Uncertainty of Axillary Artery Perfusion During Surgery for Acute Aortic Dissection

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We treated a patient with acute aortic dissection, which affected the innominate and carotid arteries. Although the true lumen was adequately wide and cerebral malperfusion deemed unlikely, extracorporeal circulation through the femoral artery caused right cerebral malperfusion, and addition of right axillary artery perfusion was ineffective. Several minutes after innominate artery snaring, cerebral blood flow was suddenly restored and the clinical outcome was favorable. Axillary artery perfusion is occasionally unreliable and inevitably demands careful cerebral flow monitoring. A dead-end false lumen in the innominate and carotid arteries requires special caution. A dual-artery perfusion strategy permits innominate artery occlusion as an emergency measure against unexpected malperfusion.


Comment

Cerebral malperfusion, even only during cooling or rewarming, may result in a dismal outcome. That appeared unlikely to occur in our patient before surgery as the true lumen of the innominate and carotid arteries was not at all stenotic, and there was scant blood flow in

A 72-year-old woman with a small build had sudden severe back pain, and was diagnosed with AAD and cardiac tamponade. Although imaging studies disclosed a bilateral carotid artery dissection, the true lumen of the innominate and right common carotid arteries had adequate width, and no flow was detected in the false lumen (Fig 1). The patient underwent an emergency operation. Because the right carotid artery was unavailable owing to a central venous catheter previously placed in the right jugular vein, a 16F perfusion cannula was initially placed in the right femoral artery. Immediately after initiation of cardiopulmonary bypass (CPB), the regional oxygen saturation (rSO₂) value of the right cerebral hemisphere disproportionately fell from 68% to 46% (Fig 2) and then rapidly recovered after cessation of CPB. Next, a 12F cannula was additionally placed in the right axillary artery, and we resumed CPB using both arteries for inflow. However, the right cerebral rSO₂ value fell again and remained low even after the innominate artery was occluded using a silicone elastomer loop. Several minutes later, the rSO₂ value of the right side rapidly elevated to a value higher than that of the left, although the exact mechanism of this recovery was unclear. The CPB was continued with the innominate artery kept snared, and the patient was cooled down to deep hypothermia. A large intimal tear was found in the ascending aorta. After a vascular prosthesis was anastomosed to the distal part of the ascending aorta, perfusion was resumed through the graft, and the rSO₂ value remained stable thereafter. The patient regained consciousness 4 hours later, and the postoperative course was uneventful. In follow-up examinations, the false lumen of the innominate artery and right carotid arteries eventually shrunk.

Fig 1. (A) Dissection affected the bilateral common carotid arteries. The false lumen of the right carotid artery was not opacified and the true lumen was not stenotic. (B) No significant flow was detected in the false lumen of the right carotid artery, whereas there was sufficient flow in the true lumen. A central venous catheter was placed in the right jugular vein (arrow).
Moreover, in patients with carotid artery obstruction, thrombi may exist in the true lumen, and simple flow restoration through the axillary artery can be hazardous [5]. If AAD obviously affects the innominate or carotid artery, direct carotid artery cannulation may be the method of choice.

The false lumen. However, perfusion through a femoral artery (16F) caused right cerebral malperfusion. Surprisingly, addition of right axillary artery perfusion (12F) was ineffective, and malperfusion persisted even after innominate artery occlusion, putting this patient at great risk. Nevertheless, the clinical outcome was not affected because right cerebral blood flow was restored several minutes later, although the exact mechanism of that remains unknown. Moreover, tight snaring or clamping of a dissected artery may cause another vascular injury and is not an optimal maneuver [1].

Our patient had a small build, and the size of the arterial cannula was determined in proportion to both arteries. Therefore, the true cause of malperfusion in this case was a pitfall of the CPB strategy. Although right axillary arterial perfusion has recently been advocated during surgery for AAD, and some even claim that a very small cannula is acceptable for the axillary artery [2], that is not always the case. In contrast, axillary artery perfusion is not reliable, and cerebral rSO2 monitoring is indispensable even in the absence of critical findings, such as seen with the present patient. A dead-end false lumen in the innominate and carotid arteries requires special caution because CPB flow may expand it to cause cerebral malperfusion. Innominate artery occlusion can be an effective emergency measure in some cases in which a dual artery perfusion strategy is adopted.

There is a growing body of evidence showing that perfusion through the axillary artery can cause cerebral malperfusion [1, 3, 4]. Moreover, in patients with carotid artery obstruction, thrombi may exist in the true lumen, and simple flow restoration through the axillary artery can be hazardous [5]. If AAD obviously affects the innominate or carotid artery, direct carotid artery cannulation may be the method of choice.

References


Unexpected Cause of Cyanosis and Dyspnea in an Adult: Direct Communication of the Right Pulmonary Artery and Left Atrium

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Direct communication of the right pulmonary artery and the left atrium is an extremely rare congenital malformation of the pulmonary vasculature. A 41-year-old woman with a history of cyanosis since childhood presented with mild exertional dyspnea. On physical examination, she had central cyanosis, clubbing of the fingers, and an upright position caused by orthodeoxia. Imaging studies showed a very large aneurysm in the distal right pulmonary artery with a direct communication to the left atrium. The patient underwent successful repair, with resolution of hypoxia and exertional symptoms.

Accepted for publication Aug 8, 2013.
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Direct communication of the right pulmonary artery and left atrium is an extremely rare congenital malformation of the pulmonary vasculature. Clinical presentation varies from vague symptoms to death in the neonatal period, and diagnosis in adulthood is uncommon. We present a case involving this anomaly and details of the surgical repair.

A 41-year-old woman who was a mother of 2 children with a history of cyanosis since childhood presented with mild