Symptomatic Inferior Cavernous Sinus Artery Aneurysm Associated With Cerebral Arteriovenous Malformation

—Case Report—

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Abstract

A 50-year-old man presented with a symptomatic aneurysm arising from the right inferior cavernous sinus artery (ICSA) associated with a cerebral arteriovenous malformation (AVM) manifesting as a 3-month history of progressive right abducens nerve palsy. Cerebral angiography demonstrated a high-flow AVM and a saccular aneurysm arising from the right ICSA acting as a meningeal feeder. The symptom was thought to be attributable to aneurysmal mass effect rather than the AVM. The aneurysm was successfully treated with endovascular embolization and the symptom improved gradually. Hemodynamic stress in the ICSA may have resulted in the development of the aneurysm of the ICSA. Meningeal artery aneurysm presenting with cranial nerve palsy is extremely uncommon. The present case illustrates the need for detailed evaluation of the external carotid artery and internal carotid artery vasculature in patients with cerebral AVMs.

Key words: cerebral aneurysm, cerebral arteriovenous malformation, mass effect, meningeal artery

Introduction

Cerebral arteriovenous malformation (AVM) is associated with aneurysm in 2.7–51.5% of cases,³⁾ and meningeal arteries feed the cerebral AVM in 50% of these cases.⁴⁾ On the other hand, aneurysms involving a meningeal feeder of a cerebral AVM are extremely rare. We report a case of a symptomatic aneurysm arising from a meningeal artery feeding a cerebral AVM.

Case Report

A 50-year-old man presented with a 3-month history of progressive right abducens nerve palsy. Magnetic resonance imaging revealed a diffuse AVM in the right cerebral hemisphere. Cerebral angiography demonstrated a huge AVM supplied by feeders from the right middle, right posterior, and bilateral anterior cerebral arteries. Right internal carotid angiography revealed a saccular, posteriorly-directed aneurysm at the intracavernous portion of the inter-

nal carotid artery (ICA) (Fig. 1A). Selective right external carotid angiography showed an enlarged right accessory meningeal artery (AMA) sequentially filling the aneurysm, the right ICA intracavernous portion, and the AVM (Fig. 1C). External carotid an-

Fig. 1 A: Right internal carotid angiogram showing a huge frontoparietal nidus fed by the right middle and anterior cerebral arteries, and a saccular aneurysm at the cavernous portion (arrow). B, C: Selective right external carotid angiograms demonstrating the same aneurysm more clearly (arrow) (B), and the enlarged right accessory meningeal artery sequentially filling the aneurysm and the intracavernous portion of the right internal carotid artery (C).

Fig. 2 Postoperative right internal carotid (A) and external carotid angiograms (B) showing the aneurysm and the proximal portion of the accessory meningeal artery embolized with coils.

giography demonstrated the aneurysm more clearly than internal carotid angiography (Fig. 1B). We postulated that the aneurysm arose from the right inferior cavernous sinus artery (ICSA), which had an anastomosis with the AMA, and that the symptom was attributable to the aneurysmal mass effect rather than the AVM. Therefore, endovascular treatment of the aneurysm was scheduled. Superselective catheterization of the aneurysm failed due to the tortuosity of the right AMA, so the aneurysm was embolized via the right ICA. Proximal occlusion of the right AMA was also performed.

The postoperative course was uneventful and the symptom improved gradually. Cerebral angiography obtained at 6-month follow-up examination confirmed stable embolization of the aneurysm (Fig. 2).

Discussion

The ICSA arises from the horizontal segment of the intracavernous portion of the ICA and passes above the abducens nerve.¹⁾ This artery is also called the inferior lateral trunk or lateral artery of the cavernous sinus. The ICSA supplies the dura of the lateral wall of the cavernous sinus and anastomoses with the AMA (Fig. 3A).²⁾ This anastomosis connects the ICA and external carotid artery (ECA) systems, and such extracranial-intracranial anastomoses are often involved in cerebral AVMs as meningeal feeders.⁴⁾ In our case, the blood flow in the ICA was increased to supply the huge AVM, and resulted in the steal phenomenon from the ECA system via the anastomosis between the ICSA and the AMA, leading to formation of an anastomotic channel between these vessels and an indirect meningeal arterial contribution to the AVM (Fig. 3B). Under these conditions, the anastomotic channel between the ICSA and the

Fig. 3 Proposed scheme of blood supply. A: The inferior cavernous sinus artery (ICSA) supplies the dura and anastomoses with the accessory meningeal artery (AMA). B: Blood flow augmentation in the internal carotid artery to supply the arteriovenous malformation (AVM) results in the steal phenomenon from the external carotid artery system via the anastomosis between the ICSA and the AMA. C: The anastomotic channel between the ICSA and the AMA enlarges and consequent hemodynamic stress causes the aneurysm of the ICSA.

AMA may have continued to enlarge and the consequent hemodynamic stress may have resulted in the development of the aneurysm of the ICSA (Fig. 3C). The present case illustrates the need for detailed evaluation of the ECA and ICA vasculature in patients with cerebral AVMs.

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