Basal ganglion hematoma evacuation and clipping of middle cerebral artery aneurysm by neuroendoscopy

A case report

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Abstract

Rationale: Basal ganglia hematomas resulting from the rupture of aneurysms of the distal middle cerebral artery (MCA) are extremely rare and are usually treated by craniotomy. To date, only 5 cases of MCA aneurysm have been treated using neuroendoscopy, and none of these cases involved hematomas. For the first time, we report a special case in which neuroendoscopy was used to evacuate a hematoma and clip an aneurysm at the same time.

Patient concerns: A massive basal ganglia hematoma in a 60-year-old man was evacuated using neuroendoscopy, and a distal MCA aneurysm was discovered and clipped successfully under the neuroendoscopy during the operation.

Diagnosis: Basal ganglia hematoma, Distal MCA aneurysm.

Outcomes: The patient's left pupil shrunk, and his state of consciousness gradually improved after the operation.

Lessons: Our experience with this patient demonstrates that an aneurysm originating in the distal MCA and accompanied by hematoma may be treated using minimally invasive neuroendoscopy. The fact that cerebral angiography was not performed before or after this patient's first operation indicates that all basal-ganglia hematoma patients, including those with lower risks of cerebrovascular anomalies, should undergo cerebral angiography before and after surgical treatment.

Abbreviations: BGH = basal ganglia hematoma, CT = computed tomography, CTA = computed tomography angiography, GCS = Glasgow Coma Scale, MCA = middle cerebral artery.

Keywords: aneurysm, basal ganglia hematoma, middle cerebral artery, neuroendoscopy

KEY POINTS

Question: Could basal ganglia hematoma from rupture of the distal middle cerebral artery aneurysms be treated by neuroendoscopy?

Findings: A 60-year-old man presented a massive basal ganglia hematoma was evacuated by neuroendoscopy and a

MCA aneurysm was founded and clipped during the operation at the same.

Meaning: Aneurysms originating from the distal MCA accompany by hematoma also had the opportunity treated by minimal surgery of neuroendoscopy.

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1. Introduction

Basal ganglia hematoma (BGH), one of the deadliest diseases, is generally caused by hypertension as well as rare abnormal vascular lesions, including arteriovenous malformations, moya-moya disease, and aneurysms.^[1] Among these vascular lesions, those involving ruptures of distal middle cerebral artery (MCA) aneurysms are extremely rare and account for only 2% to 6% of all MCA aneurysms.^[2]

Aneurysm-related BGH is typically treated using craniotomy, but this approach has been challenged due to its invasiveness. Endoscopic technology has played a significant role in the treatment of BGH because of the minimal injury it causes, though there have been only 5 cases in which MCA aneurysms have been clipped using neuroendoscopy.^[3,4] Therefore, it is likely that these 2 procedures can be performed in 1 step using neuroendoscopy. Here, we report for the first time a case of a patient in whom a BGH was evacuated and an MCA aneurysm was clipped by neuroendoscopy at the same time.

Figure 1. Changes in the hematoma before and after minimally invasive puncture and drainage at the county-level hospital. (A) A computed tomography (CT) scan at admission revealed a small hematoma in the left basal ganglia. (B) A repeat CT scan revealed an enlarged massive hematoma, which compromised adjacent structures, and a herniation that occurred one day after initiation of conservative treatment. (C) A postoperative CT scan demonstrated effective removal of the hematoma 2 days after the minimally invasive puncture-and-drainage surgery. (D) A CT scan demonstrated nearly complete removal of the hematoma 5 days after the operation. (E) Two weeks later, re-bleeding occurred in the same location in the left basal ganglia. CT=computed tomography.

2. Case report

A 60-year-old man presented with a sudden onset of right-sided weakness and headache in a county-level hospital. He had a history of hypertension, and computed tomography (CT) results

revealed a small hematoma in the basal ganglia, such that a conservative treatment approach was suggested. One day later, the patient went into a coma, during which his left pupil was dilated. CT results indicated an enlarged massive hematoma, and

Figure 2. Hematoma evacuation and aneurysm clipping via neuroendoscopy. (A) After opening the dura matter, the intracerebral pressure was very high, and the brain tissue bulged outward. (B) The hematoma was evacuated under the neuroendoscope. (C) After removal of the hematoma, an aneurysm was found at the M3 segment. (D) The proximal parent artery and corner of the aneurysm was revealed. (E) The distal parent artery and corner of the aneurysm was revealed. (F) Endoscopic clipping of the neck of the aneurysm and confirmation that there is no residual neck. (G) The body of the aneurysm is removed. (H) The parent artery of the aneurysm displays no parent vessel occlusion or normal vessel in the clip blades. (I) The intracerebral pressure decreased significantly, and the bulging tissue shrunk back into the dura matter after the operation.

Figure 3. Postoperative image obtained after neuroendoscopic surgery. (A) A CT scan shows that most of the hematoma was evacuated. (B) The location of the aneurysm clip. (C) The CT reconstruction shows the replacement of the skull bone flap, in the middle of which was a small hole corresponding to the puncture point of the first operation. (D) The diameter of the bone flap measured approximately 3 cm. (E) The aneurysm clip was located at the M3 segment. (F) The parent artery was unobstructed. (G) The first CT scan shows that the hemorrhage was in the left basal ganglia. (H) A postoperative CTA shows that the aneurysm clip was located at the M3 segment. (I) The melt picture shows that the aneurysm clip was correctly located at the first hemorrhage site. CT=computed tomography, CTA=computed tomography angiography.

emergency surgery using minimally invasive puncture and drainage was performed. Postoperative CT indicated that the hematoma was removed successfully, and the patient recovered consciousness. No cerebral angiography was performed due to the high risk factors for stroke and the typical location of the hematoma. However, on day 14 after surgery, the patient went into a coma again, and CT results showed resumed bleeding and a hematoma at the first bleeding site (Fig. 1A–E).

Subsequently, this patient was transported to our hospital; he was comatose with a Glasgow Coma Scale (GCS) reading of 5. His left pupil was dilated, and a cerebral angiography was not possible. An emergency craniotomy or neuroendoscopy was discussed, and his family selected the latter procedure. After the clot was evacuated, an aneurysm was discovered in the M3 segment of the MCA. The aneurysm was clipped using neuroendoscopy (Fig. 2A–I). After the operation, the patient's left pupil shrunk, his state of consciousness gradually improved, and his GCS rose to 7 prior to rehabilitation treatment. Postoperation imaging showed that most of the hematoma was evacuated (Fig. 3A–D) and indicated no parent vessel occlusion (Fig. 3E and F).

Written informed consent was obtained from the patient's daughter for the publication of this case report and the accompanying images. All procedures were approved by the ethics committee of Renmin Hospital of Wuhan University.

3. Discussion

Although cases of BGH are rarely related to aneurysms, due to concerns regarding hemorrhaging and significantly higher risks of re-bleeding, early detection and treatment are crucial.^[5] Historically, the best treatment has been craniotomy, whereby the clot can be evacuated and the aneurysm can be clipped at the same time. However, given the invasiveness of this procedure, the International Surgical Trial in Intracerebral Hemorrhage (STICH) concluded that early surgery provides no improved benefits compared to conservative BGH treatment.^[6]

Neuroendoscopic surgery, on the other hand, is minimally invasive and was reported to be safe and effective for BGH treatment; moreover, due to considerations regarding light intensity and visual-field augmentation, neuroendoscopic surgery

has been used solely to treat aneurysms in recent years.^[3,4] To date, only 5 cases of endoscopic clippings of MCA aneurysms have been reported in the English literature, and all of these aneurysms occurred at MCA bifurcations. Four of the 5 aneurysms presented with subarachnoid hemorrhaging, and one was accompanied by a middle fossa arachnoid cyst; none of the patients exhibited intracerebral hematoma.^[3,4] The case reported herein shows that an aneurysm originating from a distal MCA and accompanied by intracerebral hematoma can also be successfully treated using minimally invasive neuroendoscopic surgery.

The lack of a cerebral angiography before the operation resulted in the misdiagnosis of this patient's aneurysm, which may have led to disastrous results during the operation. Although this patient was very lucky, a much safer practice would be to make a clear diagnosis using cerebral angiography before surgical treatment is considered. Obviously, patients with high risks of underlying cerebrovascular anomalies should have extensive vascular evaluations.^[5] However, such evaluations are not performed routinely in cases of deep intracerebral hematomas, particularly in elderly patients with histories of hypertension.^[7] The study reported herein indicates that cerebral angiography is still necessary in the typical treatment of BGH patients.

Given that our patient had a history of hypertension, we also analyzed the relationship between the hemorrhage and the aneurysm. We combined the first CT scan and the postoperative computed tomography angiography (CTA); the results showed that the aneurysm clip was indeed located at the first hemorrhage site, providing further evidence that the hemorrhage came from the aneurysm. Thus, the relationship between the hemorrhage and the aneurysm was causal rather than parallel (Fig. 3G–I).

In one large case study that examined the autopsies of 144 patients with histories of hypertension, 36% of the autopsies revealed specific structural lesions that had led to intracerebral hematomas.^[8] Therefore, we conclude that cerebral angiography should be performed both before and after surgery in all intracerebral hematoma patients, regardless of their risks of cerebrovascular anomaly.

Author contributions

Conceptualization: qiang cai.

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