

# Hemorrhagic cardiac tamponade complicated by acute type A aortic dissection

## A case report with critical care ultrasound findings

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### Abstract

**Rationale:** Acute type A aortic dissection (AAAD) is a potentially fatal clinical crisis. Hemorrhagic cardiac tamponade due to the rupture of an ascending aortic root dissection is extremely dangerous and often lacks timely clinical evidence. We report sudden death in a patient diagnosed with AAAD and in whom critical care ultrasound highly indicated hemorrhagic cardiac tamponade.

**Presenting concerns:** A 75-year-old man was admitted to our emergency department with a complaint of chest pain for 8 hours. Computed tomography angiography findings indicated AAAD with a wide range of lesions. During the preoperative preparation process, he suddenly lost consciousness with a pulseless femoral artery.

**Diagnoses:** Cardiopulmonary resuscitation was initiated and critical care ultrasound revealed hemorrhagic cardiac tamponade, strongly indicating the rupture of an ascending aortic root dissection.

**Interventions:** However, family members refused further surgical interventions.

**Outcomes:** The etiology could not be reversed and the patient died.

**Lessons:** Critical care ultrasound is an important skill that intensivists should master for fast screening of life-threatening complications in patients with AAAD.

**Abbreviation:** AAAD = acute type A aortic dissection.

**Keywords:** acute type A aortic dissection, critical care ultrasound, hemorrhagic cardiac tamponade

## 1. Introduction

Acute type A aortic dissection (AAAD) is a critical condition with unacceptably high morbidity and mortality. Emergency surgical intervention is the treatment of choice. When left untreated, mortality rates can reach even 60%.<sup>[1]</sup> Hemorrhagic cardiac tamponade is occasionally reported in patients undergoing radiofrequency ablation<sup>[2]</sup> and anticoagulant therapy<sup>[3]</sup>; however, spontaneous rupture of an ascending aortic root associated with a hemorrhagic cardiac tamponade is seldom reported. This

mainly arises due to the rapid progress of an aortic dissection, and timely imaging evidence on this condition is scarce. Therefore, the final diagnosis usually comes from retrospective autopsy reports.<sup>[4]</sup> Herein, we report a life-threatening case of hemorrhagic cardiac tamponade complicated by AAAD with clear evidence from critical care ultrasound.

This study adhered to the tenets of the Declaration of Helsinki, and the ethics committee of the First Affiliated Hospital of Chongqing Medical University approved the study. Informed consent was obtained from the patient for publication of this report and its related images.

## 2. Case report

A 75-year-old man was admitted to our emergency department with a complaint of chest pain that spread to his back for 8 hours. The pain was described as a tearing feeling, which was not relieved by resting. He was immediately sent for radiological examinations. Computed tomography (CT) and computed tomography angiography findings indicated AAAD with a wide range of lesions, but there was no evidence of pericardium effusion (Fig. 1). He was a heavy tobacco user with a 50-year smoking history and 1 year of irregularly controlled hypertension.

He was transferred to the intensive care unit. Medical therapies to control pain and sustain hemodynamic stability were performed with continuous infusion of remifentanyl. During perioperative preparation, his chest pain exacerbated, followed by oxygen degeneration and unconsciousness. His blood pressure decreased to 65/47 mm Hg. Endotracheal intubation and mechanical ventilation were performed. Rapid fluid resuscitation and noradrenaline were used to maintain blood pressure. Critical care ultrasound was acquired. Vascular images showed a deflated

Editor: Jacek Bil.

RG and Y-MF contributed equally to this work.

**Funding:** This study is funded by the National Nature Science Foundation of China (No. 81201173).

The authors have no conflicts of interest to disclose.

Supplemental Digital Content is available for this article.

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Medicine (2017) 96:49(e8773)

Received: 26 July 2017 / Received in final form: 25 October 2017 / Accepted: 27 October 2017

<http://dx.doi.org/10.1097/MD.00000000000008773>



**Figure 1.** Computed tomography view of AAAD. (A) Image showing pathologic changes in the aortic root and ascending aorta. Longitudinal section (B) indicating involvement of the aortic arch, descending aorta, abdominal aorta, right common iliac artery, and external iliac artery. In addition, the ascending aorta, aortic arch, and thoracic aorta presented with a sleeve-like tear. Arrows indicate the dissection of the aortic wall and the asterisk (\*) means false lumen. AAAD = acute type A aortic dissection.

carotid artery with flow retention, but an enlarged jugular vein with a vortex blood flow (Fig. 2A, Video I in the online-only Data Supplement, <http://links.lww.com/MD/B992>). The subxiphoid 4-chamber view revealed hemopericardium with a collapsed right ventricle, highly indicative of acute cardiac tamponade (Fig. 2B, Video II in the online-only Data Supplement, <http://links.lww.com/MD/B993>). One minute later, a pulseless femoral artery was noted and cardiopulmonary resuscitation was initiated. However, we were not permitted to treat the etiology and the patient died.

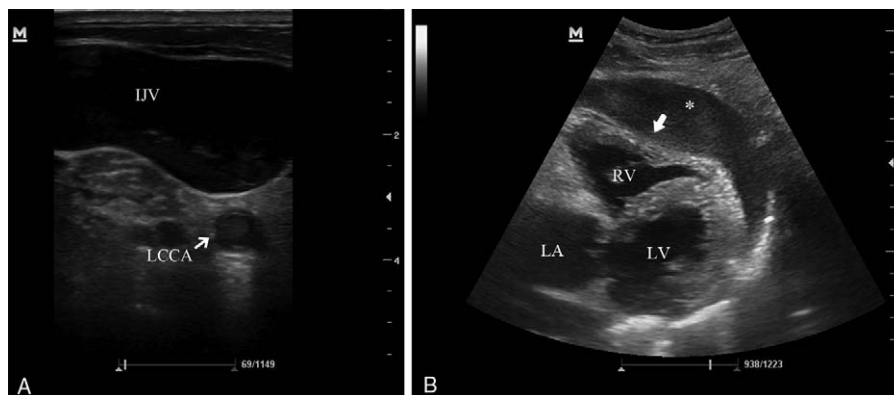
### 3. Discussion

Hemorrhagic cardiac tamponade caused by AAAD is a life-threatening emergency. In the case presented herein, endothelial injury due to a long-term smoking history, irregularly controlled hypertension, and being elderly were the major risk factors. In a previous study, patients with diffuse lesions (as detected via angiography), especially arch vessel involvement, more frequently experienced syncope.<sup>[5]</sup> In our case, severe shrinkage of the common carotid artery (Fig. 2A) was due to acute cardiac tamponade associated with diastolic dysfunction, which caused

insufficient blood supply. This phenomenon leads to decreased blood flow to the brain, leading to sudden loss of consciousness.

Strategies for treating hemorrhagic cardiac tamponade secondary to the rupture of an AAAD are woefully limited. Pericardiocentesis is the primary choice for cardiac tamponade, but it is not recommended for hemopericardium induced by AAAD.<sup>[6]</sup> Because drainage may worsen the leakage and aggravate the tear, pericardiocentesis could increase mortality in this situation.<sup>[7]</sup> Recently, a method to immediately repair aorta after timely controlled pericardial drainage to maintain blood pressure at  $\approx 90$  mm Hg was developed to improve survival until surgery.<sup>[8]</sup>

Nevertheless, perioperative management by reducing blood pressure and cardiac contractility is still the cornerstone for the treatment of AAAD. Current guidelines recommend opiate analgesia to control pain as needed.<sup>[9]</sup> In our case, we used remifentanyl as a stronger analgesic for continuous pain management. However, this strategy is a double-edged sword. Although sufficient analgesia could minimize aortic wall shear stress due to pain-related sudden rises in arterial blood pressure, careless monitoring may blunt the signs used for the early identification of cardiac tamponade due to AAAD. Therefore,



**Figure 2.** Critical care ultrasound. (A) Dilated jugular vein with a vortex blood flow and a deflated carotid artery. (B) Cardiac tamponade; the white arrow indicates a collapsed right ventricle and the asterisk (\*) indicates hemopericardium. IJV = internal jugular vein, LA = left atrial, LCCA = left common carotid artery, LV = left ventricle, RV = right ventricle.

dynamic monitoring and timely assessment with critical care ultrasound can improve the early detection and management of the often fatal complications of AAAD.

#### 4. Conclusions

In patients with AAAD, chest pain may represent not only a tear or damage to the inner wall of the aorta but also rupture of an aortic dissection. Therefore, in addition to analgesic treatment, dynamic monitoring is necessary. Critical care ultrasound is a bedside technique that provides fast screening of this life-threatening complication, which may help intensivists identify the etiology early and conduct timely surgical interventions to reduce mortality associated with hemorrhagic cardiac tamponade due to AAAD.

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