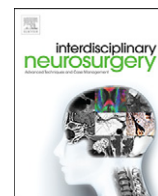


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Case Report & Case Series

Infarction of the entire corpus callosum as a complication in subarachnoid hemorrhage: A case report



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ABSTRACT

The corpus callosum is the major commissural pathway connecting the cerebral hemispheres. This pathway receives its blood supply from anterior communicating artery, pericallosal artery, and posterior pericallosal artery. However, in some cases, the entire corpus callosum is supplied by median callosal artery; thus, occlusion of this artery can lead to infarction of the entire corpus callosum. Few reports have described this type of infarction, and no reports after subarachnoid hemorrhage (SAH) exist. Here, we report on a 42-year-old female who was diagnosed with SAH after two aneurysms were discovered in bifurcation of left anterior cerebral artery (A1-A2). After successful clipping was performed, the patient was alert and had no neurological deficits; moreover, the computed tomography images that were acquired after the operation showed no evidence of infarction. Nine days after admittance to the hospital, drowsiness and weakness of the left limbs with brain swelling appeared and decompressive hemi-craniectomy was performed. Diagnostic cerebral angiography revealed vasospasms in both anterior and middle cerebral arteries, thus fasudil hydrochloride was administered intra-arterially. While blood flow in all arteries improved, diffusion-weighted magnetic resonance imaging detected infarction along the entire length of the corpus callosum and in the medial region of the right frontal lobe. We believe this infarction was due to secondary ischemia of median callosal artery. This case reminded us of the anatomical variation wherein median callosal artery is the sole blood supply line for the corpus callosum and demonstrated that infarction of the entire corpus callosum is possible.

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1. Introduction

The corpus callosum is the major commissural pathway connecting the cerebral hemispheres that receives its blood supply from anterior communicating artery, pericallosal artery, and posterior pericallosal artery. However, in some cases, the entire corpus callosum is supplied by median callosal artery; thus, occlusion of this artery can lead to infarction of the entire corpus callosum.

2. Case report

A 42-year-old female presented with sudden-onset headache. Subarachnoid hemorrhages in the sylvian fissure and posterior cranial fossa were identified on computed tomography (CT) images that were acquired upon admission. Diagnostic cerebral angiography demonstrated two inferiorly facing aneurysms in the bifurcation of left anterior cerebral artery (A1-A2), with diameters of 2.5 mm and 3 mm, respectively.

Neck clipping was performed using the left pterional approach, and the aneurysms were treated by applying three clips. After the procedure, the patient was alert and showed no signs of any neurological deficits; the CT images acquired the day after the operation and six days after the operation showed no evidence of re-rupture or infarction. Eight days after admittance to the hospital, she showed disturbances of consciousness and hemiparesis of the left side, which worsened over the next two days, and she showed anisocoria on her left eye. CT images revealed swelling in the left hemisphere and a left to right midline shift with 10 mm of septum pellucidum shift that was possible for the cause of disturbances of consciousness and anisocoria on left eye and emergent decompressive hemi-craniectomy was performed. After the operation, the patient's consciousness disturbances improved, however they reappeared the day after decompressive hemi-craniectomy. As hemiparesis of the left side remained after decompressive hemi-craniectomy without any improvement, infarction from vasospasm was possible for the cause of this hemiparesis and diagnostic cerebral angiography was performed. Diagnostic cerebral angiography revealed vasospasms in both anterior and middle cerebral arteries, thus we intra-arterially administered fasudil hydrochloride from both of the internal carotid arteries, and the blood flow in the anterior cerebral

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arteries (ACAs) and middle cerebral arteries improved. As vasospasm was detected in the anterior circulation and the symptom was hemiparesis of the left side, assessment of the posterior cerebral arteries was not performed. The pre-operative angiography showed both of the ACAs from the left internal carotid artery, but the angiography performed on admission of fasudil hydrochloride showed only the left ACA from the left internal carotid artery, indicating the presence of disturbance of blood flow in the AcoA. Diffusion-weighted (DW) magnetic resonance imaging (Fig. 1) detected infarction of the entire length of the corpus callosum and medial region of the right frontal lobe. After cranioplasty and placement of the lumboperitoneal shunt, the patient was discharged to a rehabilitation hospital. At discharge, the patient showed moderate bilateral hemiparesis, however she was able to grip objects with both right and left hand, wiggle her toes on her right foot, swallow Jell-O, and engage in simple conversations.

3. Discussion

The corpus callosum is the major commissural pathway connecting the cerebral hemispheres of the human brain. It receives its blood supply from three main arterial systems: the anterior communicating artery, pericallosal artery, and posterior pericallosal artery. Most of the blood supply comes from the pericallosal and posterior pericallosal arteries, which are branches of the anterior and posterior cerebral arteries, respectively. As multiple arteries supply the corpus callosum with blood, infarction of the entire corpus callosum is rare. However, in

some people, the subcallosal artery or median callosal artery is the main blood supply for the corpus callosum. Several reports have described patients with infarction of the entire corpus callosum, however the infarction due to median callosal artery have not been reported [1, 2]. The subcallosal artery and median callosal artery arise from the AcoA. According to a microsurgical anatomical study by Türe et al. [3], the subcallosal artery is a major blood supply contributor for the medial portions of the rostrum and genu. The median callosal artery follows the same course as the subcallosal artery but also supplies blood to the body and splenium of the corpus callosum. Moreover, it supplies the medial regions of the frontal and parietal lobes with blood. There are two anatomical variations of the median callosal artery, namely the classical and hemispheric types. In the classical type, the artery terminates at a point along the body or splenium of the corpus callosum, or joins with the posterior pericallosal artery at the splenium. In the hemispheric type, the median callosal artery supplies most of the blood for the rostrum, genu, and body of the corpus callosum, as well as the medial regions of the frontal and parietal lobes. These anatomical findings indicate that infarction of the entire length of the corpus callosum can occur when the hemispheric type of median callosal artery is occluded.

In our patient, infarction of the entire length of the corpus callosum and medial region of the right frontal lobe was detected by diffusion-weighted magnetic resonance imaging. Because there were no signs of infarction on the post-operative CT images and the patient was showing no neurological deficit, this event was not the result of direct obstruction of the blood flow by the clips during the aneurysm treatment. The

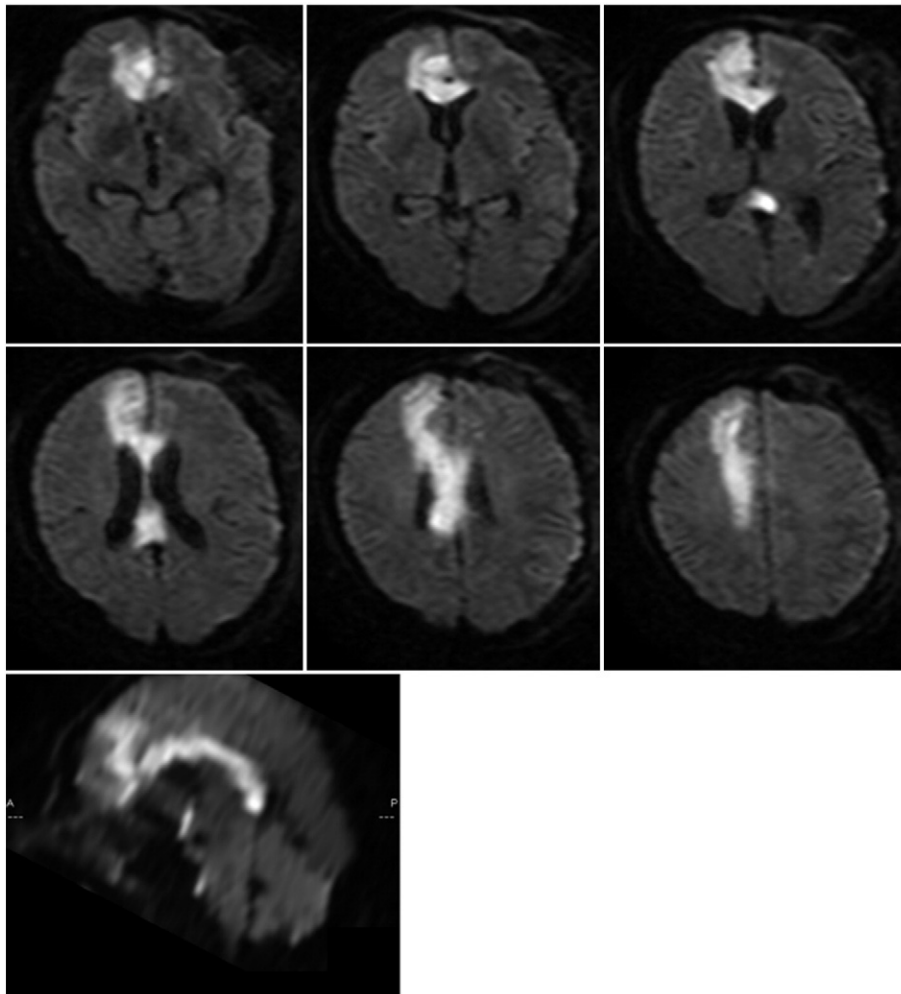


Fig. 1. Diffusion-weighted magnetic resonance images in the axial (top and middle) and sagittal (bottom) planes in which infarction of the entire length of the corpus callosum and medial aspect of the right frontal lobe can be detected.

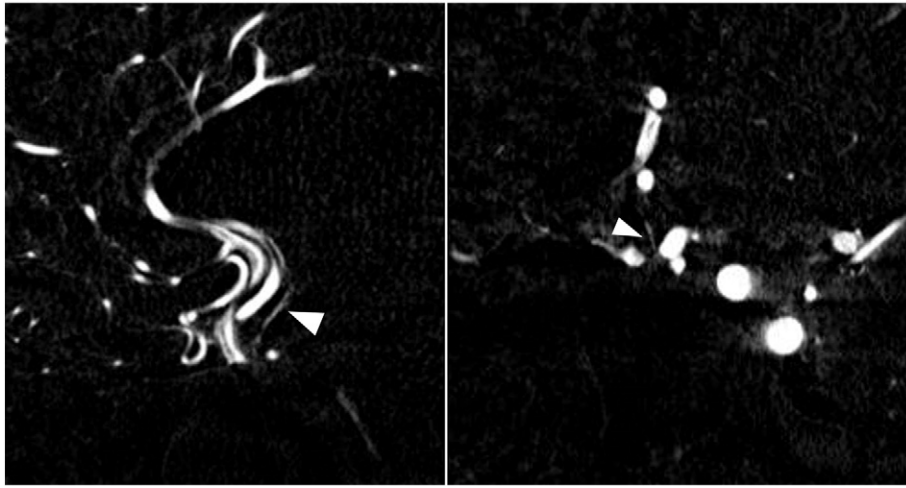


Fig. 2. Right: Sagittal image of pre-operative angiography from left carotid artery. Arrow head represents median callosal artery. Left: Coronal image of pre-operative angiography from left carotid artery. Arrow head represents median callosal artery. The artery arises from AcoA.

diagnostic cerebral angiography performed after occurrence of neurological deficit revealed the possibility of disturbance of the blood flow in the AcoA. Diagnostic cerebral angiography acquired upon admission showed an artery that runs along the anterior cerebral arteries from AcoA. (Fig. 2) These findings suggested that the patient had hemispheric type of median callosal artery from AcoA as the main blood supply for the entire length of the corpus callosum and secondary ischemia of this artery led to the infarction of the entire corpus callosum. The cause of the secondary ischemia is uncertain, however it can be predicted that vasospasm on AcoA or disturbance of the blood flow due to brain swelling might have caused this ischemia.

4. Conclusion

In sum, this case reminded us of the anatomical variation wherein the median callosal artery is the sole blood supply line for the corpus callosum. Importantly, this case demonstrated that infarction of the entire length of the corpus callosum due to secondary ischemia of the median callosal artery is possible in patients with SAH.

Conflict of interest

The authors declare that they have no conflict of interest.

Informed patient consent

The patient has consented to submission of this case report to the journal.

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