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Case Report

Localized Aortic Root Dissection with a Superior Mesenteric Artery Aneurysm

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In this study, the case of a 46-year-old female patient with localized aortic root dissection and a superior mesenteric artery (SMA) aneurysm is described. Computed tomographic angiography could not clearly delineate an intimal flap in the aortic root, but it detected SMA aneurysm, which implied the presence of a vulnerability of the aortic wall. Finally, transesophageal echocardiography (TEE) evidently showed the intimal flap localized in the aortic root. The present case suggests that TEE is of paramount importance for detecting localized aortic root dissection. In addition, a coexisting vascular lesion may be a clue to diagnose another vascular lesion.

Keywords: aortic dissection, superior mesenteric aneurysm, emergency surgery

Introduction

Computed tomographic angiography (CTA) is a high-sensitivity technique that facilitates the diagnosis of an aortic dissection. However, false negative scans may occur in cases where an intimal flap is localized in the aortic root. This is because non-electrocardiogram (ECG)-gated CTA is affected by motion artifacts.[1)] Aneurysmal formation in the superior mesenteric artery (SMA) occurs infrequently, and its etiologies include cystic medical necrosis that can cause an aortic dissection.[2)] In the present study, we report a case of localized aortic root dissection with SMA aneurysm.

Case Report

A 46-year-old female patient with a 3-week history of chest pain was referred to our hospital. She had no remarkable medical or family history. During the physical examination, a diastolic murmur was heard best at the right third parasternal border. Laboratory examination revealed a white blood cell count of 9200 cells/μl, an hemoglobin level of 10.5 mg/dl, a C-reactive protein level of 0.23 mg/dl, and a D-dimer level of 1.35 μl/ml. Chest X-ray showed mild cardiomegaly without pulmonary edema. ECG did not show any significant ST-T wave changes. However, frequent supraventricular premature contractions were recorded. Transthoracic echocardiography revealed severe aortic regurgitation. An intimal flap was not observed in the ascending aorta and in the aortic root. Pericardial effusion was not observed; however, regional wall motion asynergy was observed. Non-ECG-gated CTA showed a normal morphology of the ascending aorta and aortic root without a mediastinal hematoma. The detection of an intimal flap in the aortic root was unclear because of motion artifacts (**Figs. 1A**–**1D**); however, we observed SMA aneurysm that implied the presence of a vulnerability of the aortic wall (**Figs. 2A** and **2B**). Transesophageal echocardiography (TEE) was performed during a second imaging study and the intimal flap localized in the aortic root was evidently detected (**Figs. 3A** and **3B**). The patient was diagnosed with a Stanford type A subacute aortic dissection with severe aortic regurgitation, and she underwent an emergency surgery.

The surgery was performed through a median sternotomy. Cardiopulmonary bypass was established by aorto–bicaval cannulation. After the ascending aorta was clamped, selective cardioplegia was administered. We confirmed the intimal tear and extension of the dissection through an aortotomy. The intimal tear affected two-thirds of the circumference of the aorta, which had caused a detachment of the noncoronary cusp. The dissection flap only extended into the proximal aortic root. An aortic root replacement using a 23 mm SJM mechanical heart valve (St. Jude Medical, Minneapolis, MN, USA) and a 28 mm J Graft (Japan Lifeline, Tokyo, Japan) was successfully performed. The postoperative course was uneventful. The pathological results revealed cystic medial necrosis in the resected aortic wall. This SMA aneurysm was carefully followed-up because its size was 12 mm; at 1 year postop-

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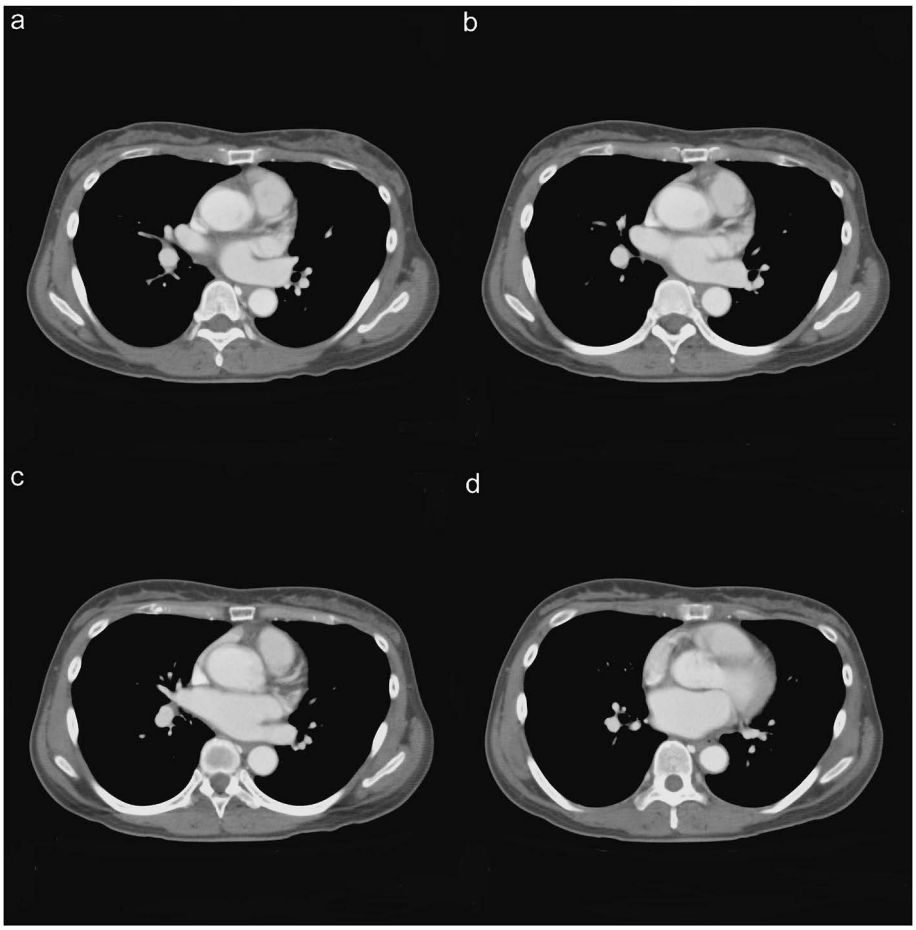

Fig. 1 (**A**)–(**D**) Preoperative non-electrocardiogram-gated computed tomography is unable to clearly detect an intimal flap in the ascending aorta and in the aortic root because of motion artifacts.

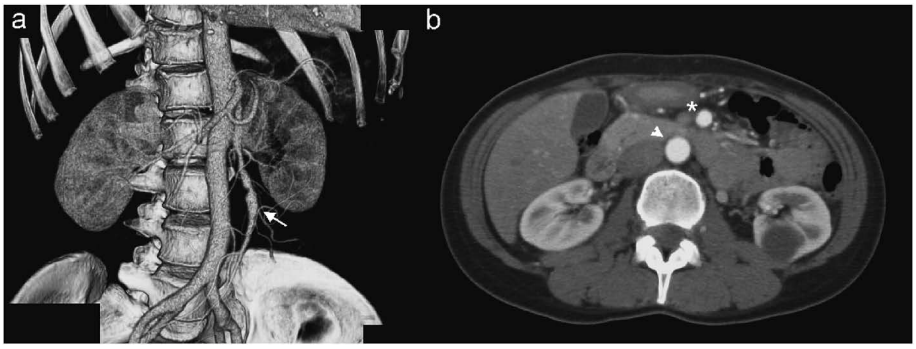

Fig. 2 Preoperative computed tomographic angiography shows a superior mesenteric artery (SMA) aneurysm. (**A**) The SMA is dilated into a spindle form from the middle (arrow). (**B**) The maximal diameter of the SMA aneurysm is 12 mm (asterisk). The arrowhead indicates the abdominal aorta.

eratively, no change was observed.

Discussion

Aortic dissection is a vascular catastrophe that requires prompt diagnosis and treatment.[3] CTA shows a high sensitivity and facilitates the detection of aortic dissection. However, the aortic root and ascending aorta move in association with cardiac beats. Motion artifacts caused by the aortic wall affect the description of an intimal flap,

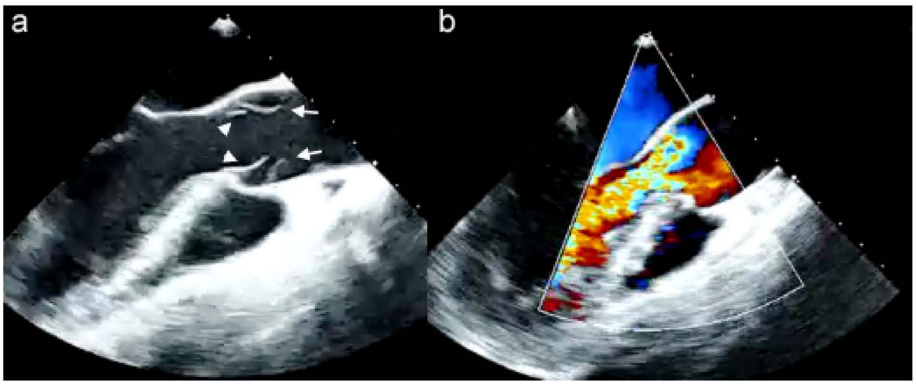

Fig. 3 Preoperative transesophageal echocardiography evidently shows aortic dissection localized in the aortic root. (**A**) An intimal flap (arrows) originates just above the aortic valve (arrowheads). (**B**) The aortic dissection causes severe aortic regurgitation.

especially in the aortic root. Therefore, non-ECG-gated CTA can fail to diagnose an aortic dissection localized in the aortic root.[1] The 2010 American College of Cardiology Foundation/American Heart Association Thoracic Aortic Disease Guidelines statement recommends that "if a high clinical suspicion exists for acute aortic dissection but initial aortic imaging is negative, a second imaging study should be obtained."[4] In such situations, TEE or ECG-gated CTA can be chosen to perform the second imaging study.

TEE is superior to transthoracic echocardiography and non-ECG-gated CTA in detecting localized aortic root dissection.[1,5,6] This is because TEE is not affected by obesity, chronic obstructive diseases, and motion artifacts caused by cardiac beats.[5] In addition, TEE has the advantage of avoiding contrast media and radiation exposure. Nevertheless, a disadvantage of TEE is that it cannot be easily performed at the bedside of patients with unstable hemodynamics.[1] Compared with non-ECG-gated CTA, ECG-gated CTA reduces motion artifacts and improves the accuracy of the diagnosis of an aortic dissection.[7] Although the routine and initial use of ECG-gated CTA is ideal to diagnose an aortic dissection, the increase in the patient's exposure to radiation and the cost of the facilities may become issues that need to be solved.[8] Moreover, ECG-gated CTA is affected by arrhythmia.[9] In the present case, frequent supraventricular premature contractions were observed, but the patient's hemodynamics were stable. Therefore, TEE was chosen as a secondary imaging study for detecting aortic dissection.

Clinical presentations and findings of aortic dissection include chest pain, anemia, an elevated D-dimer level, and aortic regurgitation.[3] Furthermore, SMA aneurysm may be a major clue for the diagnosis of aortic dissection. The definition of an aneurysm is a permanent localized dilatation of the artery with at least a 50% increase in diameter compared to a normal artery.[10] The average diameter of SMA in normal adults is reported to be 6.2 ± 1.7 mm.[11] Thus, SMA aneurysm may be appropriately defined as a localized dilatation of SMA with a diameter of more than 9.3 ± 1.7 mm. Although the incidence of aortic dissection with SMA aneurysm is unknown, the etiology of SMA aneurysms includes cystic medial necrosis, which may cause aortic dissection regardless of Marfan syndrome and may affect the long-term prognosis.[2,12] Loeys–Dietz syndrome, which is an autosomal dominant connective tissue disorder, can cause both aortic root dissection and SMA aneurysm.[13] Therefore, aortic dissection can coexist with SMA aneurysm. In most cases of aortic dissection and SMA aneurysms, SMA aneurysms may be incidentally detected while performing a CTA for detecting aortic dissection because SMA aneurysms are usually asymptomatic.[2] Although the therapeutic indication for SMA aneurysms is unclear, small SMA aneurysms with a diameter of less than 15 mm tend to be conservatively observed.[2] If acute Stanford type A aortic dissection is accompanied by SMA aneurysm with a diameter of more than 15 mm, a central repair for the aortic dissection has priority over the treatment of SMA aneurysm. The treatments for SMA aneurysms include open surgeries and endovascular repairs. Compared to an open surgery, an endovascular repair for SMA aneurysms is useful in patients with comorbidities and is associated with a decreased length of hospital stay in elective settings.[14]

Conclusion

In the present study, a case of localized aortic dissection that was accompanied by an SMA aneurysm was described. Non-ECG-gated CTA may not be able to detect an intimal flap localized in the aortic root. Regardless of whether the initial imaging study is negative, a second imaging study should be performed in cases with a high suspicion for an aortic dissection. TEE is of paramount

importance for detecting localized aortic root dissection. SMA aneurysms can coexist with aortic dissection and may become a clue leading to the diagnosis of aortic dissection. If acute Stanford type A aortic dissection is accompanied by SMA aneurysm with a diameter of more than 15 mm, an elective endovascular repair of this SMA aneurysm following a central repair of the aortic dissection would be appropriate.

Disclosure Statement

The authors have no conflicts of interest to declare.

Author Contributions

Writing: AI
Performance of the operation: AI, TN
Supervision of the case study: YH, TJ
Final approval of the article: all authors

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