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New Methods

Bailout Solution for Hemostasis from Distal Anastomotic Site during Total Aortic Arch Repair

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Intraoperative bleeding from the distal anastomotic site during graft replacement of the arch to distal arch via median sternotomy to treat an aortic aneurysm is sometimes difficult to control because of the limited distal view. I herein report a case in which I addressed this uncontrollable bleeding using a commercialized frozen elephant trunk.

Keywords: frozen elephant trunk, thoracic aortic aneurysm, bail out, bleeding

Introduction

Median sternotomy is often applied when treating arch and distal arch aneurysm because myocardial protection and cerebral perfusion can be easily controlled.[1] Distal anastomosis is often performed at a distal site with fragile tissue and atherosclerotic change, which occasionally results in fatal bleeding from this anastomosis site. To prevent this unfavorable condition, various anastomotic techniques have been reported;[2,3] however, few reports have described a bailout solution for this condition.

Case Report

An 87-year-old man with a high fever was diagnosed with an infected thoracic aortic aneurysm. Computed tomography (CT) showed an infected saccular thoracic aortic aneurysm at the distal aortic arch. Total arch replacement with an omental flap was planned via median sternotomy. Standard cardiopulmonary bypass (CPB) was established with cooling to 25°C. After aortic cross-clamping and cardioplegic arrest at this temperature, selective cerebral perfusion was established. After removing the infected aortic aneurysm, open distal anastomosis was performed 2 cm distal to the infected aneurysm, where some edematous and atherosclerotic change was noted, using a four-branched 22 × 11 × 9 × 9 mm J Graft (Japan Lifeline, Tokyo, Japan) with reinforced Teflon felt and an over and over suture technique. After open distal anastomosis, distal perfusion was initiated, followed by rewarming. Proximal anastomosis was performed at the level of the sinotubular junction. The left subclavian artery (LSCA), left common carotid artery, and brachiocephalic artery were anastomosed to the branches of the graft, respectively. Upon termination of CPB, a relatively large amount of bleeding at the distal anastomotic site was noted. Application of several stiches with a Teflon pledget was attempted but failed. Left thoracotomy was considered because it would provide a wide surgical view, making it possible to change the anastomotic site. Additionally, considering the availability of intraoperative radiographic imaging and an appropriate stent graft, endovascular repair was also a promising option without the use of CPB. In this case, the patient was old and we hoped to avoid left thoracotomy if possible. An appropriately sized stent graft was not available. We therefore inserted a frozen elephant trunk (FET) to cover the

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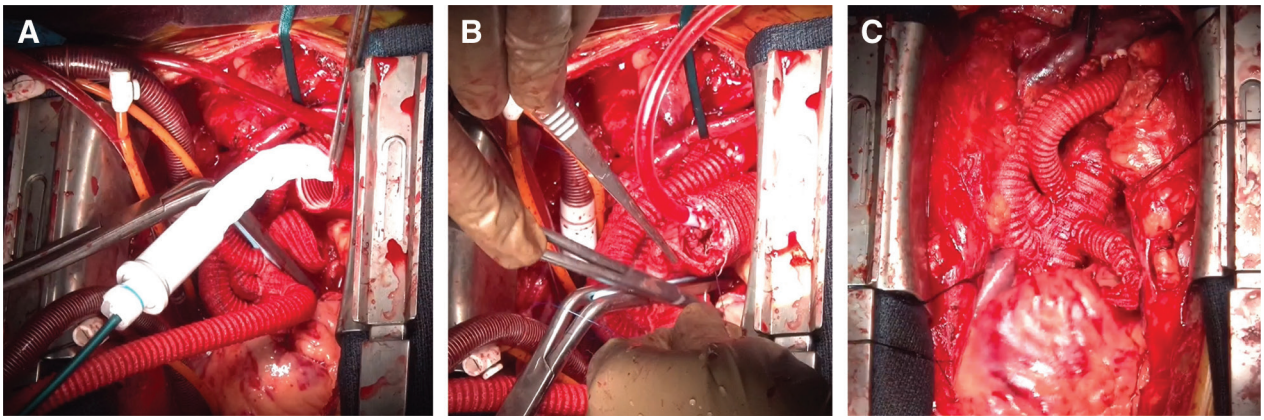

Fig. 1 (**A**) Aortic clamping was performed immediately distal to the branch of the graft anastomosed to LSCA and the graft body was transversely cut 1 cm distal to this clamp site. FET was inserted. (**B**) The anastomosis between the FET and vascular graft. (**C**) Completion of FET insertion. LSCA: left subclavian artery; FET: frozen elephant trunk

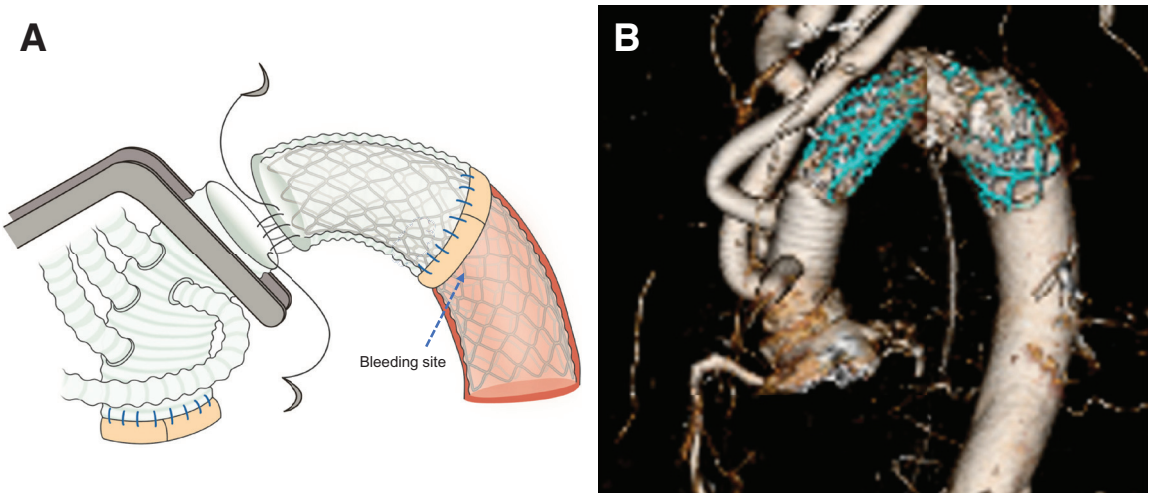

Fig. 2 (**A**) Shema of the present method. (**B**) Postoperative 3-dimensional CT. CT: computed tomography

bleeding site from the inside of aorta. The body temperature was recooled down to 30°C to protect abdominal organs. During cooling, the diameter of the descending aorta, where the distal end of the FET was placed, was measured as 32 mm on the previously examined CT image. Aortic clamping was performed just distal to the branch of the graft anastomosed to LSCA with the heart beating. The graft body was transversely cut 1 cm distal to this clamp site, and a 35 mm–120 mm Japanese-made FET (Frozenix; Japan Lifeline) was inserted into the proximal to medial descending aorta to cover the distal anastomotic site with a 5-cm distal landing zone (**Figs. 1A** and **2A**). After insertion, anastomosis was completed with an over-and-over suture technique using 3-0 Prolene (Ethicon Inc., Somerville, NJ, USA) with a particular focus on the anastomosis between the FET and 22 mm vascular graft (**Fig. 1B**) in 10 min. After anastomosis and rewarming, CPB was terminated with little bleeding from the distal anastomotic site. After neutralization of heparin, hemostasis was achieved (**Fig. 1C**). Postoperative CT demonstrated no pseudoaneurysm (**Fig. 2B**). The postoperative course was uneventful with neither brain or spinal cord ischemic complications nor recurrence of infection.

Discussion

Intraoperative and postoperative bleeding is strongly associated with postoperative recovery, and surgeons must focus on reducing the amount of bleeding. Fatal bleeding at the distal anastomosis site of distal aortic arch to proximal descending aorta under median sternotomy, which is difficult to control, is sometimes encountered, and is a major concern for surgeons.

Endovascular treatment for a seroma after graft replacement of the thoracic aorta has been reported.[4] To the best

of our knowledge, however, no report has documented the efficacy of using a commercialized FET to cover the bleeding site from the inside of aorta in cases of uncontrollable intraoperative bleeding at the aortic anastomosis site.

The present case suggests the following advantages of this method. First, the technique, including the anastomosis, is easy to perform without radiographic imaging. Second, a sufficient distal landing zone for the FET provides strong hemostasis from the anastomotic site. However, an adequate FET may not always be available in the clinical settings, and FETs are known to have the potential to cause spinal cord ischemic injury.[5)]

Conclusion

An FET might serve as a bailout solution for fatal bleeding, which is difficult to control with usual methods, from the distal anastomotic site during total aortic arch repair.

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Disclosure Statement

None declared.

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