» **Case Report** «

A Case of Dissection and Rupture of the Innominate Artery in Acute Type A Aortic Dissection

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We report the case of a 59-year-old male presenting with dissection and rupture of the innominate artery with acute type A aortic dissection. We performed total arch replacement via median sternotomy with extension into the right side of the neck. The innominate artery was reconstructed just proximal to the bifurcation of the right subclavian artery and common carotid artery using the 1st limb of a 4-branched graft. This case illustrates an unusual aspect of an isolated innominate artery rupture in the absence of aortic rupture in acute type A aortic dissection.

Keywords: aortic dissection, aneurysm

Introduction

Innominate artery rupture is uncommon, and its common causes are either innominate artery aneurysm¹⁾ or injury after blunt trauma.²⁾ Although innominate artery dissection commonly occurs in type A aortic dissection, simultaneous innominate artery rupture is extremely rare.³⁾ We present a case of successful treatment for innominate artery dissection and rupture in acute type A aortic dissection.

Case

A 59-year-old man with chest pain was referred to our hospital for the management of acute type A aortic dissection. Physical examination revealed a blood pressure of 82/56 mmHg and a heart rate of 92 beats/min. Enhanced computed tomography (CT) showed acute type A aortic dissection with the dilatation of the false lumen of the

innominate artery and hematoma of the mediastinum (Fig. 1). There were no clinical signs of cerebral malperfusion. An emergency operation was performed under the diagnosis of acute type A aortic dissection complicated with dissection and rupture of the bottom of the innominate artery. Under general anesthesia, midline sternotomy with an extended incision along the medial border of the right sternocleidomastoid muscle was performed. Following systemic heparinization, cardiopulmonary bypass (CPB) was established by double direct cannulations of the right axillary artery and the femoral artery with bicaval drainage. Under the circulatory arrest at a bladder temperature of 22°C, the ascending aorta and the innominate artery was opened. The false lumen of the innominate artery was dilated and ruptured. Although the dissection extended to the proximal portion of the bifurcation between the right common carotid artery and the right subclavian artery, we judged isolated reconstruction of the innominate artery was possible at the level proximal to its bifurcation. A large and latitudinal intimal tear was identified between the orifice of the innominate artery and that of the left common carotid artery in the aortic arch. Selective antegrade cerebral perfusion was established by clamping the innominate artery just proximal to its bifurcation and inserting the balloon catheters into the left common carotid artery and left subclavian artery, individually. Following the elephant trunk technique to reconstruct the distal stump of the aorta, distal anastomosis was performed using a 4-branched graft (J graft, Japan Lifeline, Tokyo, Japan). The left subclavian artery and the left common carotid artery were individually reconstructed. And then, the innominate artery was reconstructed proximal to its bifurcation under the cross-clamps of the right common carotid artery and right axillary artery. The postoperative CT demonstrated that the innominate artery was successfully reconstructed just proximal to the bifurcation between the right common carotid artery and the right axillary artery (Fig. 2). Histological findings of the ascending aorta showed neither cystic medial necrosis nor nonspecific inflammation as in Takayasu's aortitis. The patient's postoperative course was uneventful and he was discharged home on the 23rd postoperative day.

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Fig. 1 Preoperative computed tomography showed acute type A aortic dissection with dilatation of false lumen of innominate artery (A) and hematoma of mediastinum (B).

Fig. 2 Total arch replacement with elephant trunk technique was performed using 4-branched graft. The innominate artery was reconstructed using the 1st limb of the graft just proximal to the bifurcation of right subclavian artery and right common carotid artery.

Discussion

Acute type A aortic dissection is a life-threatening condition with 30% of patients dying within 48 hours, mostly due to ascending aortic rupture.⁴⁾ Innominate artery dissection in acute type A aortic dissection is associated with neurological complication, but hardly ever complicated by rupture. Kaul P. et al.⁵⁾ reported an innominate truncal dissection and rupture into the right pleural cavity following acute

type A aortic dissection as a previously undescribed instance. The difference of rupture rate between the ascending aorta and the innominate artery is explained by Laplace's law, which describes the relationship of blood pressure, radius, and thickness of the vessel wall. The primary entry tear is located in the ascending aorta in majority of patients and is very rarely located in the innominate artery. In the present case, a large entry was located in the aortic arch near orifice of the innominate artery and no re-entry formed in the innominate artery. That is, the primary cause of the rapid enlargement of the dissected innominate artery could be explained by the continuous pressurization inside the false lumen due to the absence of re-entry.

Innominate artery rupture is considered to be a rare condition. Innominate artery aneurysm, blunt injury, iatrogenic injury, invasive infection, or bovine aortic arch can result in innominate rupture. Isolated innominate artery aneurysms are relatively common, and they represent 3% of all arterial aneurysms. While most of innominate artery aneurysms are atherosclerotic in etiology, alternative causes include Takayasu's aortitis, Behçets disease, or connective tissue disorders. In the present case, the innominate artery aneurysm must have not preexisted because the true lumen of the innominate artery was not dilated, and histological findings did not demonstrate specific aortic wall etiologies such as aortitis or connective tissue disorders.

Conventional surgical approaches for innominate artery include median sternotomy with an extended incision along the medial border of the right sternocleidomastoid muscle or median hemisternotomy combined with right anterior thoracotomy in the 3rd intercostal space. We performed median sternotomy plus the extended incision into the right side of the neck, which allowed excellent exposure

of the ascending aorta, aortic arch, and innominate artery. Cerebral protection is an important consideration for innominate artery rupture. In the present case, direct clamping of the distal innominate artery was performed after hypothermic circulatory arrest; then, we were able to establish selective antegrade cerebral perfusion via the right axillary artery cannulation and selectively insert balloon catheters into the left common carotid artery and left subclavian artery.

Conclusion

In conclusion, we successfully performed median sternotomy with an extended incision into the right side of the neck in an unusual case of innominate artery dissection and rupture in acute type A aortic dissection.

Disclosure Statement

All authors have no conflict of interest.

Author Contributions

Study conception: KT

Data collection: KT

Analysis: KT

Investigation: KT

Writing: KT

Critical review and revision: all authors

Final approval of the article: all authors

Accountability for all aspects of the works: all authors.

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