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The distribution of bleeding sites in idiopathic hidden arterial epistaxis

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Abstract

Objective. To determine the frequency distribution of bleeding sites in idiopathic hidden arterial epistaxis.

Methods. In this retrospective cohort study, 107 patients with hidden arterial epistaxis were endoscopically examined for sites of bleeding.

Results. All sites of hidden arterial epistaxis were identified by endoscopic examination. Bleeding sites were identified at initial surgery in 103 patients and during the second surgery in 4. The bleeding sites included: the olfactory cleft region in 47 patients, the inferior meatus region in 29, the middle meatus region in 11, multiple bleeding sites (olfactory cleft and anterior septum) in 3, the anterior roof of the nasal cavity in 4, the nasal floor in 11 and the nasopharynx in 2. The bleeding points showed a white or red volcano-like bump in 75 patients, isolated prominent telangiectasia in 21 and mucosal ulceration in 11.

Conclusion. Common sites of hidden arterial epistaxis include the olfactory cleft, inferior meatus and middle meatus. However, there should be awareness of some uncommon bleeding sites (including the anterior roof of the nasal cavity, the nasal floor and the nasopharynx) and of multiple bleeding sites.

Main Article

Dr Z-C Lou takes responsibility for the integrity of the content of the paper

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Introduction

Hidden arterial epistaxis is a disease process commonly seen in the emergency department. Although not life-threatening in most circumstances, it can severely affect patients' quality of life and cause undue anxiety.

Hidden arterial epistaxis was historically thought to be venous bleeding originating from Woodruff's venous plexus. Previously, evaluation of this region was difficult because of the limited view and restricted access to the nasal cavity afforded by rudimentary equipment. However, the advent of endoscopic technology has allowed for improved visualisation of the nasal cavity, with recent studies suggesting that hidden arterial epistaxis is primarily of an arterial source, rather than venous as previously thought. Vessels involved include the sphenopalatine artery, anterior ethmoidal artery and facial arteries.[1–3]

Previous studies have evaluated the ability of arterial ligation, embolism and electrocoagulation to control posterior epistaxis.[4,5] The findings demonstrated that anatomical variation in the anastomotic feeder arteries of the nasal cavity[6,7] resulted in high rates of recurrent epistaxis post-operatively. Furthermore, these studies have suggested that the key to epistaxis control is identification of specific bleeding sites, followed by ligation or electrocoagulation of the feeder artery with nasal packing.[8–10]

However, we believe that the bleeding 'site' in hidden arterial epistaxis is fundamentally different from the bleeding 'point'. Ando *et al.*[11] believed that the cause of recurrent epistaxis was bleeding from an unidentified point, and that identification and precise electrocoagulation of this bleeding point is therefore required to reduce overall complication rates and prevent re-bleeding. This study aimed to evaluate the common bleeding sites in hidden arterial epistaxis.

Materials and methods

Ethical considerations

This study was reviewed and approved by the Institutional Ethical Review Board of Wenzhou Medical College Affiliated Yiwu Hospital, Zhejiang, China. Informed consent was obtained from all participants.

Patient recruitment and data collection

The study subjects were patients who presented with posterior arterial epistaxis to the emergency department of the Affiliated Yiwu Hospital of Wenzhou Medical College, between February 2017 and February 2018.

Patients were included in the study if they met the following inclusion criteria: (1) the primary reason for presentation to the hospital was idiopathic posterior arterial epistaxis;

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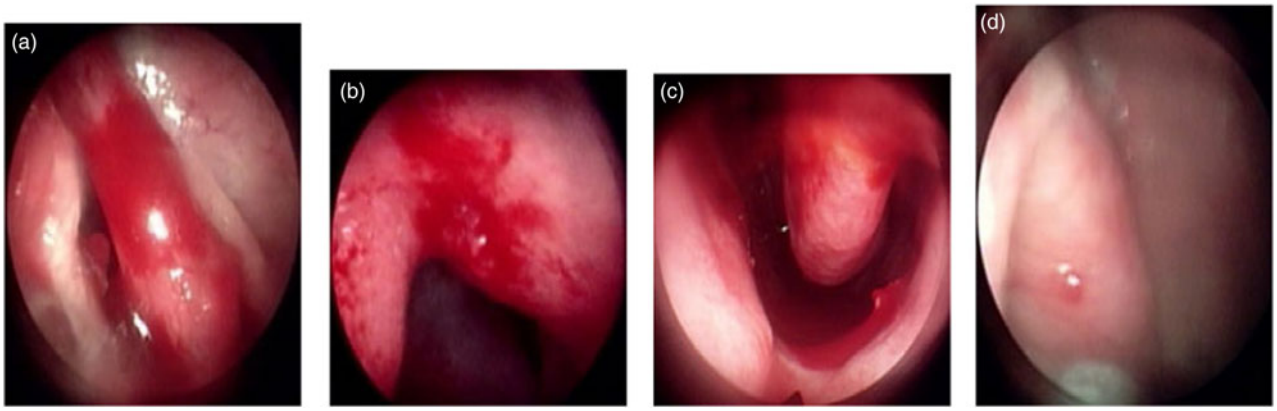

Fig. 1. The bleeding sites included: (a) the olfactory cleft region, (b) the mucosal groove of the fornix of the inferior meatus, (c) the nasal floor and (d) the nasopharynx.

(2) it was the patient's first visit to the hospital; (3) there was no previous history of nasal packing or nasal surgery; (4) there was difficulty in identifying bleeding sites by headlight; and (5) there was evidence of paroxysmal pulsation epistaxis. Patients were excluded from the study if they had pre-existing nasal packing, or if there was epistaxis of the anterior nasal septum.

Hidden arterial epistaxis was defined as posterior, intermittent and severe bleeding, with or without hypertension. Bleeding sites were classified into: the olfactory cleft, the middle meatus region, the inferior meatus region and other sites. The middle turbinate, middle meatus and posterior nasal cavity (superior posterior end of the inferior turbinate) were included in the middle meatus region. The inferior nasal turbinate and inferior meatus were included in the inferior meatus region. Other sites included the anterior roof of the nasal cavity, the nasal floor and the nasopharynx.

Identification of bleeding sites and points

Laterality of the epistaxis is first confirmed by thorough clinical history and physical examination. Thorough inspection of both nasal cavities should be performed. Bilateral treatment is not needed if the side of the haemorrhage has been clearly identified.

Topical anaesthesia or general anaesthesia is performed according to the general condition of the patient. Any blood clots identified should be removed prior to the procedure. Pledgets of cotton soaked in 1 per cent Dicaine with adrenaline are placed in the nasal cavity, for 10–15 minutes, to reduce bleeding and improve visualisation. After an appropriate amount of time has passed, the pledgets of cotton are removed and endoscopic inspection is performed. Patients receiving topical anaesthesia are placed in a normal sitting position at the time of examination. This allows blood flow to occur in a cranial to caudal direction, resulting in retention of blood at the nasal cavity floor. For patients placed in the supine position receiving general anaesthesia, blood flows from the cribriform plate to the common meatus. Identification of bleeding sites should be systematically guided by the hydrodynamic behaviour of blood as it flows from the superior olfactory cleft to the superior middle meatus, olfactory cleft, middle meatus, posterior nasal floor and inferior meatus.

Effective examination of hidden arterial epistaxis requires the simultaneous use of both a suction tip and an endoscope. First, any blood clots are removed from the olfactory cleft and middle meatus region. Olfactory cleft epistaxis is confirmed if further bleeding is seen while the suction tip is placed directly over this region. Epistaxis of the middle meatus region is confirmed if, after removal of blood clots from the middle meatus region, there is any posterior flow of blood from the inferior middle meatus to the superior border of the inferior turbinate. The presence of further bleeding, or bleeding from the inferior meatus to the post-nasal space, indicates that the source of epistaxis is on the nasal floor. Removal of blood clots from the nasal floor and inferior meatus that is followed by further bleeding indicates epistaxis in the inferior meatus region. If the olfactory cleft, middle meatus region and inferior meatus region can be ruled out as the source of bleeding, but epistaxis persists, a more detailed examination is warranted. This should be conducted in the anterior roof of the nasal cavity, the nasal floor and the nasopharyngeal region. Patients should be closely observed if the bleeding site cannot be identified, to resolve epistaxis.

After all of the bleeding sites have been determined, the bleeding points should be identified. Pledgets of cotton soaked in 1 per cent Dicaine with adrenaline are gently placed in the bleeding sites, whether or not epistaxis is present. After 10–15 minutes, the pledgets are removed. A suction tip is used to locate the bleeding point. In the presence of nasal mucosal ulceration or prominent vessels, the site should be scraped with a suction tip. If further severe bleeding occurs after scraping, the bleeding point should be further explored. Occasionally, septal deviation (spurs) or nasal anatomical variations can impede visualisation or limit use of the endoscope, suction tip, and treatment equipment. In such cases, the nasal anatomical variations should be managed to achieve a sufficiently enlarged nasal cavity that allows adequate endoscopic visualisation and bleeding point treatment.

Results

In total, 107 patients with hidden arterial epistaxis were included in this study: 69 (64.5 per cent) were male and 38 (35.5 per cent) were female. Of these patients, 51 (47.7 per cent) were bleeding on the left while 56 (29.2 per cent) were bleeding on the right. The mean age was 72.4 ± 5.1 years (range, 42–91 years). The mean duration of epistaxis was 1.1 ± 2.2 days (range, 1–3 days).

Bleeding sites were identified in all patients. The bleeding point was identified during the first examination in 103 patients (96.3 per cent) and during the second examination in 4 patients (3.7 per cent). Bleeding sites were found to be in: the olfactory cleft region in 47 patients (43.9 per cent) (Figure 1), the inferior meatus region in 29 patients (27.1

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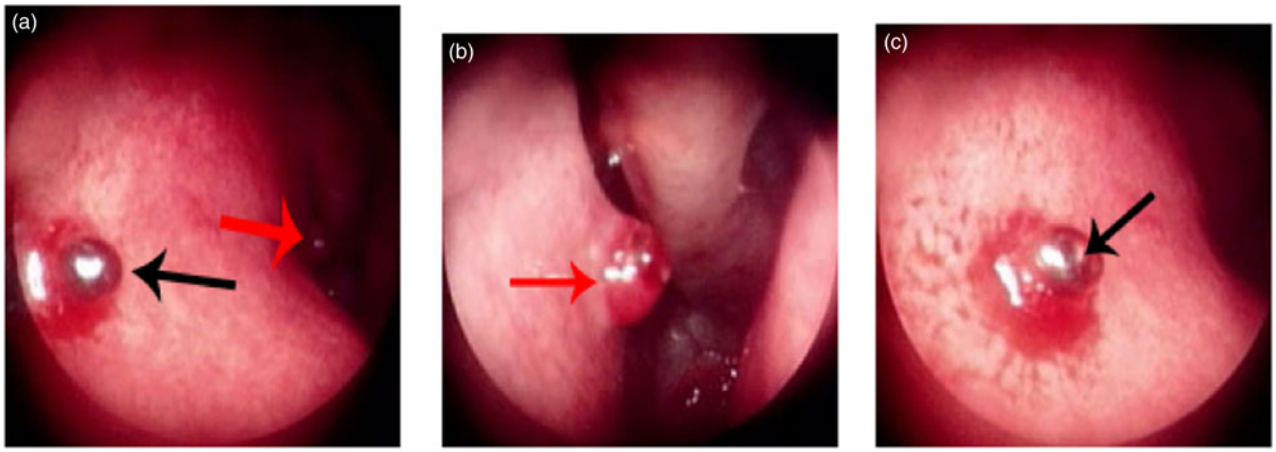

Fig. 2. Multiple bleeding sites in the same patient: (a) two simultaneously bleeding points, (b) the olfactory cleft bleeding point and (c) the anterior septum bleeding point. The red and black arrows indicate the bleeding points in the olfactory cleft and the anterior septum, respectively.

per cent) (Figure 1), the middle meatus region in 11 patients (10.3 per cent), multiple bleeding sites (olfactory cleft and anterior septum) in 3 patients (2.8 per cent) (Figure 2), the anterior roof of the nasal cavity in 4 patients (3.7 per cent), the nasal floor in 11 patients (10.3 per cent) (Figure 1) and the nasopharynx in 2 patients (1.9 per cent) (Figure 1).

Septoplasty was performed in 3 patients (2.8 per cent), the middle nasal turbinate was lateralised in 13 patients (12.1 per cent) and medialised in 6 patients (5.6 per cent), and the inferior nasal turbinate was lateralised in 10 patients (9.3 per cent). The bleeding points showed different prominent vessels and mucosal ulceration in 107 patients, including: white or red volcano-like bumps in 75 patients (70.1 per cent), isolated prominent telangiectasia in 21 patients (19.6 per cent), and mucosal ulceration in 11 patients (10.3 per cent).

Discussion

Hidden arterial epistaxis was initially thought to be venous bleeding from Woodruff's venous plexus because of the historically poor visualisation of the nasal cavity. With advances in technology, including the introduction of the endoscope, further research has demonstrated that hidden arterial epistaxis has an arterial rather than a venous origin.

In this study, the bleeding site could be endoscopically identified in all patients during either the first or second examination. In contrast to our findings, in previous studies bleeding sites were unknown or unidentifiable.[12,13] The following factors can increase the difficulty of successfully locating a bleeding site or point: inadvertent scraping of the bleeding site with nasal packing material, and retraction of the blood vessel following the inactive phase of epistaxis. We achieved higher identification rates because of our inclusion criteria, where we included only those patients who had not previously received any nasal packing, and who presented for treatment of active epistaxis only.

The literature shows a large variation in the frequency distribution of bleeding sites among studies.[12–18] Some studies suggest that posterior arterial epistaxis primarily originates from the lateral aspect of the nasal cavity.[12–15] Thornton *et al.*[14] found that 80 per cent of bleeding sites were on the lateral aspect of the middle or inferior meatus or turbinates, while only 20 per cent were on the septum. Paul *et al.*[15] found that in 50 per cent of posterior epistaxis cases, the origin was the lateral wall of the middle meatus near to the sphenopalatine foramen. Iimura *et al.*[12] reported that in 47.9 per cent of posterior epistaxis cases, the origin was the lateral wall of the nasal cavity, while in 23.4 per cent it was the olfactory cleft. Liu *et al.*[13] reported that 63.1 per cent of 263 patients with known bleeding sites had posterior epistaxis originating from the lateral wall of the nasal cavity, while 32.7 per cent of patients had epistaxis originating from the septum.

In this study, the primary site of bleeding was the olfactory cleft region, followed by the fornix of the inferior meatus. Among the 107 total patients, bleeding sites included: the olfactory cleft region in 47 patients (43.9 per cent), the inferior meatus region in 29 patients (27.1 per cent), the middle meatus region in 11 patients (10.3 per cent) and other sites in 17 patients (15.9 per cent).

Other studies have similarly reported that posterior arterial epistaxis originated primarily from the septum.[16–18] Bhatnagar and Berry[16] reported that, in 50 per cent of cases, bleeding originated from the posterior superior nasal septum. Chiu and McGarry[17] found that in 70 per cent of adult cases, posterior epistaxis arose from the septum. Turri-Zanoni *et al.*[18] reported that 83.3 per cent of posterior epistaxis cases originated from the olfactory cleft, at the level of the axilla of the middle turbinate.

It is possible that the distribution of bleeding sites could be related to individual variations in nasal anatomy, where such variations influence nasal airflow. Nasal airflow is not linear, with some patients showing turbulent flow under normal conditions. Nasal airflow is primarily distributed among the common, inferior and middle meatuses, as well as the olfactory cleft. Airflow flows upward from the anterior nares to the roof of the nasal cavity, and then downward to the posterior nares on inhalation. Airflow is mainly via the septum and olfactory cleft, and only occasionally via the middle meatus. On exhalation, the airflow forms a vortex at the inferior margin of the middle nasal turbinate.[19–21] Anterior structures in the olfactory cleft also have an effect on airflow, where the gas flow rate in the olfactory cleft is slower than that at other sites during inhalation and exhalation.[20,21] In addition, airflow in the inferior meatus region is greater toward the bottom of the inferior meatus; the gas flow rate is lower closer to the roof of the inferior meatus.[19–22]

Dust accumulates more easily in the olfactory cleft because of the relatively low gas flow rate in this region. Similarly, inhaled dust easily accumulates in the fornix of the inferior meatus, because this structure forms the mucosal groove, which reduces the gas flow rate.[14] Long-term dust accumulation can cause ulceration and abnormal hyperplasia of the

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branches of the nasal artery. This could result in bleeding in the olfactory cleft and fornices of the inferior meatus.

Nasal anatomical variations can result in abnormal patterns of nasal airflow and gas flow. The relationship between the bleeding site in posterior arterial epistaxis and nasal airflow according to nasal anatomical variation requires further research.

Although hidden arterial epistaxis originated primarily from the septum, particularly the septal side of the olfactory cleft, and should be the first site to be endoscopically examined, some uncommon bleeding sites were found in this study; these sites included the anterior roof of the nasal cavity, the nasal floor and the nasopharynx. These bleeding sites, especially the latter, may be easily missed during the endoscopic examination and may account for the high rate of unknown bleeding sites in some studies. In addition, three patients had multiple bleeding sites (olfactory cleft and anterior septum), the presence of which should be considered, particularly in patients with re-bleeding. These results highlight the need to carefully examine all regions of the nasal cavity and nasopharynx using endoscopes of different diameters and angles (including 0°, 30° and 70° endoscopes) for patients with refractory epistaxis.

- The bleeding sites of hidden arterial epistaxis should be examined endoscopically
- Common bleeding sites include the olfactory cleft, inferior meatus and middle meatus regions
- There should be awareness of uncommon and of multiple bleeding sites
- Bleeding sites may be related to nasal anatomy and nasal airflow

In addition, in most cases in this study, the bleeding point showed prominent vessels and mucosal ulceration, which further worsened bleeding after scraping with the suction tip. The prominent vessels appeared as white or red volcano-like bumps, with distinct borders and irregular shapes, mostly located parallel to or above the surface of the nasal mucosa.

Conclusion

This study showed that the common bleeding sites of hidden arterial epistaxis include the olfactory cleft region, the inferior meatus region and the middle meatus region. However, there should be awareness of some uncommon bleeding sites (including the anterior roof of the nasal cavity, the bottom of the common nasal meatus and the ostium of the Eustachian tube) and of the possibility of multiple bleeding sites. A correlational study of bleeding sites and nasal airflow may be interesting for the future.

Competing interests. None declared

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