

Successful Operation for Type-B Aortic Dissection with Partial Involvement of Kommerell's Diverticulum and Aortic Rupture: A Novel Double Short-Graft Method

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Acute type-B aortic dissection is generally managed by administering medical treatment with an aim to achieve pain relief and hypertension control. Surgery is usually performed only in cases of type-B dissection complicated with limb ischemia, branch vessel compression or potential fatal aortic rupture. Herein, we report an extremely unusual case of type-B aortic dissection with partial involvement of coexistent Kommerell's diverticulum and concurrent aortic rupture that was successfully treated by means of a novel double short-graft method.

Key Words: Aortic dissection • Double short-graft method • Kommerell's diverticulum

INTRODUCTION

Aortic dissection is life-threatening because there is injury in the inner wall of the aorta. Surgery is preferred for type-A aortic dissection, while type-B aortic dissection is first controlled by medical treatment. Patients with aortic dissection usually present with sudden-onset severe chest pain with radiating to the back. Hypovolemic shock develops due to severe hemorrhage. In 1936, Kommerell described an outpouching at the origin of an aberrant right subclavian artery. Kommerell's diverticulum (KD) is defined as the diverticulum at the origin of some aberrant right subclavian arteries resulting from incomplete arch agenesis. However, type-B

aortic dissection with partial involvement of coexistent KD and concurrent aortic rupture is rare. The present case describes successful repair by using double short-graft method.

CASE REPORT

The 46-year-old man presented to our hospital with acute-onset chest pain. He had a history of hypertension. The chest pain was severe and radiated to his back associated with cold sweating. Thoracic computed tomography (CT) revealed the presence of a Kommerell's diverticulum associating with an aberrant right subclavian artery and type-B aortic dissection with partial involvement of the KD. The patient was managed conservatively with pain relief and hypertension control in the intensive care unit. However, the patient experienced recurrent severe chest pain and profound hypotension (79/54 mmHg) with dyspnea 6 hours later. Follow-up CT revealed rupture of the dissected descending thoracic aorta and active contrast medium leakage into a large paraaortic hematoma with compression on the left atrium (Figures 1A and B). An emergency left thora-

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cotomy through the third intercostal space was performed. Under deep hypothermia (18 °C), cardiopulmonary bypass was done via the left femoral artery, vein cannulations, and insertion of an additional venous line into the main pulmonary artery after the pericardium was opened. The CT findings were confirmed during surgery. After the dissected descending aorta was opened, a proximal graft (24-mm woven double velour vascular graft; Hemashield, Boston Scientific, CA) was anastomosed to replace the dissected lower portion of the KD under total circulatory arrest. Thereafter, upper-body cardiopulmonary bypass was established with proximal graft. Subsequently, a distal graft (20-mm woven double velour vascular graft; Hemashield, Boston Scientific,

CA) was applied by bypassing the rupture site and was anastomosed to the middle third descending thoracic

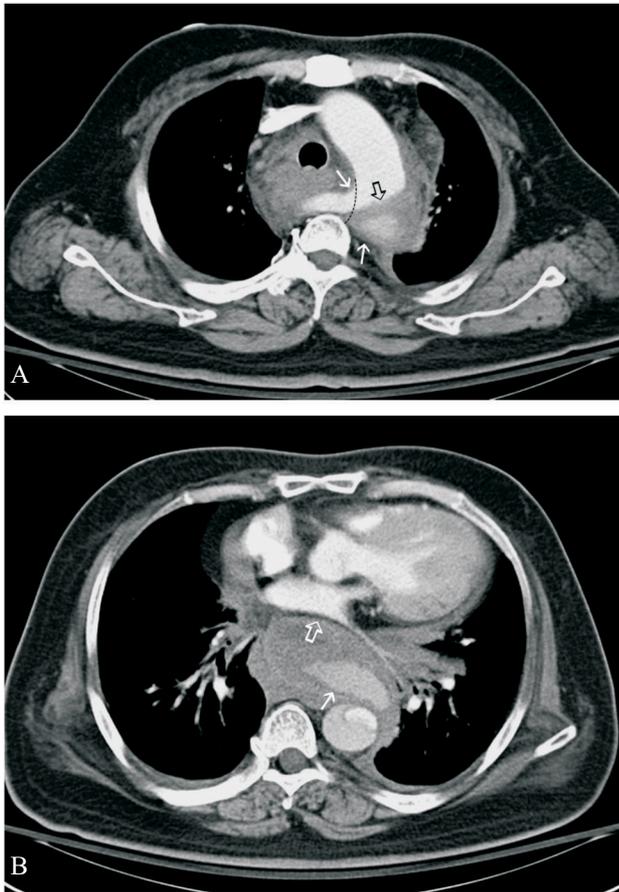


Figure 1. (A) Chest computed tomogram (CT) shows an aberrant right subclavian artery (white arrow) and type-B dissection (open arrow) with partial involvement of Kommerell's diverticulum; the native aortic border is marked with dot line, and outpouching of the aberrant right subclavian artery is beyond the dotted line. (B) Chest CT shows type-B aortic dissection with active contrast medium leakage (arrow) into a large paraaortic hematoma and marked compression on the left atrium (open arrow).

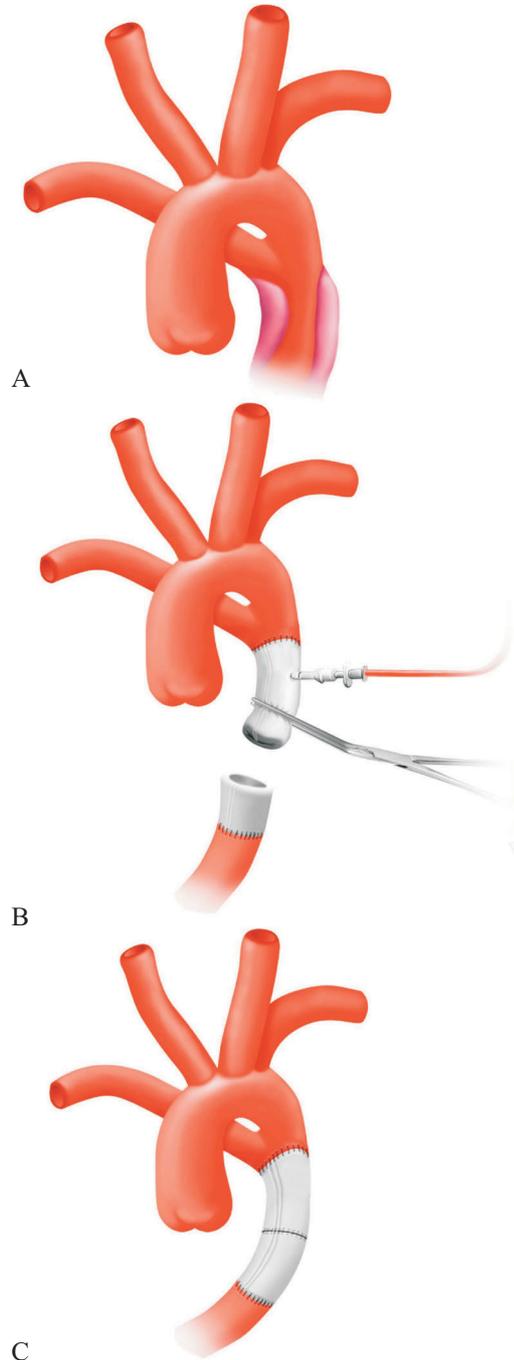


Figure 2. (A) Type-B dissection with partial involvement of Kommerell's diverticulum (KD). (B) A proximal graft anastomosed to replace the dissected lower portion of the KD, with an arterial perfusion line set from the proximal graft for the upper body; a distal graft was applied under aortic clamping and anastomosed to the middle third descending thoracic aorta. (C) Two grafts were anastomosed together.

aorta. Finally, the lower part of the proximal graft was tailored so that the proximal and distal grafts could be anastomosed tightly together with a total graft length of 8 cm (Figure 2). Cardiopulmonary bypass total time was 346 minutes and total circulatory arrest time was 50 minutes. Although mild left leg weakness was noted following the surgery, it was improved after rehabilitation. Otherwise, the patient recovered uneventfully. At 1 month follow-up, CT showed unremarkable residual KD patent aberrant right subclavian artery, resolution of paraaortic hematoma, and intact aortic grafts.

DISCUSSION

Aortic dissection is a catastrophic cardiovascular condition that leads to high morbidity and mortality. Out of 384 patients with acute type-B aortic dissection documented in the International Registry of Aortic Dissection, the overall in-hospital mortality rate was 13%; however, the mortality rate was markedly elevated to 32% in the case of patients who required surgery.¹⁻³ Aberrant right subclavian artery can be identified in approximately 0.4%-2.0% of the population, and 60% of these cases are associated with the presence of a KD, which is a remnant of the distal portion of the embryonic right aortic arch.^{4,5} Though rare, type-B dissection in patients with right aortic arch and coexistent KD have been described.^{6,7} To our knowledge, this is the first report of type-B aortic dissection with partial involvement of coexistent KD and complicated with aortic rupture.

In this particular case, an accurate early CT diagnosis and anatomic delineation of type-B dissection with partial KD involvement and site of aortic rupture was essential for forming a decision on the requirement for an emergency surgery. Due to the unstable hemodynamic status of the patient and the marked compression of the left atrium by the paraaortic hematoma, endovascular treatment was considered to be inappropriate.⁸ Rapid es-

tablishment of cardiopulmonary bypass and deep hypothermia were crucial so that the removal of the paraaortic hematoma, ample trimming of the dissected lower portion of the KD and subsequent anastomosis with the graft would be accomplished successfully under total circulatory arrest. Thereafter, by employing the proximal graft, upper body cardiopulmonary bypass could be resumed rapidly, permitting early brain perfusion. In addition, the ruptured portion of the dissected descending aorta was safely treated with another short graft. In light of this case, even complicated with the presence of a KD and aortic rupture, type-B aortic dissection might be successfully managed by employing a novel double short-graft method.

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