Spontaneous rupture of the thoracic aorta is rare. We present a 76-year-old man who developed spontaneous rupture of the aortic arch associated with massive periaortic hematoma and hypovolemic shock. Because the site of rupture could not be identified, emergency hybrid endovascular aortic repair to shield a long segment of the aorta was performed according to the extent and density of periaortic hematoma on axial CT scans. His blood pressure improved just after deployment of the endograft. Rapid diagnosis by CT and prompt control of aortic hemorrhage by endografting salvaged this patient. Three-dimensional (3D) volume-rendered CT images are useful for identifying the site of aortic rupture, but may not be available in an emergency.

Keywords: aortic arch, spontaneous thoracic aortic rupture, endovascular procedure

Introduction

Spontaneous rupture of the thoracic aorta without any history of aneurysm, dissection, infection, inflammation, trauma, or connective tissue disorder is rarely reported, but is a catastrophic event and its diagnosis is challenging. Prompt diagnosis and surgical intervention are required to salvage these patients.

Case

A 76-year-old man was transferred to our emergency room with sudden onset of transient loss of consciousness and hemodynamic deterioration. He did not have any episode of trauma, infection, or connective tissue disorder. Computed tomography (CT) revealed a massive hematoma surrounding the aortic arch with a large pleural effusion, without aneurysm or dissection (Fig. 1). We performed emergency hybrid repair to cover a long segment of the aorta according to the extent and density of periaortic hematoma on axial CT scans. The proximal end of a Valiant thoracic stent graft (a proximal side of 34 mm, a distal side of 30 mm, a length of 150 mm; Medtronic, Santa Rosa, CA, USA) was deployed at the orifice of the left subclavian artery (LSA), with extra-anatomic reconstruction of the LSA using a ringed expanded polytetrafluoroethylene (ePTFE) prosthesis and occlusion of the native artery by an Amplatzer Vascular Plug (St. Jude Medical Inc., St. Paul, MN, USA). His blood pressure improved just after deployment of the endograft. A total of 1450 mL of bloody fluid was drained.

After thoracic endovascular aortic repair, detailed three-dimensional (3D) images derived from the initial CT scans (0.5 mm slices) showed a 13-mm long laceration like lesion on the posterior aspect of the aorta near the LSA orifice (Fig. 2, arrow). A tiny projection that was identical to the lesion shown in Fig. 2 was also pointed out using thin slice axial images after surgery (Fig. 1). A slight dilatation site of the distal arch was also shown (Fig. 2, arrowheads). Although the exact site of...
Spontaneous Thoracic Aortic Rupture was not identified due to endovascular surgery, CT findings suggested that one of the two lesions mentioned above was likely to be a rupture site.

The patient recovered fully and resumed daily activities without any complications. Postoperative CT demonstrated patency of the extra-anatomic bypass and did not identify any aortic pathology except for arteriosclerosis (Fig. 2).

Discussion

Spontaneous or idiopathic rupture of the thoracic aorta without any history of aneurysm, dissection, infection, inflammation, trauma, or connective tissue disorder is rarely reported.1,2) There have been sporadic reports of sudden death due to this condition since the consequences can be catastrophic and survival is rare. Yokoyama et al.1) reviewed 18 patients with this disease and reported that arteriosclerosis was the most common etiology, as present case.

Although relatively severe arteriosclerosis was seen in the present case (Fig. 2), he did not have any signs of common aortic rupture pathology, including aneurysm, pseudoaneurysm, infectious aortitis, intimal tear, intramural hematoma, or penetrating aortic ulcer, based on clinical and radiological findings. Bacteriologic culture was negative. After endovascular repair, two probable lesions causing the periaortic hematoma were identified on reconstructed 3D images.

Prompt diagnosis is necessary in a patient with aortic rupture and shock. Therefore, CT is useful since it can rapidly scan a wide region with higher resolution than other imaging modalities and can provide information to facilitate surgical planning.3) In particular, 3D images present detailed morphologic information and are very useful for aortic diagnosis because small lesions located around the arch are often difficult to detect on axial images due to the curvature at this site.3) However, accurately identifying the site of rupture may be difficult in an emergency, depending on the quality of the reconstructed 3D images.

The endovascular approach is probably better than open surgery for these patients, allowing prompt initiation of intervention in the supine position, easy aortic access via the femoral artery, and faster control of hemorrhage by endograft deployment, if an appropriate size endograft is available immediately.4) If the exact site of aortic disruption is unclear, the endovascular approach is especially efficient for covering a long segment of the aorta and can easily be extended distally if necessary. Since endovascular proximal extension is not easy, we performed debranching procedure to shield a long segment of the aorta and to secure adequate endograft landing zones. In contrast, open surgery is technically challenging, including the need for exposure around the distal arch within dense hematoma. The requirement for extracorporeal

![Fig. 1 CT reveals massive hematoma surrounding the aortic arch and the descending aorta, as well as a large pleural effusion. (A–F) Axial images from head side to caudal side. The arrow is indicated by a tiny projection we noticed after surgery using thin-slice (0.5 mm) images. It was not pointed out in emergency room because of setting of speed-priority CT. CT: computed tomography](image-url)
circulation is also highly invasive. In case of the exact site of aortic disruption is unclear, decision of surgical approach, such as median sternotomy or left thoracotomy, might be discussed. Therefore, salvage of these patients was very difficult before the endovascular era. Although the endovascular approach is efficient, if hemodynamic stability could not be obtained, additional endograft deployment or open conversion should be prepared.

Conclusion

We encountered a patient with spontaneous rupture of the thoracic aorta. After rapid CT diagnosis based on the extent and density of the periaortic hematoma, prompt control of hemorrhage by endograft deployment is useful for salvaging these patients, especially when the exact site of rupture cannot be identified.

Fig. 2 (A and B) 3D volume-rendered images of the aorta reconstructed from 0.5 mm slices after surgery. A 13 mm laceration (arrow) is located on the posterior aspect of the aorta near the LSA orifice, which is identical to the site shown in Fig. 1. A slight dilatation site of the distal arch is also shown (arrowheads). There is scattered mural calcified lesions. (A) anterior view. (B) posterior view. (C and D) 3D images of the aorta at 7 days after surgery. Postoperative CT did not identify any aortic pathology. C: anterior view; D: posterior view; 3D: three-dimensional; LSA: left subclavian artery; CT: computed tomography.

Disclosure Statement

The authors have declared that no conflict of interest exists.

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