

# A case report of unexpected sudden cardiac death due to aortic rupture following laparoscopic appendectomy

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## Abstract

**Introduction:** Aortic dissection is a very rare but life-threatening condition associated with a high mortality. Unexpected sudden cardiac death due to aortic rupture following laparoscopic appendectomy is very rare and may be difficult to diagnose. However, early diagnosis of aortic dissection is essential for the timely treatment and outcome of aortic dissection.

**Case presentation:** A 50-year-old man underwent a laparoscopic appendectomy. Postoperatively, the patient complained of dyspnea and chest pain. In 25 minutes after arrival in the postanesthesia care unit (PACU), the patient was in asystole. Then, he underwent cardiopulmonary resuscitation (CPR) according to advanced cardiac life support (ACLS) protocol using 1 mg of epinephrine, one 200J DC shock for ventricular fibrillation (V-fib). After that, his noninvasive blood pressure (NIBP) was 80/40 mm Hg, pulse rate (PR) was 140 beats/min, and peripheral oxygen saturation (SpO<sub>2</sub>) was 84%. His electrocardiogram (ECG) finding was atrial fibrillation (A-fib). After 20 minutes, the patient developed asystole rhythm again and CPR was restarted. He remained severely hypotensive despite vasopressors and died after 5 hours CPR. A forensic autopsy was performed postmortem and thoracic and abdominal aortic dissection along the root of ascending aorta was present and massive hematoma within right and left thorax was present.

**Conclusion:** Acute aortic disease can be difficult to recognize; therefore, diagnosis is sometimes delayed or missed. It is important to recognize the atypical symptoms of aortic dissection and maintain a broad differential diagnosis if patients complained of abdominal pain.

**Abbreviations:** ACLS = advanced cardiac life support, A-fib = atrial fibrillation, BP = blood pressure, CPR = cardiopulmonary resuscitation, ECG = electrocardiogram, HR = heart rate, NIBP = noninvasive blood pressure, PACU = postanesthesia care unit, PR = pulse rate, SpO<sub>2</sub> = peripheral oxygen saturation, TEE = transesophageal echocardiography, V-fib = ventricular fibrillation.

**Keywords:** acute aortic dissection, acute aortic syndrome, appendectomy, cardiopulmonary resuscitation

## 1. Introduction

Aortic dissection is a very rare but life-threatening condition associated with a high mortality.<sup>[1]</sup> The incidence of acute aortic dissection is 2.53/1,000,000 per year.<sup>[1]</sup> Because acute aortic disease can be difficult to recognize, diagnosis is sometimes delayed or missed.<sup>[2]</sup> Furthermore, acute aortic dissection can result in catastrophic complications or sudden diagnosed and

untreated, which is associated with a high mortality rate of 1% to 2% per hour.<sup>[3]</sup> Therefore, it is important to diagnose acute aortic dissection fast and accurately.

We report a rare case of unexpected sudden cardiac death due to aortic rupture following laparoscopic appendectomy.

## 2. Case report

A 50-year-old male patient with acute right lower quadrant pain was admitted to our hospital for emergency laparoscopic appendectomy under general anesthesia. He suffered from right ureter stone 2 years ago. Except that, the patient was in good health. The patient suffered from acute right lower quadrant stabbing pain from 11 AM. The physical examination was remarkable for tenderness on the right lower quadrant area. The patient's preoperative chest X-ray finding, laboratory finding, and electrocardiogram were all within normal range. His preoperative blood pressure (BP) was 125/79 mm Hg, and pulse rate (PR) was 80 beats/min. General anesthesia was induced with 350 mg of thiopental, 80 mg of succinylcholine, and 50 µg of fentanyl. Tracheal intubation was done without difficulty on a single try. And then anesthesia was maintained with 6 vol % of desflurane. The patient was monitored with noninvasive blood pressure (NIBP), ECG (lead II), pulse oximetry, and capnography. During the operation, BP, PR, and SpO<sub>2</sub> were maintained at 110 to 150/65 to 90 mm Hg, 80 to 110 beats/min, and 99% to 100%, respectively. And there was no problem during appendectomy. When the anesthesia was over, NIBP was 120/70

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and PR was 100 beats/min. On arrival in the postanesthesia care unit (PACU), the patient complained of severe dyspnea and chest pain, which was persisted and worsened. At that time, NIBP was 100/60, PR was 100 beats/min, but SpO<sub>2</sub> was 85% to 94%. Respiratory rate was 30 breaths/min. Thus naloxone 0.2 mg was administered. In 25 minutes after arrival in the PACU, the patient was in asystole. And then he underwent cardiopulmonary resuscitation according to ACLS protocol using 1 mg of epinephrine, one 200J DC shock for V-fib. After that, his NIBP was 80/40 mm Hg, PR was 140 beats/min, and SpO<sub>2</sub> was 84%. His ECG finding was A-fib. After 20 minutes, the patient developed asystole rhythm again and CPR was restarted. He remained severely hypotensive despite vasopressors, and died after 5 hours CPR. Because the patient's vital signs abruptly worsened, we could not perform additional evaluation such as chest X-ray, transthoracic echocardiography, thoracic computed tomography (CT) scan, etc. Then, a forensic autopsy was performed postmortem and thoracic and abdominal aortic dissection along the root of ascending aorta was present and massive hematoma within right and left thorax was present. And there was acute inflammation of appendix. Other findings were essentially normal. The patient had no family history of vascular disease or clinical features of connective tissue disease. He has no marfanoid habitus. This is the second case in the literature of acute aortic dissection occurring after laparoscopic appendectomy. This case was approved by Ethics Review Committee and the Institutional Review Board (OC18ZESI0062). Informed written consent was obtained from the patient's elder brother for publication of this case report and accompanying images.

### 3. Discussion

Aortic dissection is a very rare but life-threatening condition associated with a high mortality. The incidence of aortic dissection is 2.53/100,000 per year.<sup>[11]</sup> The risk factors for aortic dissection include hypertension, connective tissue disease, atherosclerosis, Marfan syndrome, Ehlers–Danlos syndrome, other connective tissue disorders, Turner syndrome, bicuspid aortic valve, aortic coarctation, cocaine use, pregnancy, and trauma.<sup>[4–10]</sup>

In this case, 2 scenarios are possible; the dissection was present before the operation. Aortic dissection occurs when the intimal layer tears due to sudden shear stress.<sup>[11]</sup> Especially, uncontrolled high BP is the major risk factor for aortic dissection. If the force of the blood pressing against the aortic wall is too high, it can lead to a tear of the wall. If the patient who underwent laparoscopic appendectomy had a cardiovascular problem with preexisting ascending aorta tear, this give rise to aortic dissection. Therefore, during induction of anesthesia for aortic dissection, smooth and deep induction is needed.<sup>[12]</sup> But in our case, we could not be suspicious of acute aortic dissection because the patient has no past history of cardiovascular disease. In a previous case,<sup>[13]</sup> a 43-year old woman with Marfan syndrome was diagnosed as dilated ascending aorta with a circular shape intimal flap at the root level, which resulted in death within 20 seconds of examination of subsequent transesophageal echocardiography (TEE). That was a very rare case of death, which could be related to TEE and deep sedation might be required to prevent the increase of BP.

Acute aortic dissection was most common cause of sudden unexpected death of aortic disease and a very catastrophic cardiovascular disease, which is associated with high mortality if undiagnosed and untreated. And acute aortic disease can be difficult to recognize or missed; therefore, diagnosis is sometimes

delayed or missed. In a retrospective study of forensic autopsy cases, 26 patients were clinically misdiagnosed with acute myocardial infarction (9 cases), coronary artery disease (6 cases), cholecystitis (4 cases), acute gastroenteritis (3 cases), renal/urinary calculi (3 cases), and acute pancreatitis (3 cases). Of this study, 22 cases were type A aortic dissection (84.6%) and 4 cases (15.4%) were type B dissection.<sup>[14]</sup> Classical symptom of aortic dissection is usually sudden chest pain or back pain, but they are atypical and nonspecific symptoms of aortic dissections. In several reported case reports, presenting symptom of aortic dissection was acute abdominal pain,<sup>[15–17]</sup> but its incidence was rare (4.6%) by Upchurch et al.<sup>[18]</sup>

To be diagnosed with acute appendicitis and aortic dissection together at the same time is extremely rare. Looking for the literature, there was only 1 case report of missed diagnosis of acute standard type A aortic dissection presenting with abdominal pain in the setting of acute appendicitis.<sup>[19]</sup> In that case, the patient who underwent laparoscopic appendectomy distressed pulmonary edema in the PACU and he was diagnosed for acute aortic dissection by means of chest CT and transthoracic echocardiogram and because his vital sign were stable compared with our patient.

Unlike previous descriptions, a new aortic dissection due to lengthy CPR is a possible scenario of this case.

Cardiac injury is a rare complication from standard CPR with only a few cases reported.<sup>[20–22]</sup> Because the patient had received CPR for a long time, it might have injured the preexisting dilated aorta or ingenerated new aortic dissection. However, isolated aortic rupture or vascular injury as a result of CPR is rare, and its reported incidence was 1%.<sup>[23]</sup> And in our patient, there was an injury including, bilateral rib fractures and ruptured pericardium, but this occurs during the late phase of CPR at autopsy finding. Therefore, CPR after operation was not the cause of the acute aortic dissection.

In conclusion, this case is a second unfortunate case of unexpected sudden cardiac death due to aortic rupture following laparoscopic appendectomy. And it is important to recognize the atypical symptoms of aortic dissection and maintain a broad differential diagnosis if patients complained abdominal pain.

### Author contributions

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**Investigation:** Joo-Won Min, Giyong Noh.

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