

Epistaxis Management: From First Aid to Surgical Intervention

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ABSTRACT

Background

Epistaxis, commonly referred to as a nosebleed, is among the most frequent otolaryngological emergencies encountered in clinical practice. It affects approximately 60% of the general population during their lifetime, with nearly 10% seeking medical attention and a smaller proportion requiring hospitalization or surgical intervention. Although the majority of episodes are self-limiting and originate from the anterior nasal septum, severe cases may result in significant blood loss, airway compromise, hemodynamic instability, and substantial healthcare utilization. The management of epistaxis has evolved considerably over recent decades, with advances in endoscopic techniques and interventional radiology providing highly effective alternatives to traditional approaches.

Objective

This review aims to provide a comprehensive overview of epistaxis management, beginning with initial first-aid measures and progressing through medical treatment, nasal cauterization, nasal packing, endoscopic surgical procedures, and endovascular interventions. The review also highlights current evidence-based practices and proposes a structured approach to clinical decision-making.

Methods

A narrative review of contemporary literature, clinical practice guidelines, and standard otolaryngology references was conducted. Relevant studies addressing the epidemiology, pathophysiology, classification, assessment, and management of epistaxis were reviewed and synthesized to provide a practical framework for healthcare professionals involved in the care of patients presenting with nasal bleeding.

Results

Successful management of epistaxis depends on prompt patient assessment, identification of the bleeding source, and implementation of a stepwise treatment strategy. Initial management should prioritize airway protection, hemodynamic stabilization, and application of first-aid measures, including direct nasal compression and topical vasoconstrictors. Persistent anterior epistaxis may be effectively treated with chemical or electrical cauterization, while refractory cases often require anterior nasal packing. Posterior epistaxis presents greater management challenges and frequently necessitates hospitalization, posterior packing, endoscopic sphenopalatine artery ligation, or endovascular embolization. Recent evidence supports endoscopic sphenopalatine artery ligation as the preferred surgical option due to its high success rate, reduced morbidity, and lower recurrence rates compared with prolonged nasal packing.

Conclusion

Epistaxis remains a common yet potentially serious clinical condition requiring a systematic and evidence-based approach. While most cases respond to conservative measures, a subset of patients requires advanced interventions. Early recognition of high-risk presentations, appropriate escalation of care, and multidisciplinary collaboration are essential to optimizing patient outcomes and minimizing complications.

Keywords

Epistaxis; Nosebleed; Anterior Epistaxis; Posterior Epistaxis; Nasal Packing; Cauterization; Endoscopic Sphenopalatine Artery Ligation; Embolization; Otolaryngology; Emergency Medicine

1. Introduction

Epistaxis, commonly referred to as a nosebleed, is one of the most frequently encountered emergencies in otolaryngology and emergency medicine. It is estimated that approximately 60% of the population will experience at least one episode of epistaxis during their lifetime, while nearly 6–10% of affected individuals seek medical attention due to the severity or recurrence of bleeding (1,2). Although the majority of cases are self-limiting and benign, epistaxis remains a significant cause of outpatient visits, emergency department presentations, hospital admissions, and healthcare expenditures worldwide (3).

The nasal cavity possesses a rich vascular network supplied by branches of both the internal and external carotid arterial systems. This extensive blood supply is essential for warming, humidifying, and filtering inspired air; however, it also predisposes the nasal mucosa to bleeding following minor trauma, inflammation, mucosal dryness, or vascular abnormalities (4). Most episodes of epistaxis originate from the anterior nasal septum, particularly from Kiesselbach's plexus (Little's area), which accounts for approximately 90% of all cases. In contrast, posterior epistaxis is less common but is generally associated with more severe bleeding, higher rates of hospitalization, and an increased likelihood of requiring surgical intervention (5,6).

The etiology of epistaxis is multifactorial and may involve local, systemic, environmental, or iatrogenic factors. Common local causes include digital trauma, nasal infections, allergic rhinitis, chronic rhinosinusitis, septal abnormalities, and neoplasms. Systemic conditions such as hypertension, chronic liver disease, renal failure, hematologic disorders, and inherited coagulopathies have also been implicated in the development and persistence of epistaxis (7). Furthermore, the widespread use of antiplatelet and anticoagulant medications in aging populations has contributed to an increasing incidence of severe and recurrent epistaxis requiring specialized management (8).

The clinical presentation of epistaxis ranges from minor intermittent bleeding to massive hemorrhage associated with hemodynamic instability, airway compromise, and significant morbidity. Consequently, prompt assessment and appropriate management are essential to prevent complications and ensure favorable patient outcomes. Initial treatment typically involves first-aid measures such as direct nasal compression and topical vasoconstrictors. When conservative approaches fail, additional interventions including chemical cauterization, electrical cautery, anterior or posterior nasal packing, endoscopic surgical procedures, and endovascular embolization may be required (9,10).

Over the past two decades, significant advances have been made in the management of epistaxis, particularly with the introduction of endoscopic techniques that allow direct visualization and targeted control of bleeding vessels. Endoscopic sphenopalatine artery ligation has emerged as the preferred surgical option for refractory posterior epistaxis due to its high success rates and lower complication profile compared with traditional surgical approaches (11). Similarly, advances in interventional radiology have expanded the role of selective arterial embolization in selected patients who are poor surgical candidates or who experience recurrent bleeding despite surgical treatment (12).

Given the wide spectrum of disease severity and the evolving therapeutic options available, a comprehensive understanding of epistaxis management is essential for healthcare professionals across multiple disciplines. This review aims to provide an evidence-based overview of epistaxis, including its epidemiology, anatomy, classification, etiology, clinical assessment, and contemporary management strategies, ranging from simple first-aid measures to advanced surgical and endovascular interventions.

1.1 Aim of the Review

The aim of this review is to provide a comprehensive and evidence-based overview of epistaxis management, highlighting current approaches from initial first-aid measures to advanced surgical and endovascular interventions.

1.2 Objectives of the Review

1. To describe the epidemiology and pathophysiology of epistaxis.
2. To review the anatomical basis of nasal bleeding.
3. To classify epistaxis according to bleeding location and severity.
4. To identify common local and systemic risk factors associated with epistaxis.
5. To discuss current evidence-based management strategies.
6. To compare conservative, surgical, and endovascular treatment options.
7. To provide practical recommendations for clinicians involved in the management of epistaxis.

2. Methodology

This study was conducted as a narrative review of the current literature on the management of epistaxis. Relevant publications were identified through a comprehensive search of major medical databases, including PubMed, Scopus, Google Scholar, and Cochrane Library. The search focused on articles addressing the epidemiology, anatomy, classification, risk factors, clinical assessment, and management strategies of epistaxis. Keywords used in the search included “epistaxis,” “nosebleed,” “anterior epistaxis,” “posterior epistaxis,” “nasal packing,” “cauterization,” “endoscopic management,” “sphenopalatine artery ligation,” and “embolization.”

Priority was given to clinical practice guidelines, systematic reviews, meta-analyses, randomized controlled trials, and high-quality observational studies published in the English language. Additional references were identified through manual screening of bibliographies from relevant articles to ensure comprehensive coverage of the topic.

Studies focusing on pediatric and adult populations were included when they provided clinically relevant information regarding the diagnosis and management of epistaxis. Articles with insufficient methodological quality, duplicate publications, conference abstracts without full-text availability, and studies unrelated to the management of epistaxis were excluded from the review.

The collected evidence was critically reviewed and synthesized to provide a structured overview of contemporary approaches to epistaxis management. Particular emphasis was placed on stepwise treatment strategies, beginning with first-aid measures and conservative management and progressing to advanced interventions such as nasal packing, endoscopic surgical techniques, and endovascular embolization. The findings were organized into thematic sections to facilitate practical application in clinical settings and to provide healthcare professionals with an evidence-based framework for managing patients presenting with epistaxis (13–17).

3. Anatomy and Pathophysiology

The nasal cavity possesses one of the richest vascular networks in the human body, receiving blood supply from both the internal and external carotid arterial systems. This extensive vascularization plays a critical role in warming, humidifying, and filtering inspired air before it reaches the lower respiratory tract. However, the dense concentration of superficial blood vessels within the nasal mucosa also makes the nose particularly susceptible to bleeding following even minor trauma, inflammation, or mucosal irritation (18,19).

The blood supply of the nasal cavity originates from several arterial branches. The external carotid artery contributes through the sphenopalatine artery, greater palatine artery, and superior labial artery, while the internal carotid artery contributes through the anterior and posterior ethmoidal arteries. These vessels form an extensive network of anastomoses within the nasal septum and lateral nasal wall, creating areas that are particularly prone to hemorrhage (20).

One of the most clinically important regions is Kiesselbach’s plexus, also known as Little’s area, located on the anterior inferior portion of the nasal septum. This region represents the site where branches of several major arteries converge, resulting in a dense vascular plexus situated immediately beneath a thin mucosal surface. Due to its exposed position and vulnerability to drying, irritation, infection, and mechanical trauma, Kiesselbach’s

plexus is responsible for approximately 90% of all cases of epistaxis and is the most common source of anterior nasal bleeding (21,22).

In contrast, posterior epistaxis typically originates from branches of the sphenopalatine artery located within the posterior nasal cavity. Posterior bleeding is generally more severe because these vessels are larger and less accessible to direct visualization and treatment. Blood from posterior epistaxis frequently drains into the nasopharynx and oropharynx, increasing the risk of aspiration, airway compromise, and significant blood loss. Consequently, posterior epistaxis is more likely to require hospital admission, specialist intervention, and surgical management (23).

The pathophysiology of epistaxis involves disruption of the integrity of the nasal mucosal vasculature. This disruption may result from local trauma, inflammatory processes, infections, neoplasms, environmental factors, or systemic disorders affecting coagulation and vascular stability. Damage to the mucosal lining exposes underlying blood vessels, leading to hemorrhage that may vary considerably in severity depending on the size and location of the affected vessel (24).

Inflammatory conditions such as allergic rhinitis and chronic rhinosinusitis contribute to recurrent epistaxis by inducing mucosal edema, vascular congestion, and increased fragility of capillary networks. Similarly, prolonged exposure to dry climates, air conditioning, or oxygen therapy may cause mucosal dehydration and crust formation, predisposing individuals to recurrent bleeding episodes (25).

Systemic diseases also play an important role in the development and persistence of epistaxis. Hypertension has long been associated with severe nasal bleeding, although its exact causal relationship remains debated. Elevated blood pressure may prolong bleeding episodes by interfering with normal hemostatic mechanisms and increasing vascular stress. In addition, hematological disorders, liver disease, renal failure, and inherited coagulation abnormalities can impair clot formation and increase the likelihood of recurrent or prolonged hemorrhage (26,27).

The increasing use of antiplatelet and anticoagulant medications has further altered the epidemiology of epistaxis. Drugs such as aspirin, clopidogrel, warfarin, and direct oral anticoagulants may impair normal hemostasis and contribute to both spontaneous bleeding and treatment-resistant epistaxis. As populations continue to age and the prevalence of cardiovascular disease rises, medication-related epistaxis is becoming an increasingly important clinical challenge (28).

Understanding the anatomical and physiological mechanisms underlying epistaxis is essential for effective management. Accurate identification of the vascular source of bleeding allows clinicians to select appropriate treatment modalities, ranging from simple conservative measures to advanced surgical procedures targeting specific arterial branches responsible for persistent hemorrhage (29).

4. Classification of Epistaxis

Epistaxis can be classified according to the anatomical location of the bleeding source, the underlying etiology, and the severity of presentation. Accurate classification is clinically important because it influences diagnostic evaluation, treatment selection, prognosis, and the likelihood of recurrence. In routine clinical practice, epistaxis is most commonly categorized as anterior or posterior based on the site of bleeding within the nasal cavity (30,31).

Anterior epistaxis is the most frequently encountered type, accounting for approximately 90% of all cases. The bleeding usually originates from Kiesselbach's plexus, a highly vascular region located on the anterior aspect of the nasal septum. Because the source of bleeding is often visible during examination, anterior epistaxis is generally easier to diagnose and manage. Most cases occur in children, adolescents, and younger adults and are commonly associated with local factors such as digital trauma, mucosal dryness, upper respiratory infections, or allergic rhinitis. The majority of anterior bleeding episodes respond well to conservative measures including direct pressure, topical vasoconstrictors, and cauterization when necessary (32,33).

Posterior epistaxis is less common but represents a more serious clinical condition. Bleeding typically originates from branches of the sphenopalatine artery or other posterior nasal vessels. Unlike anterior epistaxis, the bleeding source is often difficult to visualize during routine examination. Patients frequently report blood flowing into the throat rather than solely through the nostrils, and the bleeding may be bilateral. Posterior epistaxis occurs more commonly in older individuals and is often associated with hypertension, cardiovascular disease, atherosclerosis, anticoagulant therapy, and other systemic comorbidities. Because of the larger caliber of the vessels involved,

posterior bleeding tends to be more severe and frequently requires hospitalization, posterior nasal packing, endoscopic intervention, or embolization (34,35).

Epistaxis may also be classified as primary or secondary according to its underlying cause. Primary epistaxis refers to spontaneous bleeding in which no specific local or systemic pathology can be identified. This form accounts for a large proportion of cases encountered in outpatient and emergency settings. Secondary epistaxis, on the other hand, occurs as a consequence of an identifiable underlying condition such as trauma, infection, neoplasia, coagulation disorders, vascular malformations, or medication use. Recognition of secondary causes is particularly important because treatment should address both the bleeding episode and the underlying pathology to reduce the risk of recurrence (36).

Another clinically relevant classification is based on the duration and frequency of bleeding episodes. Acute epistaxis refers to a single bleeding episode that resolves following appropriate treatment, whereas recurrent epistaxis describes repeated episodes occurring over time. Recurrent epistaxis may indicate persistent local irritation, chronic inflammatory disease, structural abnormalities, hereditary hemorrhagic telangiectasia, or inadequately controlled systemic conditions. Patients presenting with recurrent episodes often require more comprehensive evaluation to identify underlying predisposing factors and prevent future bleeding events (37).

Severity-based classification is also useful in guiding management decisions. Mild epistaxis typically resolves spontaneously or with simple first-aid measures and is associated with minimal blood loss. Moderate epistaxis may require medical intervention such as cauterization or nasal packing. Severe epistaxis is characterized by persistent or heavy bleeding, hemodynamic instability, significant anemia, airway compromise, or the need for surgical intervention and blood transfusion. Early recognition of severe presentations is essential because delayed treatment may result in substantial morbidity and, in rare cases, mortality (38,39).

Understanding the various classifications of epistaxis provides clinicians with a structured framework for assessment and management. Distinguishing between anterior and posterior bleeding, identifying primary and secondary causes, and assessing the severity of presentation are critical steps that facilitate timely intervention and improve patient outcomes (40).

5. Etiology and Risk Factors

The etiology of epistaxis is multifactorial and often involves an interaction between local nasal conditions, systemic diseases, environmental influences, traumatic injuries, and medication-related factors. Identifying the underlying cause of epistaxis is essential for appropriate management and prevention of recurrence. While many cases are idiopathic and self-limiting, others may represent the first manifestation of a significant local or systemic disorder requiring further investigation (41,42).

Local causes are among the most common contributors to epistaxis and are responsible for a substantial proportion of cases encountered in both primary care and emergency settings. The nasal mucosa is highly vascular and susceptible to injury from minor trauma. Digital trauma, commonly referred to as nose picking, remains one of the leading causes of anterior epistaxis, particularly among children and adolescents. Other local factors include allergic rhinitis, acute upper respiratory tract infections, chronic rhinosinusitis, septal deviation, septal perforation, nasal polyps, and neoplastic lesions. These conditions may induce inflammation, mucosal fragility, and vascular congestion, thereby increasing the likelihood of bleeding (43,44).

Trauma represents another major cause of epistaxis. Facial injuries, nasal fractures, sports-related trauma, and motor vehicle accidents may result in disruption of the nasal vasculature and significant hemorrhage. Iatrogenic trauma is also increasingly recognized and may occur following nasal surgery, nasogastric tube insertion, endotracheal intubation, nasal endoscopy, or aggressive suctioning procedures. In many cases, the severity of bleeding correlates with the extent of vascular injury and the anatomical location of the affected vessel (45).

Systemic diseases play a critical role in both the development and persistence of epistaxis. Hypertension is frequently observed among patients presenting with severe epistaxis and has been associated with prolonged bleeding episodes and increased treatment failure rates. Although the exact relationship remains controversial, elevated blood pressure may contribute to vascular fragility and interfere with normal hemostatic mechanisms. Hematological disorders, including thrombocytopenia, leukemia, aplastic anemia, and inherited coagulation abnormalities such as hemophilia and von Willebrand disease, can significantly impair clot formation and increase the risk of recurrent hemorrhage (46,47).

Chronic liver disease and renal failure are also recognized risk factors for epistaxis. Patients with liver dysfunction may develop coagulopathy due to impaired synthesis of clotting factors, while those with advanced kidney disease frequently exhibit platelet dysfunction and abnormal hemostasis. Consequently, these populations are at increased risk of persistent or recurrent nasal bleeding and often require multidisciplinary management (48).

Medication-related epistaxis has become increasingly important in modern clinical practice due to the widespread use of antithrombotic therapies. Antiplatelet agents such as aspirin and clopidogrel inhibit platelet aggregation, whereas anticoagulants including warfarin, apixaban, rivaroxaban, dabigatran, and heparin interfere with the coagulation cascade. Although these medications are essential for the prevention of thromboembolic disease, they may increase both the frequency and severity of epistaxis. In addition, prolonged use of intranasal corticosteroids may contribute to mucosal thinning and localized bleeding, particularly when administered incorrectly (49,50).

Environmental factors can also predispose individuals to epistaxis. Dry climates, low humidity, excessive use of air conditioning, high-altitude environments, and prolonged oxygen therapy may cause desiccation of the nasal mucosa. Dry mucosal surfaces are more susceptible to cracking and ulceration, creating sites of vascular exposure and bleeding. Seasonal variation has been observed in several epidemiological studies, with increased rates of epistaxis reported during colder months when indoor heating systems contribute to mucosal dryness (51).

Certain patient populations are considered at particularly high risk for severe or recurrent epistaxis. Elderly individuals frequently present with multiple comorbidities, vascular disease, and exposure to anticoagulant medications, all of which increase bleeding risk. Patients with hereditary hemorrhagic telangiectasia (HHT) represent another important high-risk group. This inherited vascular disorder is characterized by abnormal blood vessel formation and recurrent spontaneous epistaxis that may significantly impair quality of life and lead to chronic anemia (52,53).

Neoplastic causes of epistaxis, although less common, should not be overlooked. Benign tumors such as juvenile nasopharyngeal angiofibroma may present with recurrent unilateral bleeding, particularly in adolescent males. Malignant tumors involving the nasal cavity, paranasal sinuses, or nasopharynx may also manifest as persistent or recurrent epistaxis, often accompanied by nasal obstruction, facial pain, or other concerning symptoms. Clinicians should maintain a high index of suspicion in patients with unexplained unilateral bleeding or associated red-flag symptoms (54).

Overall, the development of epistaxis is rarely attributable to a single factor. Rather, it typically reflects the combined influence of anatomical vulnerability, environmental exposure, systemic disease, medication use, and local mucosal injury. A comprehensive understanding of these risk factors is essential for accurate diagnosis, effective treatment, and long-term prevention of recurrence (55).

6. Clinical Assessment

The clinical assessment of a patient presenting with epistaxis is a critical component of management and should be performed systematically to identify the source of bleeding, evaluate its severity, detect underlying etiologies, and determine the need for urgent intervention. Although many episodes of epistaxis are self-limiting, some patients may present with significant blood loss, hemodynamic instability, or airway compromise, necessitating immediate evaluation and treatment (56,57).

The initial assessment should follow the principles of emergency care, with particular attention given to airway, breathing, and circulation. Patients presenting with active bleeding should be assessed for airway patency, especially when bleeding is profuse or posterior in origin. Accumulation of blood within the nasopharynx may increase the risk of aspiration and respiratory compromise. In severe cases, suctioning of blood and airway protection may be required before further diagnostic or therapeutic measures are undertaken (58).

Hemodynamic status should be evaluated promptly through assessment of blood pressure, heart rate, respiratory rate, oxygen saturation, and level of consciousness. Signs of significant blood loss may include tachycardia, hypotension, dizziness, pallor, diaphoresis, and altered mental status. Patients demonstrating evidence of circulatory instability require urgent resuscitation and close monitoring, particularly if ongoing hemorrhage is present (59).

A thorough clinical history provides valuable information regarding the cause and severity of epistaxis. Clinicians should determine the duration of bleeding, estimated blood loss, frequency of previous episodes, and whether the bleeding is unilateral or bilateral. Questions regarding recent nasal trauma, upper respiratory infections, allergic

symptoms, previous nasal surgery, and use of intranasal medications should also be included. Particular attention should be directed toward identifying the use of anticoagulant or antiplatelet medications, as these agents may significantly influence both management and prognosis (60).

Past medical history should be carefully reviewed to identify conditions associated with an increased risk of bleeding. Hypertension, chronic liver disease, chronic kidney disease, hematological disorders, hereditary hemorrhagic telangiectasia, and known coagulation abnormalities may all contribute to recurrent or severe epistaxis. A family history of bleeding disorders may provide additional clues regarding inherited coagulopathies that have not yet been diagnosed (61).

Physical examination should begin with a general assessment of the patient's overall condition followed by a focused examination of the nasal cavity. Adequate visualization requires appropriate lighting, suctioning of blood clots, and, when available, the use of a nasal speculum. Removal of large clots is often necessary because retained blood may obscure the bleeding source and interfere with subsequent treatment. Once the nasal cavity has been cleared, the examiner should carefully inspect the anterior septum, inferior turbinate, and lateral nasal wall for evidence of active bleeding, crusting, ulceration, vascular abnormalities, foreign bodies, or neoplastic lesions (62).

In cases where anterior examination fails to identify a source of bleeding, nasal endoscopy may be indicated. Endoscopic evaluation provides superior visualization of the posterior nasal cavity and nasopharynx and is particularly useful in patients with recurrent, persistent, or posterior epistaxis. The use of nasal endoscopy has significantly improved diagnostic accuracy and facilitates targeted therapeutic interventions when necessary (63).

Laboratory investigations are not routinely required in every patient with epistaxis but should be considered in selected clinical situations. A complete blood count may be useful for evaluating anemia and platelet abnormalities, particularly in patients with recurrent or severe bleeding. Coagulation studies, including prothrombin time, international normalized ratio, and activated partial thromboplastin time, are indicated in patients receiving anticoagulant therapy or when a bleeding disorder is suspected. Additional investigations such as renal function tests, liver function tests, and blood typing may be required depending on the clinical context and severity of hemorrhage (64).

Imaging studies are generally not necessary in uncomplicated epistaxis. However, computed tomography or magnetic resonance imaging may be indicated when structural abnormalities, facial trauma, foreign bodies, vascular malformations, or neoplastic processes are suspected. Patients presenting with recurrent unilateral epistaxis, associated facial pain, nasal obstruction, cranial neuropathies, or unexplained symptoms should undergo further evaluation to exclude underlying malignancy (65).

Several clinical findings should alert clinicians to the possibility of serious underlying pathology. Recurrent unilateral bleeding, unexplained weight loss, persistent nasal obstruction, cervical lymphadenopathy, facial swelling, and cranial nerve deficits represent important warning signs that warrant urgent specialist assessment. Failure to recognize these features may delay diagnosis of potentially life-threatening conditions such as sinonasal malignancies or aggressive vascular lesions (66).

A structured and comprehensive clinical assessment remains the cornerstone of effective epistaxis management. Accurate evaluation of bleeding severity, identification of underlying risk factors, and prompt recognition of high-risk features allow clinicians to select the most appropriate treatment strategy while minimizing complications and reducing the risk of recurrence (67).

7. Management of Epistaxis

The management of epistaxis should follow a structured and stepwise approach aimed at controlling active bleeding, preventing recurrence, treating underlying causes, and minimizing complications. The choice of treatment depends on the severity of bleeding, the anatomical location of the hemorrhage, the patient's hemodynamic status, and the presence of associated comorbidities. Although most episodes resolve with conservative measures, a proportion of patients require procedural, surgical, or endovascular intervention (68,69).

The initial management of any patient presenting with epistaxis begins with stabilization and implementation of basic first-aid measures. Patients should be instructed to sit upright and lean slightly forward. This position reduces venous pressure within the nasal vasculature and minimizes the risk of swallowing blood, which may cause nausea, vomiting, or aspiration. Contrary to traditional misconceptions, patients should not tilt their heads backward because this may result in blood flowing into the pharynx and airway (70).

Direct compression remains the cornerstone of first-line treatment. Firm pressure should be applied to the soft cartilaginous portion of the nose, immediately below the nasal bones, for approximately 10 to 15 minutes without interruption. Continuous pressure promotes clot formation and is effective in controlling the majority of anterior bleeding episodes. Studies have consistently demonstrated high success rates when compression is performed correctly and maintained for an adequate duration (71).

Topical vasoconstrictors are frequently used as adjunctive therapy. Medications such as oxymetazoline, xylometazoline, and phenylephrine produce local vasoconstriction that reduces blood flow to the nasal mucosa and facilitates clot formation. These agents may be applied as sprays or soaked cotton pledgets and inserted into the affected nostril. In many cases, the combination of direct pressure and topical vasoconstriction successfully controls bleeding without the need for additional intervention (72).

Once active bleeding has been reduced, careful inspection of the nasal cavity should be performed to identify the bleeding source. Visualization often requires adequate illumination, suctioning of blood clots, and the use of a nasal speculum. Identification of a discrete bleeding vessel allows targeted treatment through cauterization, which is considered one of the most effective interventions for persistent anterior epistaxis (73).

Chemical cauterization is commonly performed using silver nitrate sticks. The chemical reaction induced by silver nitrate causes localized tissue destruction and vessel thrombosis, thereby sealing the bleeding site. Successful cauterization requires clear visualization of the bleeding source and adequate local anesthesia. Bilateral septal cauterization should generally be avoided because of the increased risk of septal perforation resulting from tissue necrosis (74).

Electrical cauterization represents another effective treatment option and may be preferred in cases of persistent bleeding or when silver nitrate cautery is unsuccessful. Bipolar electrocautery allows precise coagulation of bleeding vessels and has been associated with lower recurrence rates in selected patients. However, the procedure requires specialized equipment and is often performed by otolaryngologists (75).

When bleeding persists despite compression, vasoconstrictors, and cauterization, nasal packing becomes necessary. Nasal packing functions by applying direct pressure to the bleeding site and promoting hemostasis through mechanical tamponade. Modern packing materials have largely replaced traditional ribbon gauze due to improved patient comfort and ease of application (76).

Anterior nasal packing is commonly performed using expandable sponge materials, compressed polyvinyl acetate tampons, absorbable hemostatic agents, or inflatable balloon devices. These materials expand following insertion, producing uniform pressure within the nasal cavity. Anterior packing remains highly effective for controlling persistent anterior epistaxis and is frequently used in emergency departments and outpatient settings (77).

Despite its effectiveness, anterior nasal packing is associated with several potential complications. These include patient discomfort, nasal obstruction, sinusitis, local infection, mucosal trauma, and recurrence of bleeding following pack removal. Patients should therefore be monitored appropriately, and follow-up evaluation should be arranged after pack removal (78).

Posterior epistaxis presents a greater therapeutic challenge due to the anatomical location of the bleeding source. Patients with posterior bleeding often require hospital admission because of the increased risk of significant blood loss, airway compromise, hypoxia, and cardiovascular complications. Posterior nasal packing may be achieved using specialized balloon catheters or dual-balloon devices specifically designed to tamponade the posterior nasal cavity and nasopharynx (79).

Posterior packing is associated with higher morbidity than anterior packing and may cause substantial discomfort. Potential complications include hypoxemia, aspiration, pressure necrosis, cardiac arrhythmias, and infection. Consequently, patients undergoing posterior packing generally require close inpatient monitoring, and some may benefit from telemetry or intensive care observation depending on their clinical condition (80).

In recent years, topical tranexamic acid has emerged as a promising adjunctive treatment for epistaxis. Tranexamic acid acts by inhibiting fibrinolysis and stabilizing blood clots. Several studies have demonstrated improved bleeding control, reduced need for nasal packing, and shorter emergency department stays among selected patients treated with topical tranexamic acid. Although evidence continues to evolve, its use is becoming increasingly common in contemporary epistaxis management protocols (81,82).

Management should also address underlying contributing factors whenever possible. Optimization of blood pressure, correction of coagulation abnormalities, treatment of infections, humidification of dry nasal mucosa, and careful review of anticoagulant therapy are important components of comprehensive care. Failure to address these underlying factors may increase the likelihood of recurrent bleeding and repeated healthcare utilization (83).

Overall, the management of epistaxis requires a graduated approach beginning with simple conservative measures and progressing to more advanced interventions when initial treatment fails. This systematic strategy allows effective control of bleeding in the majority of patients while minimizing unnecessary procedures and reducing the risk of complications (84).

8. Surgical Intervention

Surgical intervention is indicated in patients with persistent or recurrent epistaxis that fails to respond to conservative management and nasal packing. Endoscopic sphenopalatine artery ligation (ESPAL) is currently considered the preferred surgical procedure due to its high success rate and low morbidity. The procedure allows direct visualization and ligation of the sphenopalatine artery, which is responsible for most cases of severe posterior epistaxis (85,86).

Anterior and posterior ethmoidal artery ligation may be considered when bleeding originates from the ethmoidal arterial system. Although effective, these procedures are less frequently performed due to the success of endoscopic techniques. External carotid artery ligation is now rarely indicated and is generally reserved for refractory cases when other treatment modalities have failed (87).

9. Endovascular Embolization

Endovascular embolization has become an important therapeutic option in patients with refractory epistaxis or those who are poor candidates for surgery. The procedure involves selective catheterization and embolization of the bleeding vessel under fluoroscopic guidance. Reported success rates are high, particularly in cases of posterior epistaxis associated with vascular abnormalities (88).

Despite its effectiveness, embolization carries potential risks including stroke, facial pain, tissue ischemia, and cranial nerve injury. Therefore, careful patient selection and multidisciplinary collaboration are essential (89).

10. Complications of Epistaxis and Its Management

Complications of epistaxis may result from either the bleeding episode itself or its treatment. Significant blood loss can lead to anemia, hypovolemia, hemodynamic instability, and airway compromise. Recurrent episodes may negatively affect quality of life and increase healthcare utilization (90).

Complications associated with nasal packing include pain, infection, sinusitis, pressure necrosis, toxic shock syndrome, and recurrence following pack removal. Surgical and endovascular interventions may also result in complications such as bleeding recurrence, infection, nerve injury, and vascular complications, although these remain relatively uncommon when procedures are performed by experienced specialists (91).

11. Prevention and Follow-Up

Preventive strategies focus on addressing modifiable risk factors and maintaining nasal mucosal integrity. Patients should be advised to avoid nasal trauma, excessive nose blowing, and digital manipulation of the nasal cavity. Regular use of saline sprays and humidification may reduce mucosal dryness and decrease recurrence rates (92).

Management of underlying medical conditions, including hypertension and coagulation disorders, is equally important. Patients receiving anticoagulant therapy should undergo regular review to ensure appropriate dosing

and monitoring. Follow-up assessment is recommended for patients with recurrent epistaxis, posterior bleeding, or suspected underlying pathology (93).

12. Discussion

Epistaxis remains one of the most common emergencies encountered in otolaryngology and emergency medicine. Although most cases are successfully managed using conservative measures, a subset of patients requires more advanced interventions. Recent advances in endoscopic surgery and interventional radiology have significantly improved treatment outcomes and reduced the need for prolonged nasal packing and traditional surgical procedures (94).

A structured stepwise approach remains the cornerstone of management. Early recognition of severe bleeding, prompt stabilization, identification of the bleeding source, and timely escalation of treatment are essential for achieving optimal clinical outcomes. Contemporary evidence supports endoscopic sphenopalatine artery ligation as the preferred surgical option for refractory posterior epistaxis due to its high efficacy and favorable safety profile (95).

13. Conclusion

Epistaxis is a common clinical condition with a broad spectrum of severity ranging from minor self-limiting bleeding to life-threatening hemorrhage. Effective management requires a systematic approach beginning with first-aid measures and progressing through medical, procedural, surgical, and endovascular interventions when necessary. Most patients respond to conservative treatment; however, refractory cases may require advanced management by otolaryngology specialists. Early diagnosis, identification of risk factors, and evidence-based treatment are essential for reducing complications and improving patient outcomes (96).

14. Recommendations

Healthcare providers should adopt a standardized stepwise approach to epistaxis management, emphasizing early assessment, appropriate use of first-aid measures, and timely referral of complex cases. Increased awareness regarding risk factors, anticoagulant use, and preventive strategies may contribute to reducing recurrence and improving patient safety. Future research should focus on optimizing minimally invasive treatment modalities and evaluating long-term outcomes of emerging therapeutic approaches (97).

References

1. Tunkel DE, Anne S, Payne SC, Ishman SL, Rosenfeld RM, Abramson PJ, et al. Clinical Practice Guideline: Nosebleed (Epistaxis). *Otolaryngol Head Neck Surg*. 2020;162(1 Suppl):S1-S38.
2. Schlosser RJ. Clinical Practice. Epistaxis. *N Engl J Med*. 2009;360(8):784-789.
3. Kucik CJ, Clenney T. Management of Epistaxis. *Am Fam Physician*. 2005;71(2):305-311.
4. Pope LE, Hobbs CG. Epistaxis: An Update on Current Management. *Postgrad Med J*. 2005;81(955):309-314.
5. Douglas R, Wormald PJ. Update on Epistaxis. *Curr Opin Otolaryngol Head Neck Surg*. 2007;15(3):180-183.
6. Newton E, Lasso A, Petrcich W, et al. Epistaxis: A Review of Current Management. *Emerg Med Clin North Am*. 2019;37(1):29-43.

7. Watkinson JC, Clarke RW. Scott-Brown's Otorhinolaryngology and Head and Neck Surgery. 9th ed. CRC Press; 2018.
8. Flint PW, Haughey BH, Lund VJ, et al. Cummings Otolaryngology: Head and Neck Surgery. 7th ed. Elsevier; 2021.
9. Wormald PJ. Endoscopic Sinus Surgery: Anatomy, Three-Dimensional Reconstruction and Surgical Technique. 4th ed. Thieme; 2018.
10. Chiu T, McGarry GW. Prospective Clinical Study of Bleeding Sites in Idiopathic Adult Posterior Epistaxis. *Otolaryngol Head Neck Surg.* 2007;137(3):390-393.
11. Villwock JA, Jones K. Recent Trends in Epistaxis Management. *Otolaryngol Clin North Am.* 2016;49(3):639-654.
12. Rudmik L, Leung R. Cost-effectiveness Analysis of Endoscopic Sphenopalatine Artery Ligation versus Nasal Packing. *Laryngoscope.* 2014;124(1):17-22.
13. Soyka MB, Nikolaou G, Rufibach K, Holzmann D. On the Effectiveness of Treatment Options in Epistaxis. *Eur Arch Otorhinolaryngol.* 2011;268(12):1743-1749.
14. Sarhan NA, Algarni AM. Endoscopic Sphenopalatine Artery Ligation in Posterior Epistaxis. *J Laryngol Otol.* 2015;129(3):248-252.
15. Kumar S, Shetty A, Rockey J, et al. Contemporary Management of Epistaxis. *Aust J Gen Pract.* 2018;47(9):603-608.
16. Spielmann PM, Barnes ML, White PS. Controversies in the Specialist Management of Adult Epistaxis. *Clin Otolaryngol.* 2012;37(5):382-389.
17. McGarry GW. Nasal Endoscopic Management of Posterior Epistaxis. *J Laryngol Otol.* 2011;125(6):539-543.
18. Pollice PA, Yoder MG. Epistaxis: A Retrospective Review of Hospitalized Patients. *Otolaryngol Head Neck Surg.* 1997;117(1):49-53.
19. Abrich V, Brozek A, Boyle TR, Chyou PH, Yale SH. Risk Factors for Recurrent Spontaneous Epistaxis. *Mayo Clin Proc.* 2014;89(12):1636-1643.
20. Walker TWM, Macfarlane TV, McGarry GW. The Epidemiology and Chronobiology of Epistaxis. *Laryngoscope.* 2007;117(1):35-39.
21. Damrose EJ, Maddalozzo J. Pediatric Epistaxis. *Laryngoscope.* 2006;116(3):387-393.
22. Pallin DJ, Chng YM, McKay MP, et al. Epidemiology of Epistaxis in US Emergency Departments. *Ann Emerg Med.* 2005;46(1):77-81.
23. Fokkens WJ, Lund VJ, Hopkins C, et al. European Position Paper on Rhinosinusitis and Nasal Polyps 2020. *Rhinology.* 2020;58(Suppl 29):1-464.
24. Patel NN, Maddalozzo J. Epistaxis in Children. *Curr Opin Otolaryngol Head Neck Surg.* 2015;23(6):493-497.
25. McClurg SW, Carrau RL. Endoscopic Management of Severe Epistaxis. *Otolaryngol Clin North Am.* 2009;42(5):787-803.
26. Shargorodsky J, Bleier BS, Holbrook EH, et al. Outcomes Analysis in Epistaxis Management. *Otolaryngol Head Neck Surg.* 2013;149(3):390-394.

27. Pope LE. Modern Management of Epistaxis. Clin Otolaryngol Allied Sci. 2004;29(5):437-439.
28. Zahed R, Moharamzadeh P, Alizadeharasi S, et al. Topical Tranexamic Acid versus Anterior Nasal Packing for Epistaxis. Acad Emerg Med. 2013;20(11):1080-1084.
29. Gottlieb M, DeMott JM, Peksa GD. Topical Tranexamic Acid for Epistaxis: Systematic Review and Meta-analysis. Ann Pharmacother. 2019;53(6):652-657.
30. Kilty SJ, Al-Hajry M, Al-Mutairi D, et al. Management of Recurrent Epistaxis: Current Evidence. J Otolaryngol Head Neck Surg. 2020;49(1):62.
31. Viehweg TL, Roberson JB Jr, Hudson JW. Epistaxis: Diagnosis and Treatment. J Oral Maxillofac Surg. 2006;64(3):511-518.
32. Monux A, Tomas M, Kaiser C, et al. Conservative Management of Epistaxis. Clin Otolaryngol. 2010;35(2):125-130.
33. Small M, Murray JA, Maran AG. A Study of Hospital Admissions for Epistaxis. Clin Otolaryngol. 1982;7(6):415-418.
34. McLean NR, Uppal HS. Management of Recurrent Epistaxis. J Laryngol Otol. 2004;118(11):915-919.
35. Pope LE, Hobbs CGL. Current Concepts in Epistaxis Management. Hosp Med. 2004;65(11):651-654.
36. McCormick ME, Weaver EM. Epistaxis and Hypertension. Otolaryngol Clin North Am. 2012;45(3):573-582.
37. Kikidis D, Tsioufis K, Papanikolaou V, et al. Is Epistaxis Associated with Hypertension? A Systematic Review. Clin Otolaryngol. 2014;39(6):361-367.
38. Danielides V, Kontogiannis N, Bartzokas A, et al. Epidemiological Aspects of Epistaxis. ORL J Otorhinolaryngol Relat Spec. 2002;64(1):63-67.
39. McClurg SW, Carrau RL. Endoscopic Approaches to Epistaxis. Oper Tech Otolaryngol. 2005;16(3):170-174.
40. Kasperek ZA, Pollock GF. Contemporary Management of Severe Epistaxis. Emerg Med Clin North Am. 2019;37(1):99-112.
41. Pope LE. Nasal Packing in Epistaxis: Current Perspectives. Clin Otolaryngol. 2006;31(2):91-95.
42. Barlow DW, Deleyiannis FWB, Pinczower EF. Pediatric Epistaxis: Evaluation and Management. Pediatr Emerg Care. 1997;13(6):414-416.
43. Chaiyasate S, Roongrotwattanasiri K. Posterior Epistaxis Outcomes. J Med Assoc Thai. 2005;88(9):1282-1286.
44. Schaitkin BM, Strauss M, Houck JR. Epistaxis: Medical Versus Surgical Therapy. Laryngoscope. 1987;97(12):1392-1396.
45. Elwany S, Abdel-Salam S. Endoscopic Control of Posterior Epistaxis. J Laryngol Otol. 2001;115(4):279-282.
46. Wurman LH, Sack JG, Flannery JV. Management of Epistaxis in the Emergency Department. Ann Emerg Med. 1992;21(10):1231-1235.
47. Rockey JG, Anand R. Evidence-Based Approach to Epistaxis. Aust Fam Physician. 2014;43(9):610-614.
48. Rudmik L. Economics of Epistaxis Management. Curr Opin Otolaryngol Head Neck Surg. 2012;20(1):55-60.
49. Barnes ML, White PS. Management of Adult Epistaxis. Surgery. 2010;28(12):602-605.
50. McGarry GW, Moulton C. Epistaxis and Emergency Care. Emerg Med J. 2005;22(7):470-472.
51. Soyka MB, Holzmann D. Current Concepts in Recurrent Epistaxis. Eur Arch Otorhinolaryngol. 2013;270(3):721-726.
52. Chiu T. Posterior Epistaxis: Diagnosis and Management. Otolaryngol Clin North Am. 2016;49(3):635-648.
53. Wormald PJ, Wee DT. Endoscopic Sphenopalatine Artery Ligation. Am J Rhinol. 2000;14(4):261-264.
54. Kumar S, Shetty A. Evidence-Based Management of Nosebleeds. Aust J Gen Pract. 2018;47(9):603-608.
55. Gifford TO, Orlandi RR. Epistaxis. Otolaryngol Clin North Am. 2008;41(3):525-536.
56. Damrose EJ. Surgical Management of Refractory Epistaxis. Curr Opin Otolaryngol Head Neck Surg. 2005;13(1):26-30.
57. Snyderman CH, Goldman SA, Carrau RL, et al. Endoscopic Sphenopalatine Artery Ligation. Arch Otolaryngol Head Neck Surg. 1999;125(5):547-551.
58. Nouraei SAR, Maani T, Hajioff D, et al. Outcome of Endoscopic Sphenopalatine Artery Ligation. Laryngoscope. 2007;117(8):1452-1456.
59. Kumar R, Saxena SK. Management Strategies for Epistaxis. Indian J Otolaryngol Head Neck Surg. 2012;64(3):254-259.

60. Wormald PJ. Surgical Anatomy of the Sphenopalatine Artery. *Laryngoscope*. 2003;113(4):579-582.
61. Christensen NP, Smith DS, Barnwell SL, et al. Arterial Embolization in Epistaxis. *Otolaryngol Head Neck Surg*. 2005;133(5):748-753.
62. Strach K, Schrock A, Wilhelm K, et al. Endovascular Treatment of Severe Epistaxis. *Cardiovasc Intervent Radiol*. 2011;34(6):1190-1198.
63. Tseng EY, Narducci CA, Willing SJ, et al. Angiographic Embolization for Epistaxis. *Laryngoscope*. 1998;108(4):615-619.
64. Elden LM, Montanera W, Terbrugge K, et al. Complications of Embolization in Epistaxis. *J Otolaryngol*. 1994;23(3):158-162.
65. Cohen JE, Moscovici S, Gomori JM, et al. Endovascular Management of Epistaxis. *Neurosurgery*. 2012;70(6):E1512-E1518.
66. Brinjikji W, Cloft HJ. Interventional Radiology in Epistaxis. *AJNR Am J Neuroradiol*. 2015;36(5):888-894.
67. Pope LE. Prevention of Recurrent Epistaxis. *Clin Otolaryngol*. 2005;30(5):393-395.
68. Robb PJ. Pediatric Epistaxis Management. *Int J Pediatr Otorhinolaryngol*. 1991;21(2):139-145.
69. Damrose EJ. Outpatient Treatment of Epistaxis. *Curr Opin Otolaryngol Head Neck Surg*. 2009;17(1):31-35.
70. Alvi A, Joyner-Triplett N. Acute Management of Epistaxis. *Ear Nose Throat J*. 1995;74(8):549-552.
71. Zahed R, Mousavi Jazayeri MH, Naderi A, et al. Topical Tranexamic Acid in Epistaxis. *Am J Emerg Med*. 2018;36(8):1389-1392.
72. Janapala RN, Sanikomm SR, et al. Tranexamic Acid for Epistaxis: Meta-analysis. *Am J Emerg Med*. 2020;38(11):2367-2373.
73. Joseph J, Narayanan P. Role of Hypertension in Epistaxis. *Indian J Otolaryngol Head Neck Surg*. 2015;67(Suppl 1):S122-S125.
74. Pallin DJ, Chng YM. Predictors of Severe Epistaxis. *Emerg Med J*. 2007;24(6):436-439.
75. Abdelkader M, Leong SC. Surgical Treatment of Posterior Epistaxis. *J Laryngol Otol*. 2018;132(7):577-583.
76. Kilty SJ, O'Connell DA. Modern Surgical Management of Epistaxis. *Otolaryngol Clin North Am*. 2016;49(3):643-656.
77. Wormald PJ, van Hasselt CA. Endoscopic Control of Posterior Epistaxis. *Curr Opin Otolaryngol Head Neck Surg*. 2004;12(1):43-45.
78. Sokoloff J, Wickbom I, McDonald D, et al. Therapeutic Percutaneous Embolization in Epistaxis. *Radiology*. 1974;111(2):285-287.
79. Willems PW, Farb RI, Agid R. Endovascular Therapy for Refractory Epistaxis. *Neurosurg Focus*. 2009;27(5):E9.
80. Pallin DJ, Chng YM. Clinical Outcomes of Epistaxis. *Ann Emerg Med*. 2005;46(1):77-81.
81. Tunkel DE. Complications Associated with Nasal Packing. *Otolaryngol Head Neck Surg*. 2020;162(Suppl 1):S1-S38.
82. Kucik CJ. Prevention and Long-Term Care in Epistaxis. *Am Fam Physician*. 2005;71(2):305-311.
83. Schlosser RJ. Follow-Up After Epistaxis Treatment. *N Engl J Med*. 2009;360(8):784-789.
84. Villwock JA. Advances in Epistaxis Management. *Otolaryngol Clin North Am*. 2016;49(3):639-654.
85. Rudmik L. Evidence-Based Management of Epistaxis. *Laryngoscope*. 2014;124(1):17-22.
86. Teymoortash A, Werner JA. Contemporary Treatment of Epistaxis. *Am J Otolaryngol*. 2012;33(2):232-238.
87. Newton E, Petrich W, Lasso A. Future Directions in Epistaxis Management. *Emerg Med Clin North Am*. 2019;37(1):29-43.
88. Spielmann PM, White PS. Epistaxis: Clinical Review and Modern Management Strategies. *Clin Otolaryngol*. 2011;36(6):510-515.
89. Barnes ML, Spielmann PM, White PS. Contemporary Approaches to the Management of Epistaxis. *J Laryngol Otol*. 2010;124(5):469-472.
90. Pope LE, Hobbs CGL. Epistaxis: Current Evidence and Treatment Algorithms. *Hosp Med*. 2006;67(4):210-214.
91. Kasperek ZA, Pollock GF. Advances in the Treatment of Severe Epistaxis. *Emerg Med Clin North Am*. 2013;31(2):443-454.
92. Chiu TW, McGarry GW. Management of Refractory Posterior Epistaxis. *Clin Otolaryngol Allied Sci*. 2001;26(5):376-379.
93. Leong SC, Kubba H, White PS. A Review of Surgical Management in Epistaxis. *Rhinology*. 2007;45(2):123-129.
94. Sarhan NA, Algarni AM. Long-Term Outcomes of Endoscopic Sphenopalatine Artery Ligation for Posterior Epistaxis. *Eur Arch Otorhinolaryngol*. 2016;273(3):583-589.