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Aorta: Case Report

Aortic Floating White Thrombus in an Ascending Aortic Graft After Aortoplasty

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We encountered a 75-year-old man who underwent total arch replacement for a thoracic aortic aneurysm, then ascending aortoplasty for hemolysis due to a kinked ascending aortic graft. He presented with exhaustion and anemia 3 years later. Computed tomography revealed a large floating thrombus in the ascending aortic graft attached to the dorsal suture line. The thrombus developed after the graft kink was released, and although the dorsal mural thrombus disappeared, a floating white thrombus remained. Clinicians should ensure that the ascending graft is in a natural position without bending or kinking to reduce the risk of postoperative thrombus formation.

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An aortic mural thrombus is a rare disease, with an incidence rate of 0.45%.[1] A thrombus in an ascending aortic graft is extremely rare, with very few cases reported.[2-5] An isolated thrombus in a graft is thought to be due to kinking in the ascending aortic graft[5] or to be secondary to a systemic infection.[3,6] There are no evidence-based guidelines for the treatment of a thrombus in an ascending aortic graft. We report a rare case of successful surgical resection of a thrombus in an ascending graft after ascending aortoplasty for hemolysis due to a kinked ascending aortic graft.

The patient, a 75-year-old man, had 5 years previously undergone total arch replacement for a thoracic aortic aneurysm. Approximately 2 years after that, he underwent aortoplasty to resolve hemolysis due to a kink in the ascending aortic prosthesis (Figure 1).

After the operation, his condition remained stable for 3 years, although he had intermittent fever and tiredness. Laboratory tests showed severe anemia (hemoglobin level, 6.5 g/dL). Contrast-enhanced computed tomography showed a 1.5 × 1.5-cm mobile clot adherent to the posterior central wall of the ascending aortic graft with a mural thrombosis (Figure 2). After admission, heparin infusion therapy was initiated. We also performed blood cultures because he had intermittent fever, although the blood cultures yielded negative results.

Repeated contrast-enhanced computed tomography revealed the clot size and mural thrombosis to be almost the same as those 2 weeks previously. Surgical resection was thought to be better than continuous heparin therapy because the mobile clot was not reducing in size. Furthermore, the risk of embolism due to the blood clot was thought to be high.

After systemic heparinization, cardiopulmonary bypass was established by cannulating the left axillary artery and femoral vein. After systemic cooling to 23 °C, we achieved circulatory arrest because we were unable to clamp the ascending aorta owing to a thrombus in the ascending aortic graft. By a 3-cm vertical incision in the ascending graft, 3 antegrade cerebral perfusion catheters were inserted through the brachiocephalic artery, left common carotid artery, and graft that was anastomosed in an end-to-side fashion to cannulate the left axillary artery. A white blood clot was observed attached to the dorsal suture line (Figure 3).

The white thrombus was removed easily, and there was no residual thrombus. Interestingly, the mural thrombosis of the dorsal wall of the aorta had disappeared. After removal of the thrombus, the incision line was resutured with 4-0 Prolene. Postoperatively, the patient was prescribed warfarin. Postoperative contrast-enhanced computed tomography showed no thrombus in the ascending graft. Pathologic examination of the thrombus showed foamy cell infiltration.

Six months after discharge, he was followed up at our hospital. He is now receiving warfarin, the dose of which was adjusted to be within an international normalized ratio of 2 to 3. Contrast-enhanced computed tomography revealed no thrombus in the ascending graft (Supplemental Figure). He remains in good health.

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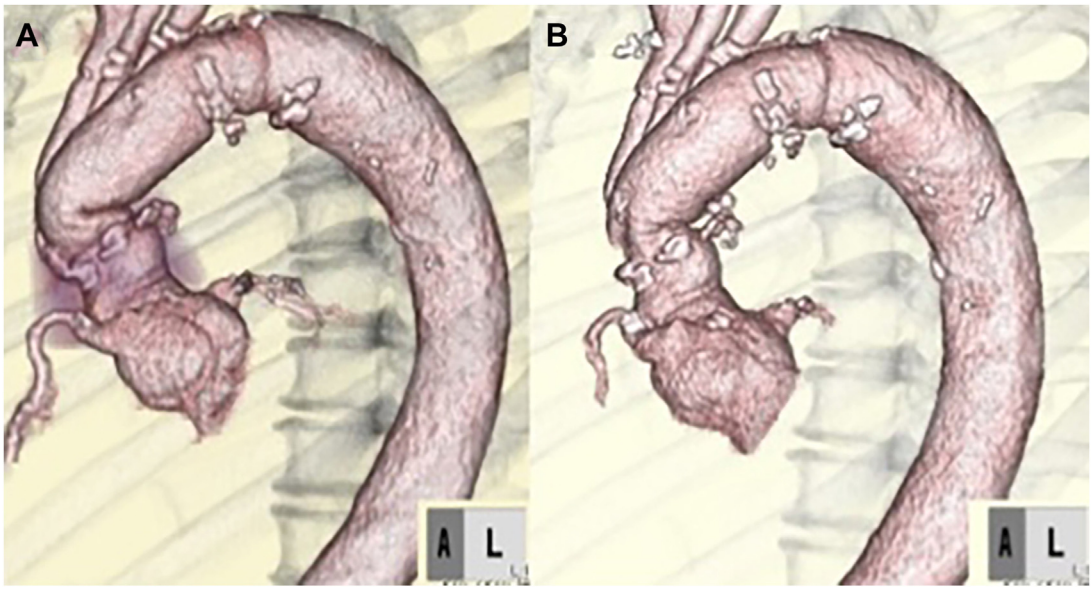

FIGURE 1 (A) Preoperatively, the graft is kinked. (B) After aortoplasty, the kinking is released somewhat (A, anterior view; L, lateral view.)

COMMENT

Various case reports have described a thrombus in the ascending aorta, although large thrombi in an artificial ascending graft are extremely rare. The causes of thrombi in an artificial ascending graft have been reported as kinking grafts,[5] systemic infections,[3,6] coagulation abnormalities,[4] and malignant neoplasms.[7]

In this case, although aortoplasty was performed, it is possible that the kink in the graft was not completely released (Figure 1) or that turbulent blood flow on the

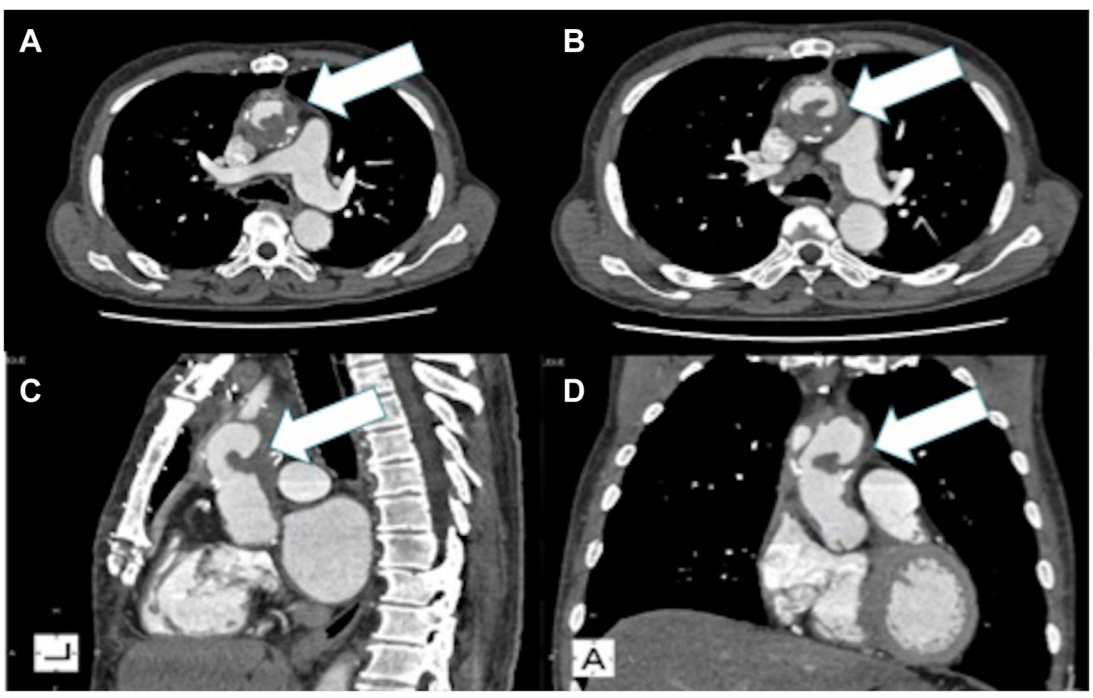

FIGURE 2 A contrast-enhanced computed tomography angiogram of the chest in (A, B) axial, (C) sagittal, and (D) coronal views shows a thrombus in the ascending aortic graft (arrows) (A, anterior view; L, lateral view.)

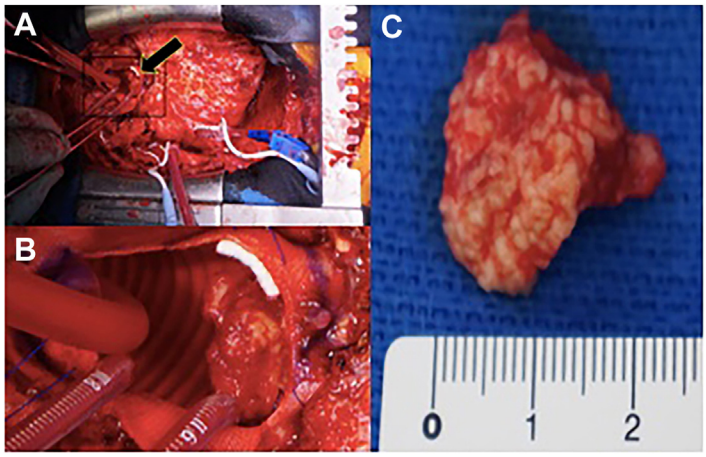

FIGURE 3 (A, B) Intraoperative findings show that the thrombus is in the ascending graft; it is attached on the dorsal suture line (arrow). (C) The thrombus is whitish and 2 cm in size.

dorsal side of the graft occurred. Regarding the mechanism by which blood clots arise from kinks, the kinked graft results in nonlaminar flow, which leads to high shear rates between blood cells. The shear results in the activation of platelets and formation of thrombi.[8] However, very few reports have described thrombi caused by graft kinks.[5]

In our case, systemic infection and coagulation abnormalities were excluded because the preoperative blood cultures yielded negative results, and the coagulation status was normal (prothrombin time, activated partial thromboplastin time, fibrinogen, antithrombin 3, factor V, factor VIII, factor XIII, von Willebrand factor, plasminogen activator inhibitor 1, plasminogen, and α_1-antitrypsin). Moreover, the patient's medical history also suggested that a malignant neoplasm was unlikely because of the lack of weight loss and other symptoms. Although he had severe anemia (hemoglobin level, 6.5 g/dL), the patient's gastrointestinal endoscopy findings were normal. Thus, the cause of the thrombus was considered to be a graft kink or another unknown origin. The detailed mechanism of thrombus formation in this patient is unknown, although it is highly likely that the wall clots and floating thrombus had different causes because the wall clots were dissolved with heparin, but the floating clot was not dissolved. Because the thrombus was white in color, it probably formed during a period of years.

In conclusion, the manner in which the graft was tailored or sutured may have caused thrombus formation; therefore, clinicians should ensure that the ascending graft is in a natural position without bending or kinking. If kinking is created, the risk of postoperative thrombus formation may increase.

The Supplemental Figure can be viewed in the online version of this article [https://doi.org/10.1016/j.atssr.2023.07.003] on http://www.annalsthoracicsurgery.org.

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PATIENT CONSENT
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