Case report

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Atypical presentation of DeBakey type I aortic dissection mimicking pulmonary embolism in a pregnant patient: a case report

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Aortic dissection in pregnant patients results in an inpatient mortality rate of 8.6%. Owing to the pronounced mortality rate and speed at which aortic dissections progress, efficient early detection methods are crucial. Here, we highlight the importance of early chest computed tomography (CT) for differentiating aortic dissection from pulmonary embolism in pregnant patients with dyspnea. We present the unique case of a 38-year-old pregnant woman with elevated D-dimer and N-terminal pro-brain natriuretic peptide (NT-proBNP) levels, initially suspected of having a pulmonary embolism. Initial transthoracic echocardiography did not indicate aortic dissection. Surprisingly, after an emergency cesarean section, a chest CT scan revealed a DeBakey type I aortic dissection, indicating a diagnostic error. Our findings emphasize the need for early chest CT in pregnant patients with dyspnea and elevated D-dimer and NT-proBNP levels. This case report highlights the critical importance of considering both aortic dissection and pulmonary embolism in the differential diagnosis of such cases, which will inform future clinical practice.

Keywords: Aortic dissection; Dyspnea; Pregnancy complications; Pulmonary embolism

Introduction

Aortic dissection occurs in 5.5 out of every 100,000 hospitalized pregnant patients or those in the postpartum period, with an inpatient mortality rate of 8.6% [1]. This rate is significantly higher than the 0.0026% in-hospital all-cause mortality rate in patients without cardiovascular disease [2]. Notably, aortic dissection tends to occur most frequently during the final stages of pregnancy and early postpartum period, owing to peak enhancements in maternal cardiac output and hormonal activation [3]. Because the mortality rate associated with aortic dissection is pronounced and increases by 1% with each passing hour [4], early detection is of paramount importance. Although chest and back pain are typical symptoms, dyspnea is a prominent symptom in cases of pulmonary embolism, and the incidence is notably higher in pregnant patients than in non-pregnant individuals [5]. However, the mortality rate for pulmonary embolism is 0.002%, which is lower than that for aortic dissection [5]. Although there is existing case report on late-pregnancy aortic dissection, previous reports have featured typical chest pain, making the diagnosis less challenging [6].

Here, we report a case of DeBakey type I aortic dissection that primarily manifested as dyspnea without chest pain. The patient

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underwent an emergency cesarean section with suspected pulmonary embolism but was later diagnosed with aortic dissection. Overall, both aortic dissection and pulmonary embolism should be considered in the differential diagnosis of pregnant patients with dyspnea, as the management and outcomes of these conditions differ significantly.

Case

Ethical statements: This case report was approved by the Institutional Review Board (IRB) of Keimyung University Dongsan Hospital (IRB No: 2023-07-063) on July 28, 2023, and the need for patient informed consent was waived.

A 38-year-old pregnant woman in her third trimester (gestational age, 36 weeks; gravida two, para one; height, 171 cm; weight, 81.7 kg; body mass index, 27.9 kg/m^2) visited the emergency department because she had been experiencing exertional dyspnea for the past 5 days. The patient had a history of gestational diabetes mellitus and hypertension. Because there was no record of genetic testing, the presence of genetic disorders could not be determined. Her initial vital signs included elevated blood pressure (130/70 mmHg), normal peripheral oxygen saturation (97%), and normal serum blood glucose levels (120 mg/dL). Although she was tachycardic (113 beats/minute), her heart rhythm by electrocardiography was normal. The patient's initial D-dimer and N-terminal pro-brain natriuretic peptide (NT-proBNP) levels were elevated, measuring 4.43 μg/mL and 5,387 pg/mL, respectively. No abnormalities were noted on chest radiograph (Fig. 1). Bedside transthoracic echocardiography (TTE) was performed in a limited manner, acquiring only apical four-chamber and parasternal short-axis view at mid-ventricle level, which revealed a dilated right ventricle and reduced right ventricular systolic function without pericardial effusion (Fig. 2). The cardiologist suspected pulmonary thromboembolism considering the patient's symptoms, elevated D-dimer level, and right ventricular dysfunction on TTE. However, considering the possible harm to the unborn child from ionizing radiation, a decision was made to prioritize emergency cesarean section.

Upon admission to the operating room, the patient's initial blood pressure was 99/52 mmHg, heart rate was 95 beats/minute, and peripheral oxygen saturation was 97% on 3 L/minute of oxygen via a nasal cannula. Spinal anesthesia was performed in the sitting position using 0.5% bupivacaine 10 mg and fentanyl 15 μg. During the surgery, phenylephrine 200 μg was administered when the patient's systolic blood pressure fell below 80 mmHg. The surgery lasted 80 minutes, and chest computed tomography (CT) was performed immediately afterward. Unexpectedly, the anticipated pulmonary embolism could not be found; however, a De-

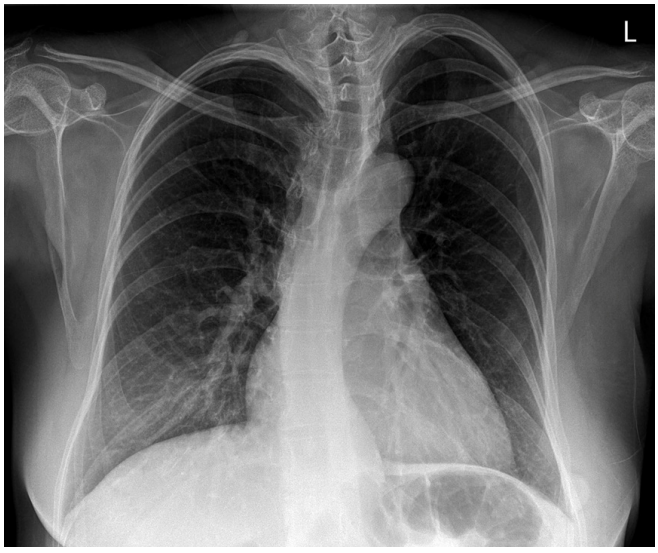

Fig. 1. Normal preoperative chest radiography.

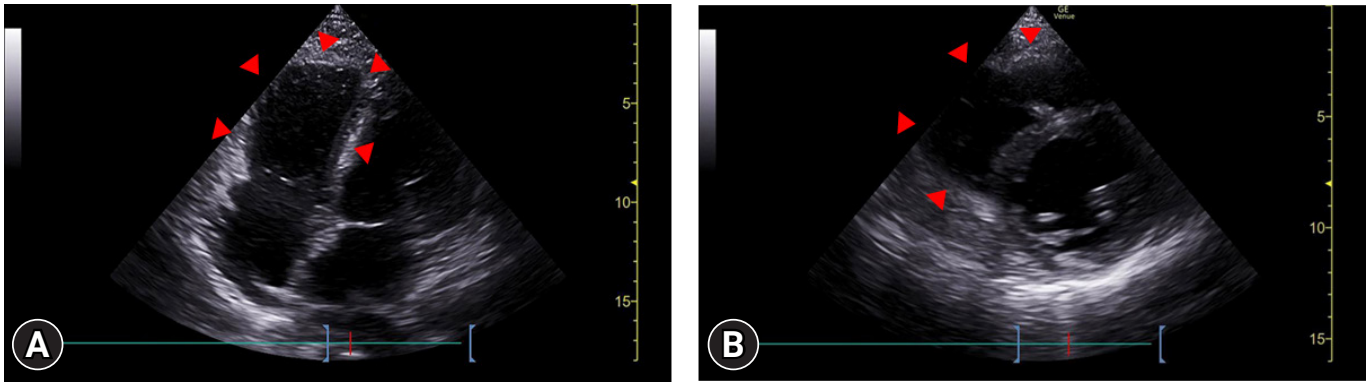

Fig. 2. Transthoracic echocardiography shows dilated right ventricle (arrowheads) and reduced right ventricular systolic function. (A) Apical four-chamber view. (B) Parasternal short-axis view at mid-ventricle level.

Bakey type I aortic dissection was detected (Fig. 3). The patient was immediately transferred to the operating room, where she underwent the Bentall procedure, hemiarch replacement, and coronary artery bypass graft surgery that lasted 7 hours. These procedures were necessary because extension of the dissection flap to the aortic valve caused severe aortic regurgitation (Fig. 4), and transection of the right coronary artery. The patient was discharged on postoperative day 11 without any complications. Two months after surgery, genetic testing confirmed the diagnosis of Marfan syndrome.

Discussion

Aortic dissection is classified as hyperacute, acute, subacute, or chronic, based on the timing of symptom onset [7]. As illustrated in this case, aortic dissection is defined as acute when the diagnosis is made within 2 weeks of symptom onset. In contrast, pulmonary embolism, as initially suspected in this case, is typically characterized by sudden onset dyspnea within 48 hours [8], which was not consistent with the observations of this case. Dyspnea can be a primary symptom of aortic dissection due to airway compression, cardiac tamponade, or aortic regurgitation, as observed in our case.

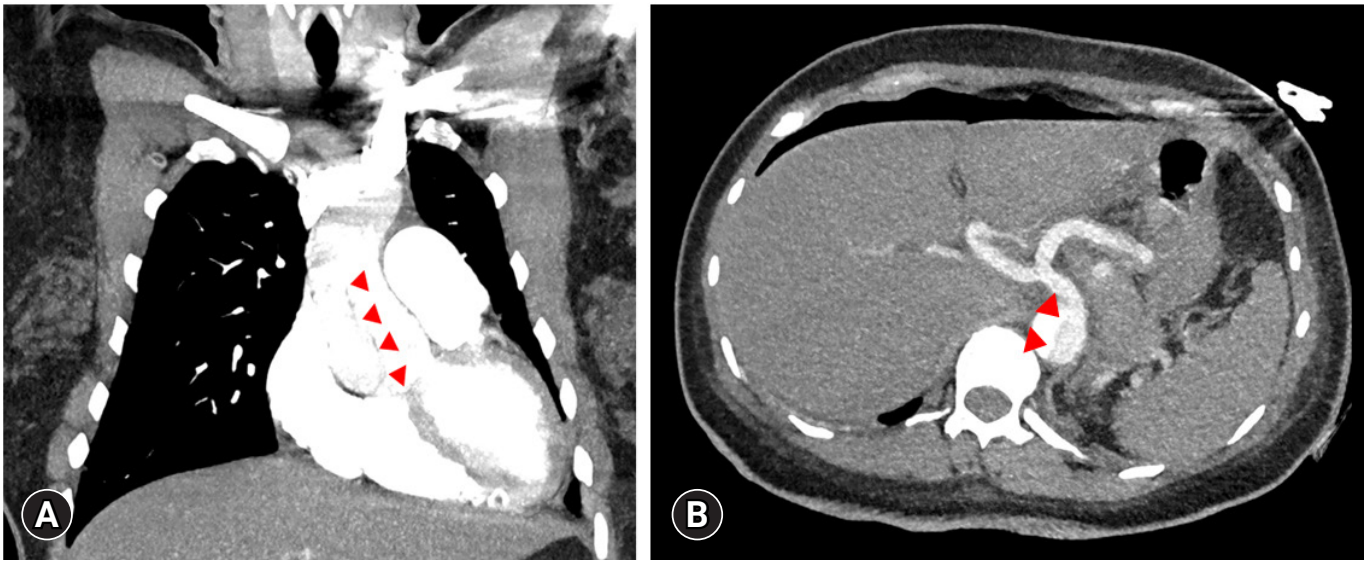

Fig. 3. Chest computed tomography shows (A) ascending (coronal view) and (B) abdominal aortic dissection (transverse view). Arrowheads indicate the dissection flap.

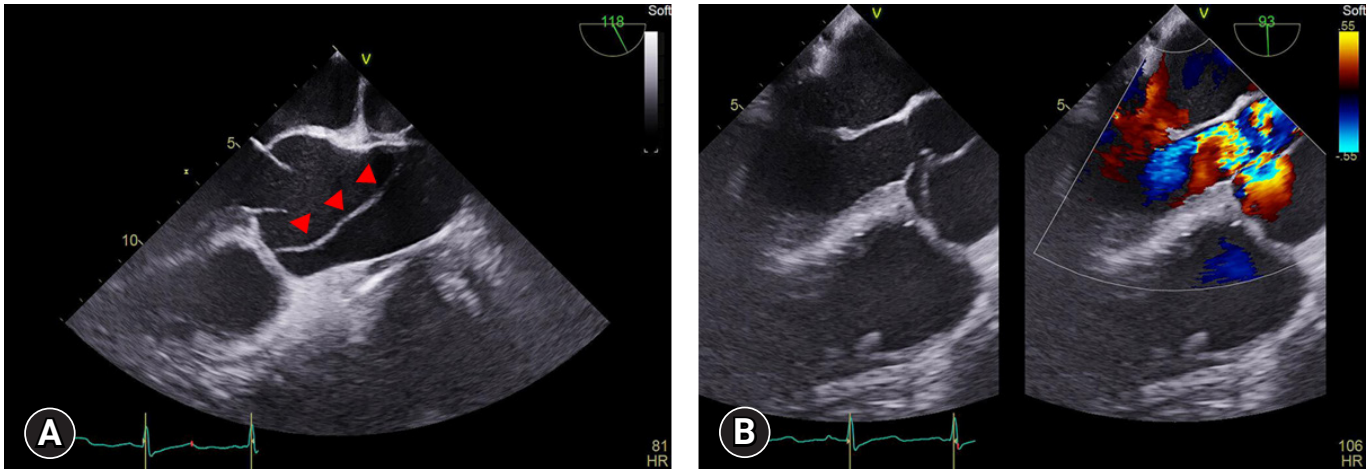

Fig. 4. (A) Intraoperative transesophageal echocardiography (mid-esophageal long-axis view). The dissection flap (arrowheads) is seen in the proximal ascending aorta. (B) Systolic aortic regurgitation is also seen.

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The risk factors for aortic dissection and pulmonary embolism differ [1,9]. The risk factors associated with our patient were hypertension and gestational diabetes for aortic dissection, and age >35 years for pulmonary embolism (Table 1) [1,9]. These factors also favor the diagnosis of aortic dissection.

According to Li et al. [10], D-dimer levels are significantly elevated in patients with acute aortic dissection and those with pulmonary embolism. Therefore, D-dimer levels cannot serve as a differentiating marker as there is no distinct variance in the values between the two conditions, with reported median values of 0.38 and 2.72 μg/mL, respectively [10]. High NT-proBNP levels are observed in both diseases. In acute aortic dissection, elevated NT-proBNP (>600 pg/mL) is observed owing to increased ventricular wall afterload caused by uncontrolled hypertension and is associated with a poor outcome, with a prognostic sensitivity of 96% and specificity of 55% [11,12]. Similarly, in pulmonary embolism cases, an initial NT-proBNP level >600 pg/mL has a sensitivity of 100% and specificity of 33% for predicting mortality, indicative of right ventricular dysfunction [13].

A definitive diagnosis is made based on radiographic examination. The 2018 European Society of Cardiology guidelines recommend TTE for patients to manage cardiovascular diseases during pregnancy, and chest CT examination to rule out the possibility of pulmonary embolism [14]. However, it is important to note that TTE has a sensitivity of 78% to 90% for diagnosing ascending aortic dissection, indicating a risk of misdiagnosis [15]. A characteristic finding of TTE in patients with pulmonary embolism is right ventricular dysfunction [16]. Therefore, the cardiologist in this case examined only the apical four-chamber and parasternal short-axis view at the mid-ventricle level. Moreover, the use of TTE for the diagnosis of pulmonary embolism is limited owing to its low sensitivity (70%) and specificity (33%) [17]. In this case, the aortic dissection involving the right coronary artery manifested as right ventricular dysfunction, further complicating the differentiation between these two conditions with TTE. In addition, the recently published pregnancy-adapted YEARS algorithm recommends performing chest CT to diagnose pulmonary embolism, even in the absence of symptoms, when the D-dimer level is >1,000 ng/mL [18]. In this case, only TTE was performed before the cesarean section because of concerns regarding fetal radiation exposure from the CT scan. However, given the low sensitivity of TTE in differentiating between aortic dissection and pulmonary embolism, coupled with the patient's elevated D-dimer and NT-proBNP levels, both critical indicators for assessing patient outcomes, a prompt chest CT scan may have been more beneficial. Furthermore, radiation doses <0.5 Gy are safe for women in their third trimester of pregnancy. Since the radiation dose for a CT scan to diagnose aortic dissection is <0.5 Gy, it can be considered safe [19]. A direct CT scan in this case might have allowed for a more definitive diagnosis and the immediate management of DeBakey type I aortic dissection.

Table 1. Risk factors associated with aortic dissection and pulmonary embolism

Risk factors for aortic dissection [1]	Risk factors for pulmonary emboli [9]
Hypertension	Prior venous thromboembolism
Body mass index, >30 kg/m^2	Body mass index, >30 kg/m^2
Marfan syndrome	Familial venous thromboembolism
Ehlers-Danlos syndrome	Age, >35 years
Gestational diabetes	Parity, >3
Preeclampsia/eclampsia	Preeclampsia

Unlike previous report describing typical chest pain in pregnant patients with aortic dissection [6], this case report offers valuable insights into the differential diagnosis and management of aortic dissection and pulmonary embolism in pregnant patients with atypical symptoms. This report uniquely combines the examination of various laboratory parameters, such as D-dimer and NT-proBNP levels, with the evaluation of patient symptoms and history, highlighting the importance of early comprehensive assessment with an early CT scan in reaching an accurate diagnosis. In addition, this differential diagnosis adheres to established guidelines and recently published algorithms, thereby demonstrating an up-to-date approach for disease diagnosis.

This case report has several limitations. It reports observations from a single case, which limits its applicability to a broader patient population. In this case, the initial evaluation with TTE was conducted within a limited scope, without observing the aortic valve and ascending aorta. Notably, detecting an intimal flap, tear, or hematoma in the proximal aorta has a significant diagnostic value for ascending aortic dissection [20]. Therefore, the lack of a comprehensive examination in these areas may have contributed to the delay in diagnosis. However, this limitation underscores the importance of thorough initial assessments to distinguish between aortic dissection and pulmonary embolism during early evaluation. This case report also does not provide a comparative analysis with similar cases. Further research should be conducted to verify whether the initial application of chest CT in pregnant patients exhibiting dyspnea and elevated D-dimer and NT-proBNP levels truly improves patient outcomes by facilitating the early differential diagnosis of aortic dissection and pulmonary embolism.

In conclusion, this case report underscores the importance of considering both aortic dissection and pulmonary embolism in the differential diagnosis of dyspnea in pregnant patients. Specifically, owing to the potential implications of elevated D-dimer and

NT-proBNP levels for adverse outcomes in both conditions, immediate implementation of a chest CT scan is particularly crucial in pregnant patients exhibiting dyspnea and elevated biomarkers. In addition, when conducting TTE in these patients, a thorough examination that includes the ascending aorta should be performed to enhance diagnostic accuracy.

Article information

Conflicts of interest
No potential conflict of interest relevant to this article was reported.

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