CASE REPORT

An unusual complication of epistaxis: cerebral abscess formation after anterior ethmoidal artery ligation

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SUMMARY

Epistaxis is a very common emergency in otorhinolaryngology. Anterior ethmoidal artery ligation using an external approach is one of the surgical options in posterior epistaxis. We present, to the best of our knowledge, the first reported case of an intracerebral abscess after epistaxis treatment with ligation of the anterior ethmoidal artery using an endoscopic-assisted external approach in a 56-year-old patient. The patient presented 4 days postoperatively with an orbital cellulitis. A CT was performed and a frontobasal hypodensity was found. An additional MR tomography the next day showed a lesion suspicious for an intracerebral abscess. Despite intravenous antibiotic therapy, the lesion increased and was successfully treated by the neurosurgeons, with abscess resection over a craniotomy and frontobasal repair using a pedicled periosteal flap. Surgeons have to be aware of this rare but possibly lethal severe complication and should consider early imaging studies, especially if a periorbital cellulitis appears.

BACKGROUND

Epistaxis is a very common emergency for otolaryngologists. Anterior nosebleeds with clear identification of the bleeding source are easy to treat. Posterior nosebleeds are sometimes troublesome. Cases where nasal packing fails are often treated by surgical intervention.¹ The most effective treatments are occlusion of the internal maxillary or sphenopalatine branches of the external carotid artery and anterior ethmoidal artery transection. Ligation of the sphenopalatine artery is most often sufficient.² If this therapy is not successful or if it's clear that the origin of bleeding is in the area of the anterior ethmoidal artery, this artery should be ligated by an external approach. At our institution, we use the method already described by Douglas and Gupta,³ although transcaruncular approaches are also possible. We present a case of a severe complication after epistaxis treatment. To the best of our knowledge, this is the first reported case of an intracerebral abscess after ligation of the anterior ethmoidal artery in epistaxis, using an endoscopic-assisted external approach.

CASE PRESENTATION

A 56-year-old man presented at the emergency unit with posterior right-sided epistaxis. He had no apparent risk factors such as anticoagulation or antiaggregational medication. The haemoglobin

level was 137 g/L at presentation. The patient was hospitalised and bleeding was stopped with the use of a Rapid Rhino 900 Epistaxis device (ArthroCare ENT, 9 cm inflatable anterior/posterior double balloon nasal packing). In his medical history, the patient had undergone operative ligation of the sphenopalatine artery on the (same) right side 2 years prior at another hospital. In the meantime, he had experienced no further bleeding to date.

The following night repeated bleeding occurred despite the nasal packing being reblocked to the maximally tolerable level, so the packing was removed and a Foley balloon catheter was introduced in the epipharynx, and the nasal cavity was filled with fatty cotton gauze. The decision for operative exploration was made. In a first attempt, the sphenopalatine artery was revised, but as bleeding persisted intraoperatively, we decided to perform external ligation of the ethmoidal vessels. After Lynch incision, dissection was performed until the bone of the medial orbital wall was reached. A 0° rigid nasal endoscope was then inserted and the periosteum was dissected until we reached the entry points where the ethmoidal arteries transverse into the nasal cavity. Both, the anterior and posterior (or possibly intermediate) branch of the ethmoidal artery were coagulated, transected (figure 1) and then a piece of Tabotamp Original (Ethicon, Johnson & Johnson) was inserted before wound closure. The intervention was successful and no more nosebleeds occurred. The patient was discharged from the hospital on the first postoperative day in good general health.

Figure 1 Arrow: coagulated and transsected anterior ethmoidal artery.

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Figure 2 Four days postoperative with orbital oedema.

The patient returned 3 days later (4 days postoperative) with an orbital oedema, tenderness and redness, as well as double vision ([figure 2](#)). The ophthalmologists registered increased eye pressure and the patient was hospitalised for intravenous antibiotic therapy (amoxicillin/clavulanic acid) with the diagnosis of a postoperative orbital cellulitis. A CT was performed and free air was discovered intracranially with a frontobasal hypodensity on the right side. An additional MR tomography the next day showed a right frontal lesion on diffusion-weighted and contrast-enhanced sequences with accompanying cerebritis and oedema suspicious for an intracerebral abscess ([figure 3A, B](#)).

These findings increased despite the antibiotic therapy with meropenem and vancomycin over the next week ([figure 3C, D](#)), and the decision for an abscess resection over a pterional craniotomy with frontobasal repair using a pedicled periosteal flap was made by the neurosurgeons. No bacterial growth was found in the swab. However, PCR revealed *Staphylococcus aureus*.

OUTCOME AND FOLLOW-UP

After the intervention, the patient showed a slow but gradual recovery under continuous antibiotic treatment with floxapen 6×2 g intravenous and moxifloxacin 1×400 mg orally for 6 weeks. The double vision disappeared and the patient was transferred to a primary care hospital 1 month after the initial operation, for the continuation of the intravenous antibiotic therapy followed by neurorehabilitation.

Three months after the event, the patient improved further clinically ([figure 3E, F](#)), with a residual short-term memory disturbance. No further nosebleeds occurred. An ophthalmological follow-up showed no residual disease.

DISCUSSION

We present, to the best of our knowledge, the first case of an intracerebral abscess formation after ligation of anterior ethmoidal artery in epistaxis. This potentially lethal complication is very unusual and we discuss different hypotheses of its pathogenesis.

In the literature, there are only a few reported major complications after ligation of the anterior ethmoidal artery in epistaxis using an endoscopic-assisted external approach. Couch *et al*⁴ reported two cases of superior oblique muscle dysfunction after anterior ethmoid artery ligation. Because of the lack of appropriate examinations preoperatively and the absence of post-operative imaging, it is not clear if this muscle dysfunction was

Figure 3 (A, C and E) Coronal T1-weighted MRI; arrow indicate contrast enhancing lesion. (B, D and F) Coronal T2-weighted MRI; asterisk indicate perifocal oedema.

actually related to the surgery performed or if it was a possible exacerbation of a pre-existing vertical phoria because of a congenital superior oblique palsy.

Yeh *et al*⁵ reported an orbital apex syndrome as a complication after anterior ethmoidal artery ligation. In the case of the orbital apex syndrome, there was an optic neuropathy and complete ophthalmoplegia after surgery and the CT showed surgical clips within the apex.

Also, in primary and revision functional endoscopic sinus surgery, major surgical complication rates are very rare (<0.4%). Reported major complications include cerebrospinal fluid leak, meningitis, haemorrhage and orbital injuries.^{6 7}

Intracranial complications are also possible as a sequel of acute rhinosinusitis. They include either phlegmonous inflammation (meningitis, cerebritis) or abscess formation (epidural, subdural, intracerebral) as well as cavernous sinus thrombosis. The spread of infection into the orbit and intracranially follows natural paths or predisposed routes. Bacteria can pass through blood vessels or they can extend behind the sinuses directly through a dehiscence. Retrograde septic thrombophlebitis is the most likely route of infection.^{8 9} Jones *et al*¹⁰ found that 45% of patients with intracranial complication presented with a peri-orbital cellulitis or frontal swelling. This was also the case in our patient.

And what could the pathogenesis of a cerebral abscess after anterior ethmoidal artery ligation, as seen in our case, be? A retrograde septic thrombophlebitis is possible. The rigid endoscope was first used intranasally for the ligation of the sphenopalatine artery and after that for the transcutaneous ethmoidal artery ligation. A bacterial contamination by this route is a possible cause. Another point is, that for haemostasis, a Tabotamp (oxidised cellulose) was inserted into the operating field. This foreign body can also be a possible bacterial growth reservoir.

The anterior ethmoidal artery is a branch of the ophthalmic artery and leaves the orbit through the anterior ethmoidal foramen, and covers the blood supply for the anterior and middle ethmoidal cells. In general, the artery lies in a bony canal in the anterior skull base and has a branch called ramus meningealis (arteria meningeae anterior) for the dura mater. Therefore, intracranially, bacterial spread through this blood vessel and its channel is possible.

The first site of symptoms was located in close proximity to the Lynch incision and at the time of diagnosis of the intracranial manifestation, there was only very mild mucosal thickening in the paranasal sinuses despite previous nasal packing. This enforces the hypothesis that the primary spread of infection, in absence of a cerebrospinal fluid leak, was transorbital rather than transnasal. Furthermore, our patient had no pneumatization of the frontal sinus on the side of the brain abscess and

there was also no previous trauma in the history of the patient to suggest a transnasal/sinonasal route of infection.

Learning points

- ▶ The most effective treatments of posterior epistaxis are occlusion of the sphenopalatine branches of the external carotid artery and anterior ethmoidal artery transection.
- ▶ Ear, nose and throat surgeons have to be aware of this rare but possibly lethal complication of epistaxis treatment.
- ▶ Early imaging studies are important, especially if a periorbital cellulitis appears.

Contributors All the authors contributed to this case report. The conception for this work was by DH and MBS, who treated the patient for his Epistaxis and had the medical lead during hospitalisation at the ENT department. J-KB was involved in the treatment of the intracerebral abscess and presented the neurosurgical point of view for the interpretation of data. KM collected the data, performed the follow-up and wrote the case report draft. All the coauthors revised the draft critically for content and approved it for publishing.

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