

## Acute Aortic Dissection with New Massive Cerebral Infarction —A Successful Repair with Ligature of the Right Common Carotid Artery—

Yasuhisa Shimazaki, MD, Takashi Minowa, MD, Takao Watanabe, MD,  
Masataka Koshika, MD, Hideshi Toyama, MD, and Kiyoshige Inui, MD

**It remains unclear whether or not the infarcted brain caused by aortic dissection should be reperfused when an emergency operation is needed for aortic arch dissection. A 64-year-old woman presented with severe back pain and syncope with a sudden left hemiplegia. CT scan demonstrated an aortic dissection of the entire aorta, obstruction of the right common carotid artery by extended aortic dissection, cerebral infarction of the right middle cerebral artery territory, brain edema and pericardial effusion. Though she was unable to communicate with us, she underwent an emergent aortic arch replacement and ligature of the right common carotid artery nine hours after the onset of stroke, when massive cerebral infarction was established. She survived the operation and regained full consciousness. When brain infarction was established by extended aortic dissection in emergent aortic surgery, concomitant ligature of the responsible artery to the brain infarction may be allowed for avoiding cerebral damage leading to brain death. (Ann Thorac Cardiovasc Surg 2004; 10: 64–6)**

**Key words:** type A acute aortic dissection, cerebral infarction, ligature of the right common carotid artery, arch replacement

### Introduction

Massive cerebral infarction due to obstruction of the common carotid artery by extended acute aortic dissection is rare,<sup>1,2)</sup> and when a patient with the above complication was medically managed, the patient would usually die of brain damage<sup>3)</sup> or of rupture of the aorta.<sup>2)</sup> Though cardiopulmonary bypass would magnify the brain edema,<sup>4)</sup> stroke should not be a contraindication to operation for aortic dissection.<sup>5)</sup> Other studies demonstrated that thrombolytic therapy for ischemic stroke should be done within the first three hours after onset of stroke, otherwise, severe brain damage due to reperfusion would occur.<sup>6-8)</sup> Surgical strategy may depend on the time from onset of stroke in this otherwise life-threatening disease. We report a patient with acute aortic dissection and new left hemiplegia who emergently underwent aortic arch replacement

*From Second Department of Surgery, Yamagata University School of Medicine, Yamagata, Japan*

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Address reprint requests to Yasuhisa Shimazaki, MD: Second Department of Surgery, Yamagata University School of Medicine, 2-2-2 Iida-nisi, Yamagata 990-9585, Japan.

and ligature of the right common carotid artery. Although the cerebral infarction had been established at the time of operation, lethal edema or hemorrhage did not develop in the brain after surgery. The procedure reported herein would offer a surgical alternative on this lethal condition.

### Patient

A 64-year-old woman experienced severe back pain, soon and after visited a local hospital at 7:00 in the morning. Ten minutes later, she lost consciousness with convulsions and developed left hemiplegia. A computed tomographic (CT) scan taken immediately after the onset showed an acute dissection of the entire aorta (Fig. 1), but a head CT scan did not demonstrate any abnormal lesion in the brain. Her consciousness improved a little, but she did not communicate with others. She was referred to us that afternoon for further examination and treatment, and her consciousness had not improved. The right radial arterial pulse was not palpable. A repeated CT scan at 13:00 on the same day showed massive cerebral infarction of the right middle cerebral artery territory with brain edema (Fig. 2), occlusion of the right common ca-

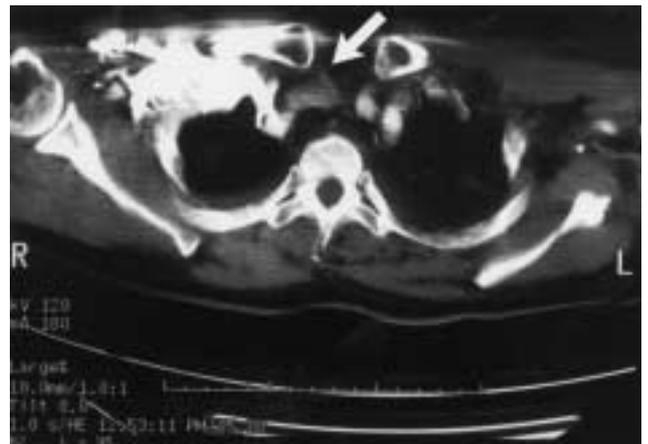


**Fig. 1.** Preoperative CT scan demonstrating aortic dissection.

rotid artery by extension of the aortic dissection (Fig. 3) and pericardial effusion. These findings suggested that the right internal carotid artery was completely occluded, too. Echocardiography showed moderate aortic regurgitation. Blood pressure was medically controlled, but the central venous pressure was increasing, suggesting cardiac tamponade and an increasing risk of rupture of the aorta. She still did not communicate with us. Since cerebral infarction of the right middle cerebral artery territory had been already established after six hours from the onset of stroke, we thought that ligation of the right carotid artery would not result in further extension of brain infarction and edema, and that it would prevent cerebral hemorrhage and edema due to reperfusion. Her family understood the above and agreed to surgical intervention for aortic dissection and ligation of the right carotid artery as a life saving procedure. An emergency operation was done at 16:00 on the same day when she developed aortic dissection. The right atrial pressure was 18 mmHg in the operating room. Aortic dissection was extended into the right and left common carotid arteries, and a small tear was found at the distal aortic arch just after the origin of the left subclavian artery. The right common carotid artery was cross-clamped before heparin was given. An arterial inflow was made in the left axillary artery with an 8 mm graft, and cardiopulmonary bypass was established. The aortic cusps were re-suspended and the aortic root was re-approximated with gelatin-resorcine-formol glue. The ascending aorta and aortic arch were replaced with a 24 mm branched graft by using an elephant trunk method under hypothermic selective cerebral perfusion except for the right common carotid artery



**Fig. 2.** Preoperative CT scan demonstrating cerebral infarction of the right brain.



**Fig. 3.** Preoperative CT scan showing occlusion of the right common carotid artery (arrow).

that was finally ligated. The truncus brachiocephalicus, and left common carotid and subclavian arteries were reconstructed with branches of the graft, separately. The patient survived the operation, and postoperative head CT scan of the next operative day showed no hemorrhage in the brain and the infarction had not increased in size. The endotracheal tube was extubated on the third postoperative day. Her consciousness improved with time and finally became clear. She was discharged with left hemiplegia.

## Comment

In this case, massive cerebral infarction had been already established when the patient came to us, and more than six hours had passed from the onset of stroke. Therefore, reperfusion to the infarcted brain would not be indicated at that time, because reperfusion may have resulted in brain hemorrhage or increased brain edema. The patient developed cardiac tamponade and was at risk of aortic rupture. Therefore, we decided to operate on this patient and not to perfuse the infarcted brain during and after the operation, and the right common carotid artery was occluded.

There are some reports describing ischemic stroke caused by extended aortic dissection to the common carotid artery.<sup>1-3,9)</sup> Cambria et al. described a strong correlation between stroke and carotid artery obstruction and a significant stroke-related mortality rate.<sup>10)</sup> They reported that six of the seven patients with preoperative profound neurological deficit with acute dissection died of brain damage after aortic repair and the remaining patient deteriorated neurologically.<sup>10)</sup> On the other hand, Fann et al. reported that in seven patients with acute aortic dissection and new stroke, one died of brain injury immediately after repair of the aortic dissection and two had persistent neurological deficits and died within four months after the operation. The remaining four patients showed improvement in their neurological symptoms after operation.<sup>9)</sup> Carrel et al. also reported in their experience in 13 operated patients, that only one died of cerebral injury, one worsened, four with hemiplegia and seven had rapid improvement of neurological symptoms after the operation.<sup>2)</sup> However, both reports failed to identify any specific individual factors to predict favorable or unfavorable outcome, and they did not describe at all whether the cerebral infarction was established or not at the time of operation and when the operation was done. Fann et al. included patients with acute dissection within 14 days from the onset of aortic dissection, and Carrel et al. included those within seven days in their reports.<sup>2,9)</sup> These reports, therefore, did not show surgical strategy for aortic dissection and concomitant cerebral infarction in the very acute phase.

Recent studies of thrombolytic therapy for acute ischemic stroke showed that reperfusion to the ischemic region of the brain should be done within the first three hours from the onset of stroke.<sup>6,7)</sup> These results suggested that time from the onset of stroke to the operation (reconstruction of the carotid artery) should be an important factor to predict the patient's outcome and to indicate the

surgical strategy. The occluded common carotid artery by extension of aortic dissection may not be always continuously obstructed but may be re-opened early although symptoms were not improved. If the innominate artery or a common carotid artery is obstructed at its origin, collateral flow from the other carotid artery probably maintains brain viability.<sup>5)</sup> Therefore, it should be important to re-evaluate whether the cerebral infarction was established or not at the time of repair for aortic arch dissection. If cerebral infarction was not established, the obstructed common carotid artery may be reconstructed, but if established, it may not be done.

In conclusion, ligation of the one common carotid artery may be justified when acute aortic dissection urges emergency aortic surgery and new brain infarction was established by obstructed carotid artery. The procedure reported herein would offer a surgical alternative on this lethal condition.

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