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Case Report

Nontraumatic aneurysm rupture following an endoscopic third ventriculostomy and ventricular drainage: Case report of a rare complication

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Abstract

Background: Although endoscopic third ventriculostomy is a safe procedure, the authors report a case of aneurysmal subarachnoid hemorrhage as an unusual and serious complication of an endoscopic third ventriculostomy and ventricular drainage.

Case Description: A 60-year-old male presented with obstructive hydrocephalus caused by midbrain tumors was admitted to our hospital. Endoscopic third ventriculostomy and external ventricular drainage were successfully performed. Two days after the operation, he became comatose, and a computed tomography (CT) scan revealed a diffuse subarachnoid hemorrhage. Emergency cerebral angiogram showed an aneurysm of the left internal carotid artery. Endovascular coil embolization of the ruptured aneurysm was then performed.

Conclusion: The rupture of the aneurysm may have been induced by excessive cerebrospinal fluid drainage after the endoscopic third ventriculostomy. Planning for intracranial endoscopic procedures should consider that rupture of an unknown previously unruptured aneurysm is a possible complication.

Key Words: Complication, endoscopic third ventriculostomy, obstructive hydrocephalus, subarachnoid hemorrhage, ventricular drainage

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INTRODUCTION

Endoscopic third ventriculostomy (ETV) is a well-established procedure for treating various forms of noncommunicating hydrocephalus.[2,6,11] The procedure has a high success rate and relatively low morbidity and mortality.[2,6] Although serious complications are uncommon, traumatic vascular injury may develop during the procedure.[1,8,10,11] We present a case of aneurysmal subarachnoid hemorrhage (SAH) after ETV and ventricular drainage, which is a quite uncommon and serious complication.

CASE REPORT

A 60-year-old male presented with slowly progressive drowsiness was admitted to our hospital. Magnetic resonance imaging (MRI) revealed an obstructive hydrocephalus caused by midbrain tumors [Figure 1a and b]. He had past history of a malignant lymphoma of the stomach, which had occurred 10 years earlier. ETV and an endoscopic biopsy were performed to treat the hydrocephalus and to confirm the histology of the tumor.

Operation

The operating sheath was inserted into the right lateral ventricle through a right-sided coronal burr hole. The endoscope was advanced into the third ventricle through the sheath and the foramen of Monro. The floor of the third ventricle was thin and translucent. Under continuous visual control, the biopsy forceps and a 4-French Fogarty balloon catheter were used to perforate and widen the stoma. The basilar tip and bilateral posterior cerebral artery were visible below the stoma, but there was no injury to these arteries. A biopsy was not performed because the tumor did not appear on the surface of the ventricle, but cerebrospinal fluid (CSF) cytology revealed malignant lymphoma cells. After some minutes of irrigation, no bleeding was confirmed, and external ventricular drainage was then inserted into the right lateral ventricle.

Postoperative course

The patient was in our intensive care unit with continuous monitoring of heart rate and blood pressure. His systolic blood pressure was stable in the range of 130–110 mmHg. He was drowsy, but did not exhibit confusion or other signs of significant pain. After the procedure, the initial level of ventricular drainage was 10 cm H_2O. About 220 ml of CSF was drained in the first day after surgery. The patient remained drowsy, but a computed tomography (CT) scan the day after the operation showed no abnormal findings except dilated lateral ventricles. The CSF continued to drain. Two days after the operation, we set the level of ventricular drainage to be the same as that on the first day. About 300 ml of CSF was gradually drained with about 16 h before the bleeding began. The patient suddenly became comatose, and the bloody CSF was rapidly drained immediately. An emergency CT scan revealed a diffuse SAH [Figure 2]. Cerebral angiograms demonstrated a saccular aneurysm of the left internal carotid-posterior communicating artery [Figure 3]. No other causes for the SAH were found. Endovascular coil embolization of the ruptured aneurysm was then performed, and the conditions of the patient gradually improved. Subsequently, he received systemic chemotherapy and irradiation for intracerebral malignant lymphomas. After a month of rehabilitation, he returned to his previous state of consciousness.

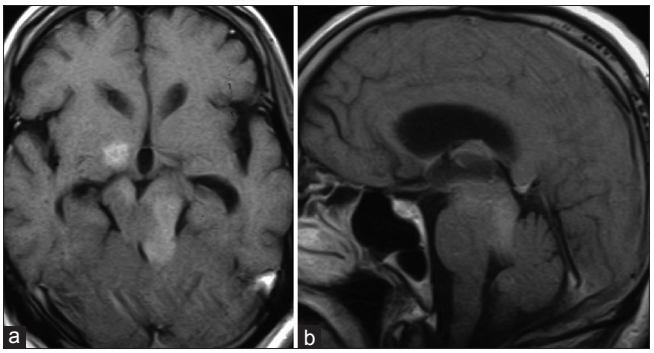

Figure 1: Preoperative enhanced MRIs (a: Axial, b: Sagittal) showing multiple tumors of the midbrain and obstructing hydrocephalus

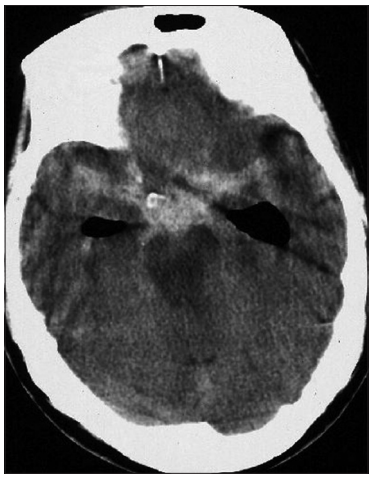

Figure 2: Plain CT 2-days after the procedures revealed a diffuse subarachnoid hemorrhage in the basal cistern

Figure 3: Lateral view of the left internal carotid angiogram demonstrating the aneurysm of the internal carotid-posterior communicating artery

DISCUSSION

Although the efficacy and safety of ETV is currently well accepted, several types of traumatic complications have been reported including basilar artery injury,

perforation of the anterior cerebral artery branch, massive intraventricular hemorrhage, and contusions of the thalamus and hypothalamus.[2,6,11] Furthermore, some authors have reported a fatal complication of ETV as SAH due to traumatic basilar aneurysm.[1,8,10] In the present case, the patient developed an aneurysmal SAH without any vascular injury during ETV. There is a possibility that continual ventricular drainage induced intracranial hypotension, which led to the hydrodynamic changes in CSF through the stoma of the third ventricle floor, or that these events may have been induced by the rupture of the aneurysm. To our knowledge, this is the first case in which the patient developed such unique and serious complications after ETV.

Intraaneurysmal pressure is equal to the systemic blood pressure. Transmural pressure can be defined as the difference between the blood pressure and the intracranial pressure.[3] Some reports have indicated that preoperative ventricular drainage may result in a higher risk of rebleeding in the case of SAH due to a ruptured cerebral aneurysm.[5,9] Increased intracranial pressure after SAH allows the diastolic arrest of hemorrhage and platelet aggregation at the rupture site; therefore, abrupt lowering of the intracranial pressure could lead to rebleeding.[3] In contrast, McIver *et al*. reported a rebleeding rate of only 4.4% in 45 patients with an external ventriculostomy after post-SAH acute hydrocephalus.[7] Furthermore, they concluded that moderate drainage pressure and early aneurysm surgery must be safe.

In the present case, we did not perform any preoperative assessment of the cerebrovascular vessels. Wardlaw and White reviewed prospective autopsy and angiographic studies, and indicated that between 3.6% and 6% of the population harbor an unruptured intracranial aneurysm.[14] Other studies have reported that the association rate of primary intracranial tumors and aneurysms have ranged from 0.33% to 0.7%.[4,13] Although these incidents are low, the rupture of an unknown unruptured aneurysm after intracranial surgery must be considered to be a possible complication.[12] We recommend careful management of ventricular drainage after ETV.

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