A case with four-channel aortic dissection

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Received 15 March 2004; received in revised form 6 September 2004; accepted 7 September 2004

Abstract

A 65-year-old male with four-channel aortic dissection successfully underwent replacement of the thoracoabdominal aorta, reconstruction of the celiac, superior mesenteric artery, renal arteries, and 5 pairs of intercostals or lumbar arteries using deep hypothermic technique. © 2004 Elsevier B.V. All rights reserved.

Keywords: Four-channel aortic dissection

1. Introduction

The three-channeled aortic dissection is rare, but well known as one of the subsets in aortic dissection and several authors reported ruptured cases of three-channel aortic dissection [1-3]. Four-channel aortic dissection is considered to be a very rare condition and very few reports have been seen [4,5]. In this report, a successful surgical experience for a patient with four-channel aortic dissection was presented.

2. Case report

The patient was a 65-year-old male who had acute type B aortic dissection 26 years ago. Eight years later, he underwent replacement of the descending aorta through left thoracotomy. During follow-up, residual thoracoabdominal aorta was found to be three-channeled (Fig. 1). One month before admission, he had back pain and computed tomography showed an enlarged aneurysm of 58 mm and a new fourth lumen in the thoracoabdominal aorta (Fig. 2). Blood chemistry revealed clear evidence of intravascular thrombosis, such as thrombocytopenia (10,700/mm³), lowered fibrinogen (210 mg/dl), elevated fibrin degenerative products (38.6 µg/ml), and elevated D-dimer (23.3 µg/ml). An operation was performed, after low-dose heparinization for one week. He had no stigmata of Marfan’s syndrome, but he had been hypertensive.

A cerebrospinal fluid drainage tube was inserted and motor evoked potentials were monitored. With right semi-recumbent position, the whole thoracoabdominal aorta was exposed through 5th left thoracotomy and retroperitoneal dissection. A partial Femoro-femoral bypass was initiated and an additional venous cannula in the main pulmonary artery was initiated. The patient was cooled down to 20°C of the ear drum temperature. Another arterial cannula was inserted in the previous graft.

As a first step, the previous graft and mid-descending aorta was clamped, and a new 22 mm graft with three branches for reconstruction of the intercostals arteries was anastomosed to the previous graft (Fig. 3). The infrarenal aorta was clamped and the aneurysm was opened. The celiac artery was branched from both the true lumen and the first false lumen. The superior mesenteric artery and the right renal artery were from the true lumen and the left renal artery was from the second false lumen. The intercostal arteries from Th 9-12 were originated from the third false lumen. The second false lumen was calcified, blind-ended, and had old thrombi. The third false lumen was also blind-ended and had fresh gel-like thrombi.

Selective visceral perfusion was a initiated with balloon tipped catheter with total flow of 500-600 ml/min. All patent intercostals arteries were occluded with two French balloon tipped catheter from inside. The Th10, Th11, and Th12 intercostal arteries were reconstructed individually with prefabricated 8 mm small grafts. The patient started to rewarm, and abdominal visceral branches were reconstructed individually in the same manner with prefabricated small grafts. The heart was defibrillated. The L2 lumbar artery was additionally reconstructed and the infrarenal portion of the aorta was replaced with a Y graft. The inferior mesenteric artery was ligated.
Cardiopulmonary bypass time was 351 min and the postoperative course was straightforward. Postoperative angiography was satisfactory and no pressure gradient was found throughout the aorta. The histological examination demonstrated numerous disruptions of the elastic fibers and cystic medial necrosis of the aortic outer wall as well as in the dissection flaps.

2. Discussion

Three-channeled aortic dissection has been rarely observed but is a well-known subset of aortic dissection. Svensson et al. reported that three-channel dissection was demonstrated in 5 patients (4.9%) of 102 aortic dissection associated with Marfan syndrome [1]. Ando et al. found that
26 (7.4%) of 349 surgically treated patients with aortic dissection had three-channel aortic dissection [2]. However, four-channel aortic dissection has been very rare and there were only two reports, which described this entity, found in the literature.

Three-channel aortic dissection frequently occurs in patients who have defects in aortic connective tissue, like Marfan syndrome or Ehlers-Danlos syndrome [6]. This was also considered to be true in patients with four-channel dissection. The previously reported cases with four-channel aortic dissection were also associated with Marfan syndrome [5]. The present case had no stigmata of Marfan syndrome; however, the histology specimen of the dissected aortic wall showed numerous disruptions of the elastic fiber and cystic medial necrosis of the aortic medial wall. Repetitive aortic dissection usually occurred in the remaining media of the 1st false lumen in most three-channel-patients. In this case, both the second false lumen and the third false lumen were originated at the lateral side of the previous dissection. The risk for rupture is high in these settings because the re-entry formations in the second or third false lumen were usually few (less than 20%) [2].

Regarding treatment, urgent surgery is required in patients with chronic dissection complicated by a new acute dissection due to higher risk of rupture. Usually, dissection anatomy of the descending aorta is complicated, so generalized or topical deep hypothermia is recommended to protect the spinal cord because of its luxury of time [7]. Furthermore, cerebrospinal fluid drainage, segmental clamping of the aorta with distal perfusion and some pharmacological agents should be applied.

References