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Case Report

Nasal Bleeding from a Ruptured Aneurysm of the Internal Carotid Artery Treated with Endovascular Coil Embolization

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Summary

Nasal bleeding can be generally controlled with only intranasal treatment. However, bleeding from large vessels, such as maxillary and internal carotid arteries, is difficult to control only by intranasal treatment, and endovascular treatment is required. Especially nasal bleeding from a ruptured internal carotid artery aneurysm is extremely rare and requires urgent treatment. The patient visited our hospital for sudden nasal bleeding, but the bleeding spontaneously stopped when the patient was first seen. When the blood clot in the natural ostium of the left sphenoid sinus was inhaled at an outpatient situation, massive pulsatile bleeding occurred and continued. The venous route was secured, extracellular fluid was rapidly administered, and tracheal intubation was performed. With computed tomography and angiography examination, the patient was diagnosed with nasal hemorrhage secondary to a ruptured aneurysm in the left internal carotid artery, and the bleeding was controlled by placing endovascular stents and coil in the left internal carotid artery. From the experience of this case, if nasal bleeding occurs around the sphenoidal sinus ostium, clinicians should consider the possibility of nasal bleeding from a ruptured aneurysm of the internal carotid artery and the appropriate treatment should be managed after detailed examinations.

Key Words: angiography, endovascular stent, sphenoid sinus

Introduction

Nasal bleeding is a common disease that rhinologists frequently encountered in daily practice[1,2)]. In most cases, nasal bleeding can be treated with only an intranasal procedure; gauze packing and cauterization, and endoscopic nasal surgery for ligation of the sphenopalatine or anterior ethmoidal arteries[1,2)]. In contrast, when nasal bleeding occurs from the maxillary or internal carotid arteries, it is difficult to control with intranasal procedures alone and there is a risk of choking and great blood loss, therefore the bleeding must be controlled immediately[1,3)].

The internal carotid artery encircles the sphenoid sinus and can lead to fatal complications if damaged and occurred massive bleeding[1)]. Although iatrogenic internal carotid artery injury, by surgical excision of the sphenoid sinus bone wall, is comparatively common for

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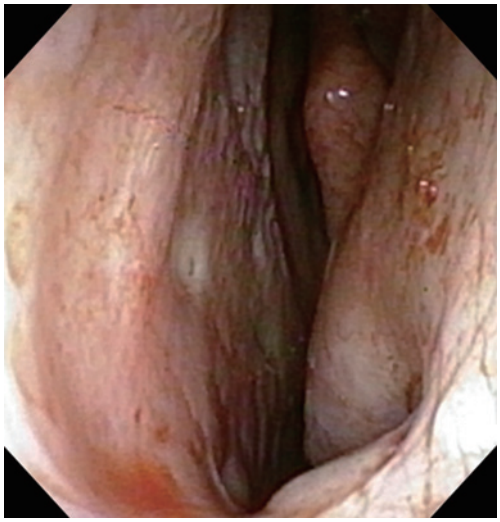

Figure 1 Endonasal image before massive nasal bleeding and treatment. Obvious bleeding points could not be identified.

otorhinolaryngologists, non-iatrogenic nasal bleeding from a spontaneously ruptured aneurysm in the internal carotid artery is extremely rare[3,4].

This manuscript describes the treatment progress of a patient with nasal bleeding from a ruptured aneurysm of the internal carotid artery. Informed consent for this article was obtained from a family member of the patient.

Case Presentation

The patient was a 70-years old man with high blood pressure, diabetes, and lung metastasis of pancreatic cancer who received only the best supportive care without chemotherapy. This patient experienced sudden nasal bleeding after breakfast and visited the emergency outpatient department. At the first visit, his consciousness was clear, his blood pressure was 111/70 mmHg, and lower brain nerve dysfunction was not observed. The nasal bleeding stopped temporarily during the first visit (Fig. 1). We planned to be hospitalized for follow-up and decided to perform intranasal observation to identify the source of the bleeding. When observing the nasal cavity using a rigid endoscope, a blood clot was found around the ostium of the left sphenoid sinus. After the removal of the blood clot by suction, massive bleeding suddenly occurred from the ostium of the left sphenoid sinus. Gauzes were inserted to control the bleeding; however, the bleeding continued, and his consciousness gradually became cloudy. To treat hemorrhagic shock, a venous route was immediately secured, extracellular fluid was rapidly administered, and the patient was intubated and supported by the mechanical ventilator.

A computed tomography was performed, and bone defects were detected in the posterior and superior walls of the left sphenoid sinus (Fig. 2). We considered that the internal carotid artery was exposed to the sphenoid sinus and that the bleeding originated from the internal carotid artery. We consulted the neurosurgery department and angiography was performed, which revealed an aneurysm in the left internal carotid artery in contact with the left sphenoid sinus and a contrast agent leak; the patient was diagnosed with nasal bleeding secondary to a ruptured aneurysm in the left internal carotid artery. Since the neck of the aneurysm was wide, it would be difficult to place a coil in the aneurysm and control the bleeding. To block the blood flow to the aneurysm, two intravascular stents were placed in the left internal carotid artery; contrast agent stagnation within the aneurysm was confirmed (Fig. 3). After this procedure, sedatives were administered with respirator assistance to prevent rebleeding due to body movement.

Nasal bleeding was observed again on day 9 of hospitalization before a withdrawal of sedation and tracheal intubation. The bleeding was temporarily stopped by compressing the left carotid artery from the body surface and inserting gauze into the nose, but nasal bleeding recurred at next day, and angiography was performed again. Contrast agent inflow to the aneurysm was confirmed, and we determined that nasal bleeding from the ruptured part of the aneurysm had recurred. When the left internal carotid artery was experimentally occluded, collateral blood flow to the feeding area of the left internal carotid artery was confirmed, and coiling embolization of the left internal carotid artery was performed without a bypass surgery (Fig. 4). Nasal bleeding did not recur after embolization of the internal carotid artery, and the patient no longer required respirator assistance on day 20 and was discharged on day 104.

Discussion

Nasal bleeding, mostly originating from the anterior

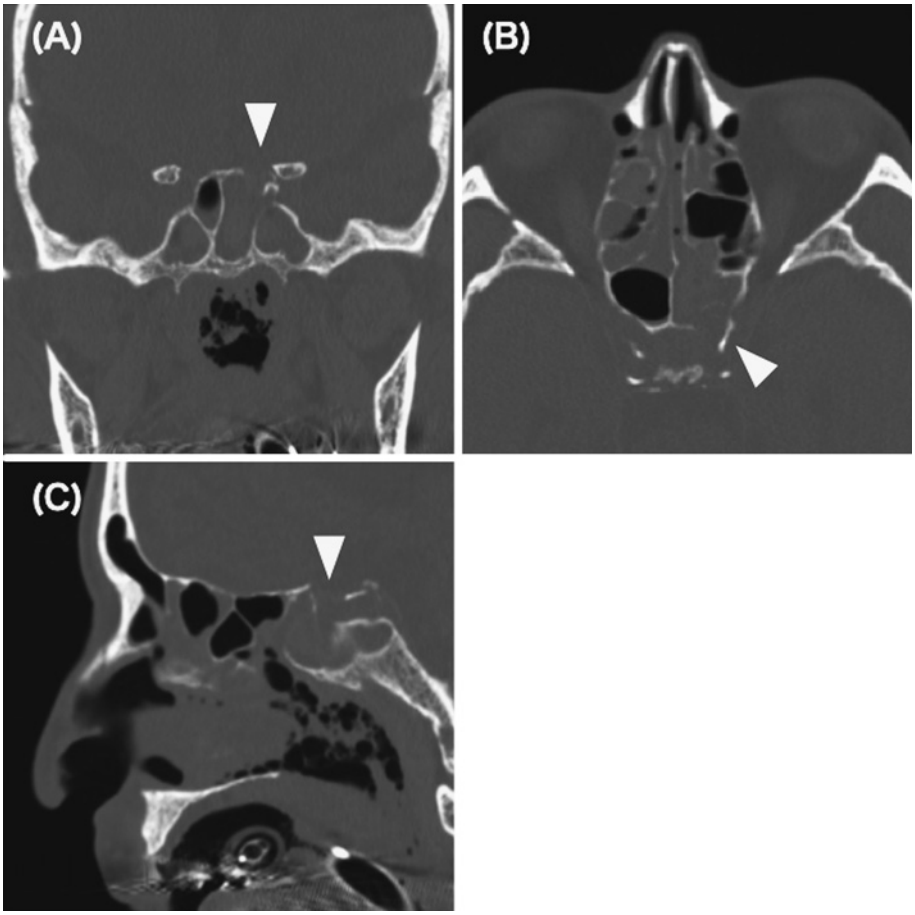

Figure 2 Computed tomography images before intravascular treatment.
(A) Coronal, **(B)** horizontal, and **(C)** sagittal slices.
Bone defects were observed in the posterior and superior walls of the left sphenoid sinus (arrowheads).

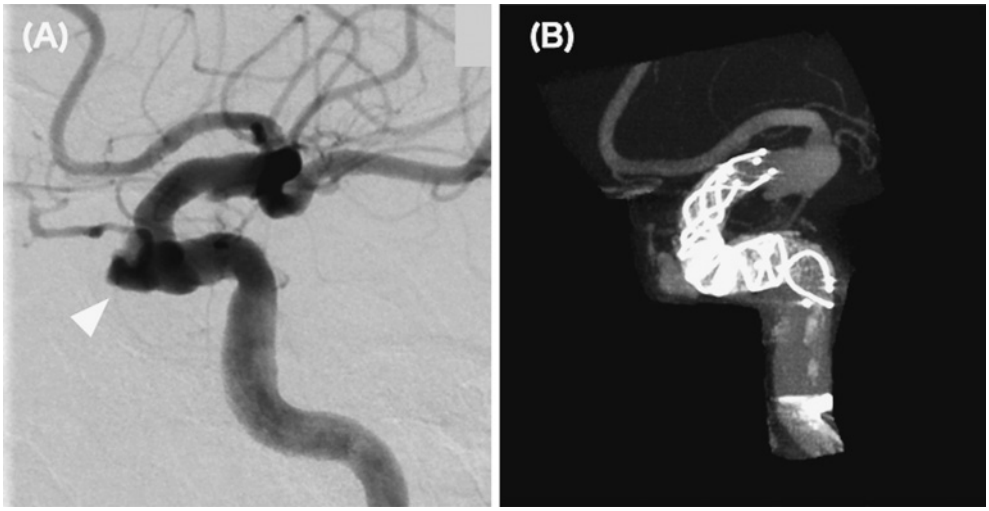

Figure 3 First angiography and stent placement.
(A) Aneurysm of the left internal carotid artery with contrast agent inflow was observed (arrowhead), and **(B)** Stents were placed to block blood flow to the aneurysm.

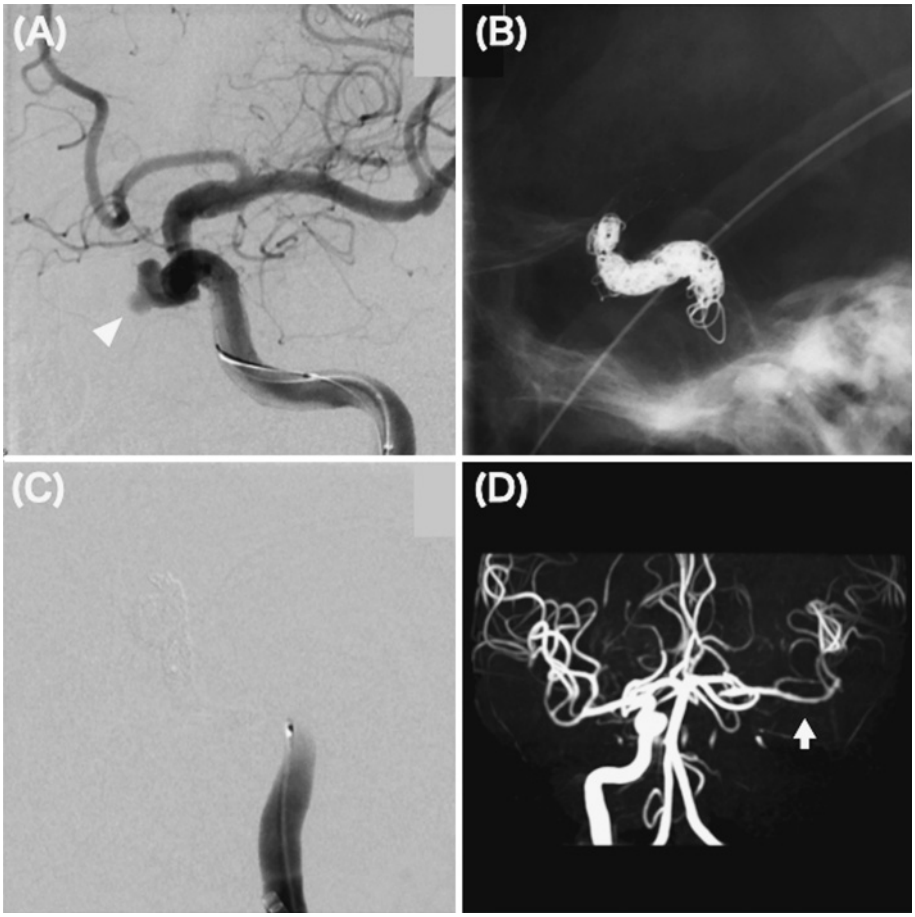

Figure 4 Second angiography and internal carotid artery embolization.
(A) Blood flow into the aneurysm was confirmed again (arrowhead), and the patient was diagnosed with a recurrence of nasal bleeding from the ruptured aneurysm. **(B)** and **(C)** After confirmation of collateral blood flow, coil embolization was performed in the left internal carotid artery. **(D)** Magnetic resonance angiography confirmed collateral blood flow in the feeding area of the left internal carotid artery after coil embolization (arrow).

nose, can be generally treated with gauze packing, mucosal cauterization, or ligation of the anterior ethmoidal and sphenopalatine arteries[1,2]. However, massive bleeding especially from the maxillary and internal carotid arteries, located in a deep area of the nose, is difficult to control only with intranasal procedures and requires other approaches[1,5]. The origins of massive hemorrhage are categorized into iatrogenic and non-iatrogenic injuries, and the urgency varies depending on these factors. Iatrogenic hemorrhage caused by vascular injury during general anesthesia surgery can be treated calmly because the patient is already tracheal intubated under sedative conditions[6]. In contrast, non-iatrogenic massive bleeding which happens in an unexpected situation, such as a ruptured aneurysm or arterial dissection, is difficult to manage because initial treatment should be performed under awake conditions[7].

Aneurysms are supposed to be caused by repetitive luminal forces and structural fragility and chronic inflammation of the blood vessel wall, but the natural history and mechanism of progression and rupture were not completely elucidated and remain controversial. Once a cerebral aneurysm ruptures, various symptoms occur depending on the site[8-10]. The middle cerebral arteries are the most common site of cerebral aneurysms[11], and the frequency of intracavernous internal carotid artery aneurysms is very low, accounting for only 1-2% of all cerebral aneurysms[4]. Moreover, nasal bleeding due to the rupture of cerebral aneurysms in the intracavernous internal carotid artery was extremely rare[4,9]. When a bony wall of sphenoid sinus defects from factors such as the large size of aneurysms, radiotherapy, infection or tumor[12], the rup-

ture of an internal carotid aneurysm leads to massive nasal bleeding, sometimes compromising the airway and leading to a life-threatening choke. When an internal carotid aneurysm ruptures and massive nasal bleeding occurs, not only intranasal packings but immediate interventions with neurosurgery and vascular surgery are required to control the bleeding[3,4]. To prevent unexpected massive bleeding due to procedures, physicians should consider the possibility of hemorrhage from a ruptured aneurysm of the internal carotid artery when seeing patients with nasal bleeding from around the sphenoid sinus. Before interventions, investigations were necessary to detect the origins of bleeding[7].

The Treatment of cerebral aneurysms is selected depending on the presence of a rupture and the aneurysm site assessed by computed tomography, magnetic resonance angiography, and radiographic angiography[8]. Unruptured cerebral aneurysms are prophylactically treated depending on many factors such as the patient's age, life expectancy, the risk of rupture, and complications attributed to treatment, but it remains still controversial when to determine the intervention[13]. In contrast, ruptured aneurysms require urgent treatment, including intravascular coil embolization, stent placement, arterial embolization, and craniotomy for direct clipping[3,4,9].

Direct clipping has a greater risk of rebleeding in ruptured intracranial aneurysms, so intravascular treatment has been available more recently[14]. Coil embolization of a cerebral aneurysm and stent placement in the internal carotid artery can block blood flow to the aneurysm while preserving blood flow to the parent artery. Arterial embolization can block blood flow to both a ruptured aneurysm and the parent artery. Coil embolization of an aneurysm is selected for aneurysms with a narrow neck, whereas stent placement is selected when aneurysms have a wide neck and are difficult for coil placement. Arterial embolization is generally selected when bleeding could not be controlled by coil embolization of an aneurysm or stent placement[3,4]. Because of its certainty, some physicians have stated that embolization of the parent artery is the best treatment method, but the treatment procedures were selected on a case-by-case basis and it might be difficult when should determine the coil embolization[9]. Once the parent artery was embolized, bypass surgery was considered to prevent cerebral ischemia; when collateral blood flow was confirmed in the area perfused by the occluded internal carotid artery, bypass surgery was needless and arterial embolization was performed alone[3,4]. In the present case, neurosurgeons firstly selected intravascular stent placement against a ruptured aneurysm because of the wide neck. However, when bleeding recurred, to completely block the blood flow of the aneurysm, internal carotid artery embolization was performed alone after confirming collateral blood flow and could course without recurrence.

Author Contributions

Hikaru Sakamoto and Keisuke Miyashita faced this patient and wrote the original graft.

Kosuke Tochigi designed figures and adjusted the graft.

Yasuhiro Tanaka finally revised the manuscript.

Conflict of interest

There is no conflict of interest in all authors associated with this case report.

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