Short Communication

Is Aortic Enlargement a Risk Factor for Type A Acute Aortic Dissection?

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Type A acute aortic dissection occurs suddenly, without any clinical sign and often takes the patient's life before appropriate treatment can be provided. Herein, we report 12 patients who underwent computed tomography scan for assessment of other diseases less than 1 year before the onset of aortic dissection. We evaluated aortic diameter before the onset of aortic dissection. All patients had some risk of aortic dissection. The average maximum ascending aortic diameter was 44.3 ± 2.7 mm; range: 40 to 48 mm. Eleven patients underwent successful emergency surgery. However, 1 patient died before arrival at our hospital. Careful management is necessary for patients with aortic enlargement and risk of type A acute aortic dissection.

Key words: Type A acute aortic dissection, aortic enlargement, CT finding before onset of aortic dissection
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Introduction

A major concern about type A acute aortic dissection (AAD) is the lack of warning signs. A history of hypertension alone cannot be the only risk factor for sudden AAD. Several investigators reported that aortic dilatation was a risk factor for sports-related AAD^{1,2)}. However, it is still unclear whether aortic enlargement presents a risk for AAD in non-hereditary, sporadic AAD. We reviewed 12 patients who undergone computed tomography (CT) scan within 1 year before the onset of AAD.

Presentation

During the last 5 years, 126 AAD patients were transferred to our institution. Among these, 12 had CT assessment for other diseases within 1 year before onset of AAD. Institutional review board approval and informed consent from all patients were provided before publication of this manuscript and reporting of the information. Three patients (25.0%) were female, and the average age was 64.3 ± 15.8 years, ranging from 34 to 83 years. All patients had been treated for hypertension. Five had been followed up for malignancy, 2 for type B dissection, 3 for sleep apnea syndrome, 3 for mild bicuspid aortic valve stenosis, and 1 for post-catheter ablation. One patient was assessed in the postpartum period. We assessed the maximum ascending aortic diameter using CT findings prior to onset of AAD. The average duration between CT assessment and AAD onset was 7.8 ± 2.3 months, ranging from 2 to 11 months. The average maximum ascending aortic diameter was 44.3 ± 2.7 mm, ranging from 40 to 48 mm (Table 1).

Emergency ascending aortic replacement was performed in 11 patients and concomitant aortic valve replacement was performed in 4 patients. In these 11 patients, an intimal tear was located in the ascending aorta, and histological examination of the aortic wall showed the presence of cystic medial necrosis in 5 patients but in the other 6 patients, it showed atherosclerotic changes in the aortic wall (Table 1). These 11 patients could be discharged from the hospital without any complications. However, 1 patient died before arrival at our hospital due to left main coronary artery mal-perfusion. This 80-year-old woman had been followed up after surgery for breast cancer. CT before onset of AAD showed maximum ascending aortic diameter of 45 mm (Fig. 1). She developed AAD 11 months after CT assessment, and CT on admission for AAD showed further dilatation to 55 mm in the ascending aorta (Fig. 2).

Discussion

Should aortic enlargement be considered a risk factor for AAD?

It is well known that mechanical deterioration of the structural properties of the aortic media, so-called “lamellar unit” is associated with aortic dissection^{3,4)}. Koullias, et al. reported that an ascending aorta with a diameter of at least 5 cm had significantly higher wall stress values than compared with normal aortas and these phenomena were associated with marked mechanical deterioration of the structural properties of the aortic wall in a large ascending aorta⁵⁾. Hatzaras et al. reported that increased blood pressure due to weight lifting raises aortic wall stress to a level that produces aortic dissection in pre-

Table 1 Profiles

	Age	Sex	Disease	Diameter	Until the onset	Histology	Prognosis
Case 1	62	M	Bicusp	40 mm	4 months	atherosclerosis	Survive
Case 2	70	M	BAD, SAS	45 mm	11 months	atherosclerosis	Survive
Case 3	34	F	Pregnancy	47 mm	8 months	CMN	Survive
Case 4	85	F	Br. Cancer	41 mm	10 months	atherosclerosis	Survive
Case 5	63	M	G. Cancer	44 mm	8 months	CMN	Survive
Case 6	61	M	BAD	42 mm	6 months	CMN	Survive
Case 7	45	M	Bicusp	41 mm	7 months	atherosclerosis	Survive
Case 8	83	M	G. Cancer	46 mm	6 months	atherosclerosis	Survive
Case 9	80	F	Br. Cancer	45 mm	11 months		Died
Case 10	65	M	Lu. Cancer	47 mm	6 months	CMN	Survive
Case 11	75	M	Bicusp, SAS	45 mm	9 months	atherosclerosis	Survive
Case 12	48	M	Abration, SAS	48 mm	2 months	CMN	Survive

BAD: Type B dissection, SAS: Sleep apnea syndrome, Br.: Breast, G.: Gastric, Lu.: Lung
CMN: Cystic medial necrosis

Fig. 1 CT finding before onset of AAD
Maximum ascending aortic diameter was 45 mm.

Fig. 2 CT finding at onset of AAD
CT showed AAD and further dilatation of the ascending aorta to 55 mm.

existing mild to moderate aortic enlargement¹⁾. In the present study, no patients had sports-related dissection. However, all patients had some additional risks for aortic dissection, such as hypertension, type B dissection, bicuspid aortic valve, a sleep disorder⁶⁾, or pregnancy.

Aortic dissection occurs when the wall stress reaches a dangerous level and surpasses wall strength. Therefore, preventive surgical extirpation of the ascending aorta when the diameter reaches approximately 5 cm is recommended⁵⁾. The fact that aortic diameter in our patients had reached a dangerous level and that all had additional risks of dissection might provide evidence in favor of preventive surgical extirpation of the ascending aorta. If so, the patient with left main coronary mal-perfusion in this study might have survived.

Conclusion

When the patient's aortic diameter, who was complicated by the risks of AAD, reached approximately 5 cm, it is necessary to consider whether preventive surgical extirpation is required or not.

Disclosure Statement

There is no conflict of interest.

References

- 1) Hatzaras I, Tranquilli M, Coady M, et al. Weight Lifting and Aortic Dissection: More Evidence for a Connection. *Cardiology* 2007; **107**: 103–106.
- 2) Itagaki R, Kimura N, Itoh S, et al. Acute type a aortic dissection associated with a sporting activity. *Surgery Today* 2017; **47**: 1163–1171.
- 3) Clark JM, Glagov S. Transmural organization of the arterial media. The lamellar unit revisited. *Arteriosclerosis* 1985; **5**: 19–34.
- 4) Nakashima Y. Pathogenesis of aortic dissection: Elastic fiber abnormalities and aortic medial weakness. *Ann Vasc Dis* 2010; **3**: 28–36.
- 5) Koullias G, Modak R, Tranquilli M, et al. Mechanical deterioration underlies malignant behavior of aneurysmal human ascending aorta. *J Thorac Cardiovasc Surg* 2005; **130**: 677–683.
- 6) Hata M, Yoshitake I, Wakui S, et al. Sleep disorders and aortic dissection in a working population. *Surg Today* 2012; **42**: 403–405.