

**Case Report**

# Localized Aortic Root Dissection Detected by Echocardiography: Series of Two Cases

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**To cite this article:**

Suining Li, Xiaoshen Zhang, Hua Lu, Jiawen Huang. Localized Aortic Root Dissection Detected by Echocardiography: Series of Two Cases. *Clinical Medicine Research*. Vol. 10, No. 3, 2021, pp. 102-104. doi: 10.11648/j.cmr.20211003.16

**Received:** June 7, 2021; **Accepted:** June 21, 2021; **Published:** June 25, 2021

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**Abstract:** Background: Computed Tomography Angiograph (CTA) is the golden standard for diagnosing aortic dissection (AD). However, echocardiography has some advantages over CTA in screening aortic root dissection. Objective: In this report, we present 2 cases of aortic root dissection not found by CTA but by echocardiography. Method: Two middle-aged male patients were admitted to our hospital due to similar symptoms of chest distress. Diastolic murmurs can be heard in the aortic valve second auscultation area. CTA showed aortic artifacts and no dissection signs. The preoperative echocardiography showed that the aortic root was dissected together with aortic valve, and then aortic regurgitation (AR) was formed during diastole. AD was considered. Result: The patients underwent Bentall operation with extracorporeal circulation through femoral arteriovenous cannula. The patients were diagnosed as DeBakey type II AD with severe AR during operation. Both of them recovered and were discharged smoothly after the operation. Conclusions: The diagnostic significance of CTA may be limited in some localized aortic root dissections. At this point, we can improve the accuracy of the diagnosis by echocardiography.

**Keywords:** Aortic Root Dissection, Diagnosis, Echocardiography, Bentall

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## 1. Introduction

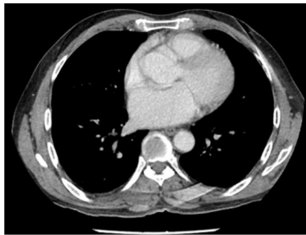
Aortic dissection (AD) is a well-known life-threatening emergency with an estimated incidence of 2 to 3.5 cases per 100000 person-years [1]. The Stanford classification of aortic dissection was described in 1970. The classification proposed that type A aortic dissection should be surgically repaired immediately, whereas type B aortic dissection can be treated medically [2]. Since then, diagnostic tools of aortic dissection have undergone substantial evolution [3]. Echocardiography is the most commonly used auxiliary examination in cardiovascular surgery [4]. It plays a certain role in screening AD and helps to clarify the aortic root lesions, but it is not the main diagnostic method for AD [5]. CTA is the golden standard for diagnosing AD. However, non-electrocardiogram-gated CTA may produce artifacts at the aortic root, affecting the accuracy of diagnosis [6]. In this report, we present 2 cases of aortic root dissection not

found by CTA but by echocardiography.

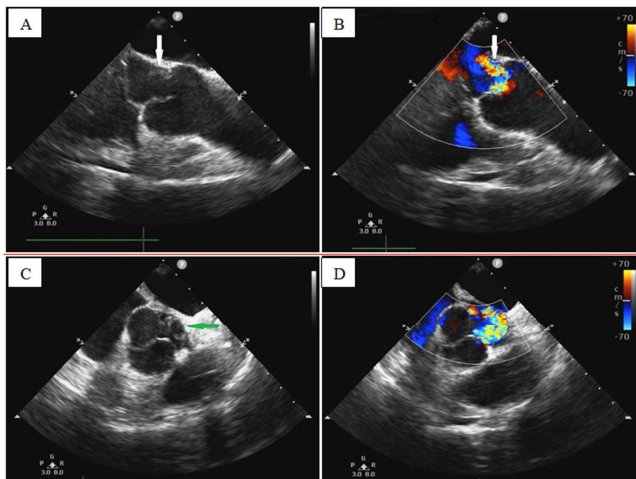
## 2. Case Presentation

*Case 1:* A 57-year-old male patient was admitted to our hospital due to repeated chest distress and shortness of breath about 1 month. There was a history of hypertension. Diastolic murmurs can be heard in the aortic valve second auscultation area. Laboratory tests showed no significant positive results. CTA showed aortic artifacts and no dissection sign (figure 1). Aortic valve tear with severe aortic regurgitation (AR) was diagnosed by Transthoracic echocardiography (TTE). The patient's symptoms were relieved by drug therapy of diuresis and blood pressure control, and valve replacement was planned. After general anesthesia, transesophageal echocardiography (TEE) showed that the aortic root was dissected together with the non-coronary aortic valve, and then flung into the left

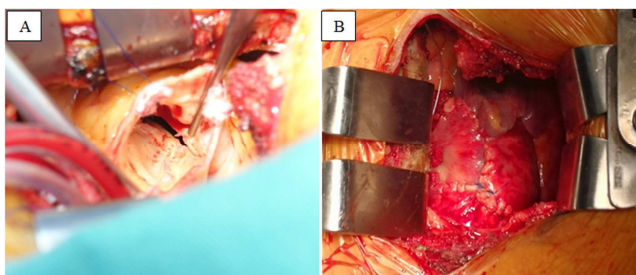
ventricle during diastole. AD was considered (Figure 2). The patient underwent extracorporeal circulation through femoral arteriovenous cannula. The incision at the right margin of the sternum was 9 cm long, and the right 3rd and 4th costal cartilage was cut off to expose the pericardium. During the operation, we found that the non-coronary sinus was dissected, involving the left-sided and right-sided borders, about 0.3 cm away from the opening of left coronary artery. The non-coronary aortic valve was torn to the root and confined to the aortic sinus (figure 3). Soon after the Bentall surgery, the patient recovered and were discharged smoothly.



**Figure 1.** CTA showed aortic artifacts and no dissection sign.



**Figure 2.** The aortic root was avulsed together with the uncaval valve (A, C), resulting in massive regurgitation of the aortic valve (B, D).



**Figure 3.** Dissection of the aortic root was identified intraoperatively (A) and Bentall was performed (B).

**Case 2:** A 50-year-old male patient was diagnosed with tuberculous pericarditis in the external hospital because of repeated chest pain and chest distress for about one month, and transferred to our hospital due to severe AR. There was no positive family history. Diastolic murmurs can be heard in the aortic valve second auscultation area. Laboratory tests showed

no significant positive results. CTA showed aortic artifacts and no dissection sign (Figure 4). TTE indicated aortic root dissection. The patient was diagnosed as DeBakey type II AD with severe AR. After general anesthesia, TEE showed that the aortic sinus was dissected, involving the left and right coronary valves, and the AR was formed during diastole (Figure 5). The patient underwent a median chest incision, extracorporeal circulation through femoral arteriovenous cannula. Direct perfusion of left and right coronary arteries was performed after occlusion of ascending aorta. The tear of intima was located between the openings of left and right coronary arteries, and limited to the aortic root. Bentall surgery was done and the patient recovered smoothly and got discharged soon after the operation.



**Figure 4.** CTA showed aortic artifacts and no dissection sign.



**Figure 5.** The aortic root was avulsed together with right coronary valve.

### 3. Discussion

AD is a life-threatening cardiovascular disease. AD is a fatal disease [7]. Which needs rapid diagnosis and treatment [8]. CTA, which has a high specificity in the diagnosis, is the first choice examination of AD [9]. But due to the impact of heart beat, non-electrocardiogram-gated CTA may induce motion artifacts of aortic root and ascending aorta, the value is not as good as expected [10]. In general, AD involves a large area, so even if there are artifacts, abnormalities can be found through other layers. However, the AD limited to the root is very rare, with the influence of artifacts, leading to missed diagnosis [11]. Moreover, type A aortic dissection is often associated with aortic regurgitation, which requires preoperative ultrasonography to guide intraoperative treatment of the aortic root [12]. It is also mentioned in the American Heart Association Thoracic Aortic Disease Guidelines that if the AD is highly suspected in clinical feature and the initial imaging examination is negative, another examination is needed [13]. The first patient had a history of acute AR, aortic valve tear was found by TTE, TEE before operation found that the aortic valve with the endocardial flap floating in the aortic root, and the presence of dissection was apparent during operation. The second patient had a history of pericardial effusion and chest pain. The floating intimal film of

aortic root was found by TTE and TEE. The possibility of AD was considered in both patients before operation. However, CTA found aortic root artifacts but not definite of AD. In these cases, echocardiography is undoubtedly the best choice. This is because echocardiography will not be affected by the heartbeat, we can clearly see the avulsion of aortic root intima, especially through TEE can be more direct observation [14]. However, the use of echocardiography as the diagnosis of aortic dissection is still lacking. On one hand, echocardiography can not provide a comprehensive dissection like CTA. On the other hand, TEE stimulation of the heart and aorta may increase the risk of dissection rupture. In addition, in patients with AR, if the tear of aortic valve is considered by ultrasound, CTA should be performed to exclude the possibility of AD [15].

## 4. Conclusions

In some localized aortic root dissections, the diagnostic significance of CTA may be limited. At this point, we can improve the accuracy of the diagnosis by transthoracic and transesophageal echocardiography, and provide important information for the operation plan.

## List of Abbreviations

CTA: Computed Tomography Angiograph;  
AD: Aortic dissection;  
AR: Aortic regurgitation;  
TTE: Transthoracic echocardiography;  
TEE: Transesophageal echocardiography.

## Declarations

### *Ethics Approval and Consent to Participate*

The patient provided full consent for the publication of the data. The need for ethics approval was not required describing this case.

### *Consent for Publication*

Written informed consent was obtained from the patient for publication of this case report and any accompanying images.

### *Availability of Data and Materials*

All data generated or analysed during this study are included in the published article.

### *Competing Interests*

The authors declare that they have no competing interests.

### *Funding*

Not applicable.

## Acknowledgements

Not applicable.

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