) Endoscopic clipping or coagulation of the anterior ethmoidal artery
b) Endoscopic clipping or coagulation of the posterior ethmoidal artery
c) Endoscopic clipping or coagulation of the sphenopalatine artery
d) Ligation of the ipsilateral maxillary artery
e) Ligation of the ipsilateral external carotid artery

Question 9

In which of the following cases is inpatient admission always recommended despite absence of further bleeding after intervention?

a) Anterior epistaxis persisting after placement of packing impregnated with oxymetazoline
b) Patient aged <12, anterior epistaxis, hemostasis by bidigital compression and application of a cream
c) Anterior epistaxis, hemostasis by bipolar coagulation
d) Anterior epistaxis, hemostasis by chemical cautery
e) Anterior epistaxis, hemostasis with bilateral rubber-coated sponge packs

Question 10

In which of the following cases is percutaneous embolization indicated?

a) Patient aged <18, no concomitant disease, posterior epistaxis persisting under packing
b) Patient aged <18, no concomitant disease, anterior epistaxis persisting under packing
c) Patient with high anesthetic risk, posterior epistaxis persisting under packing
d) Patient with recurrent anterior epistaxis
e) Patient with anterior epistaxis persisting under anterior packing

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Supplementary material to:

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by Rafael Beck, Martin Sorge, Antonius Schneider, and Andreas Dietz

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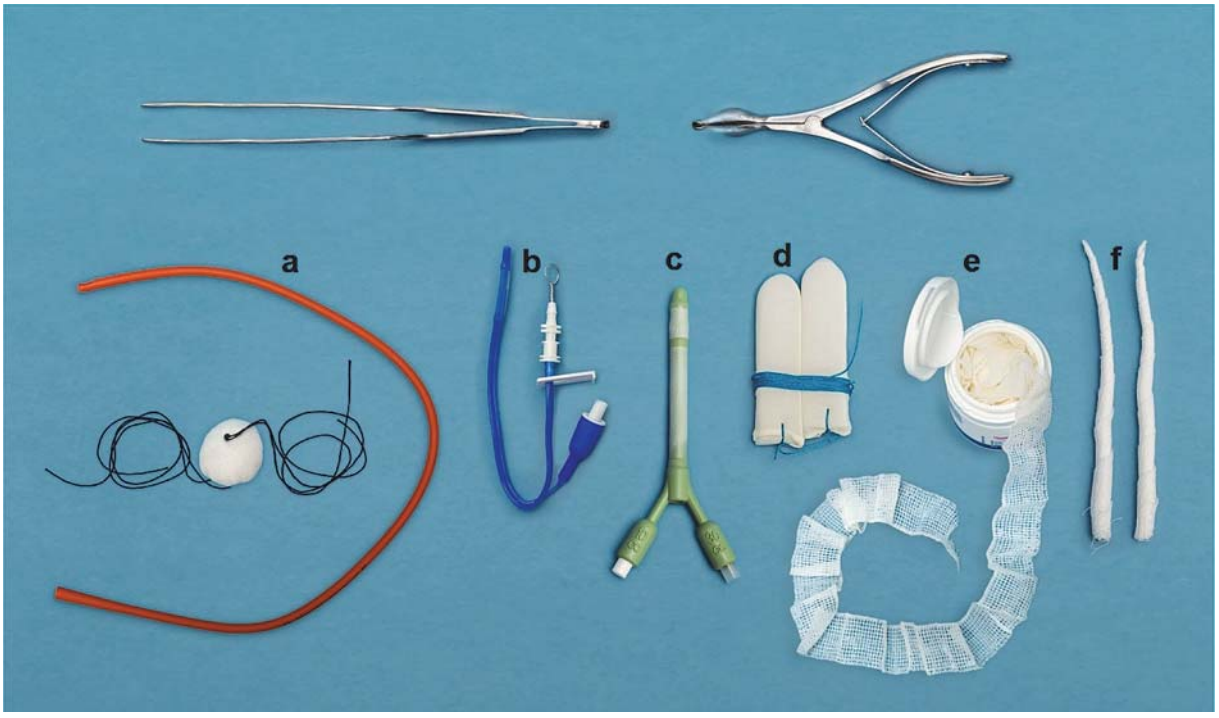

eFigure: Selection of nasal packing products in common use
a) Bellocq posterior nasal pack
b) Nasopharyngeal balloon
c) Xomed catheter
d) Rubber-coated sponge tampons
e) Cotton ribbon gauze
f) Ribbon gauze pledgets for intranasal application of oxymetazoline

eBOX 1

Overview of the most commonly used nasal packing materials

- **Rubber-coated sponge tampons**

Rubber-coated sponge tampons are sponges covered with a layer of rubber that prevents colonization by bacteria or viruses. Effective for hemostasis, simple and relatively atraumatic to apply and remove, and causing little discomfort for the patient, rubber-coated sponge packs are the norm for nasal packing in Germany. Complications to watch out for include damage from pressure to the columella and nasal cartilage, and posterior dislocation (e10).

- **Expandable nasal packs**

Expandable nasal packs are usually made of polyvinyl acetal and expand on contact with blood or water. The advantage of this form of pack is that, especially when made of materials with small pores, placement and removal are comparatively less traumatic and unpleasant for the patient.
Rapid Rhino is a special form of this kind of pack. A Rapid Rhino pack consists of a core sponge or balloon covered in a carboxymethyl cellulose fabric intended to promote aggregation of thrombocytes (e10).

- **Cotton ribbon gauze**

Pledgets of cotton ribbon gauze are placed intranasally for ongoing packing, usually after impregnation with Vaseline or an antibiotic cream. The advantage is that it is easy to place the gauze exactly where it is wanted for local pressure effect (e12). Disadvantages are that placing and removing the pledgets is relatively painful for the patient, they are less comfortable when in place, bleeding can be caused when they are removed, and paraffinomas may form where they are placed (e10, e12, e37).

- **Balloon packing**

The main indication for balloon packing is severe posterior bleeding (e10). Additional anterior packing is always required. Once the nasopharyngeal balloon has been advanced along the caudal part of the main nasal cavity, it should be filled with up to 10 mL sterile water for injection purposes and then carefully pulled against the choanae (29). If a nasopharyngeal balloon is not available, use of a Foley catheter, which is expanded in the nasopharynx, has been described as a possible alternative (12). Double balloon catheters also exist which, in addition to the posterior balloon for the nasopharynx, also have an anterior balloon that is inflated in the nasal cavity. Because of the relatively high risk of pressure necrosis, balloon packing of the nasal cavity should be used with caution (e10).

- **Bellocq posterior nasal pack**

The principle of the Bellocq posterior nasal pack is based on sealing off the nasopharynx with a gauze or sponge pack which is pulled into the nasopharynx via the mouth by means of two transnasally introduced rubber catheters. This is is very uncomfortable for the patient, who should therefore preferably be sedated or under general anesthesia while it is being carried out. Moreover, this method of packing has a markedly higher rate of associated local and general complications than does the nasopharyngeal balloon (e38). Its use is therefore only indicated in patients with posterior epistaxis where anterior packing and balloon catheters fail and in those with nasopharyngeal bleeding, e.g., after cancer surgery (e18).

eBOX 2

Operative procedures

To give the surgeon a better view of the bleeding area, and to reduce blood loss, local and topical use of vasoconstrictors is recommended, together with raising the patient's head by 15° to 20° (e25, e39). In addition, care should be taken to keep the patient hypotensive under anesthesia (e25).

- **Sphenopalatine artery ligation**

A significant landmark for identifying the sphenopalatine artery is the ethmoid crest. This is exposed either by a vertical incision in front of the posterior attachment of the middle nasal concha or via a middle meatal antrostomy with exposure of the posterior wall of the maxillary cavity and abrasion of the mucosa at the maxilloethmoid angle. When the ethmoid crest has been removed, the arterial branches of the sphenopalatine artery that lie behind it are identified and sealed off with a clip (Ligaclip) or by electrocoagulation (e25).

- **Anterior ethmoidal artery ligation**

A less common cause of severe epistaxis is bleeding from the anterior ethmoidal artery (AEA), which may occur spontaneously, postoperatively after surgery of the paranasal sinuses, or after trauma. In cases where anterior epistaxis is difficult to control, clipping of the AEA is a good therapeutic option. The artery can be located via an open approach in the area of the medial canthus (Lynch incision; transcaruncular approach) or endoscopically. In endoscopic procedures, maxillary antrostomy is carried out and the anterior ethmoidal cells are excavated and the lamina papyracea visualized. Angled lenses are used to locate the AEA, which passes through the base of the skull in an antero-medial direction (e25). Apart from recurrent bleeding, complications include injury to orbital structures and the base of the skull (e25).

- **Posterior ethmoidal artery ligation**

In rare cases of severe epistaxis, ligation of the posterior ethmoidal artery is indicated. According to a US study, this artery is located an average of 8.1 mm anterior to the anterior wall of the sphenoid sinus (e40).

Where bleeding persists following the usual surgical and neuroradiological procedures, the French guidelines recommend surgical exploration of the paranasal sinuses with elective coagulation of bleeds from side/secondary branches or ethmoidectomy in patients with diffuse bleeding (e31).