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Case Report

Obstructive shock with mediastinal hematoma caused by chest compressions after successful primary percutaneous coronary intervention

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ABSTRACT

A 75-year-old man with a history of hypertension was transferred to our hospital due to pulseless ventricular tachycardia. When return of spontaneous circulation was achieved, an electrocardiogram showed ST elevation in V1-4 leads. Successful primary percutaneous coronary intervention was performed. However, on the next day, the patient's systolic blood pressure dropped to 60 mmHg despite using high-dose inotropic agents. Echocardiography and chest computed tomography revealed large mediastinal hematoma. A diagnosis of obstructive shock caused by massive mediastinal hematoma was made. Emergency surgical evacuation of hematoma and hemostasis was successfully performed.
<**Learning objective:** In a case with cardiac arrest due to ST-segment elevation myocardial infarction, primary percutaneous coronary intervention is necessary after successful cardiopulmonary resuscitation. However, chest compressions may cause severe trauma and subsequently massive hemorrhage under high-dose antiplatelet use. Careful monitoring of hemodynamic parameters is necessary even after successful coronary revascularization.>

Introduction

In a case with cardiac arrest due to ST-segment elevation myocardial infarction (STEMI), primary percutaneous coronary intervention (PCI) is necessary when return of spontaneous circulation (ROSC) is achieved. However, chest compressions may cause severe trauma and subsequently massive hemorrhage because loading of high-dose dual antiplatelet therapy (DAPT) is necessary in a case with STEMI [1]. To detect fatal hemorrhagic complications such as hemothorax, cardiac tamponade, and mediastinal hematoma, careful monitoring of hemodynamic parameters is necessary even after successful coronary revascularization. We report a case with obstructive shock caused by mediastinal hematoma after successful primary PCI, which was successfully surgically treated.

Case report

A 75-year-old man with a history of hypertension presented to a clinic in his neighborhood because of dizziness. Soon after arrival, he lost his consciousness due to pulseless ventricular tachycardia. Medical staff at the clinic immediately started cardiopulmonary resuscitation (CPR). After chest compressions and repeat electrical defibrillation for more than 10 min, ROSC was achieved. Then the patient was transferred to our hospital. When he arrived at our hospital, electrocardiogram showed ST elevation in V1-4 leads (Fig. 1), and a diagnosis of STEMI was made. A physical examination revealed the following findings: body temperature, 36.5 °C; blood pressure, 77/47 mmHg; pulse rate, 89/min and regular; and oxygen saturation, 98% on 4 L oxgen. The findings of a laboratory analysis were as follows: white blood cell count, 9100/μL (with a normal

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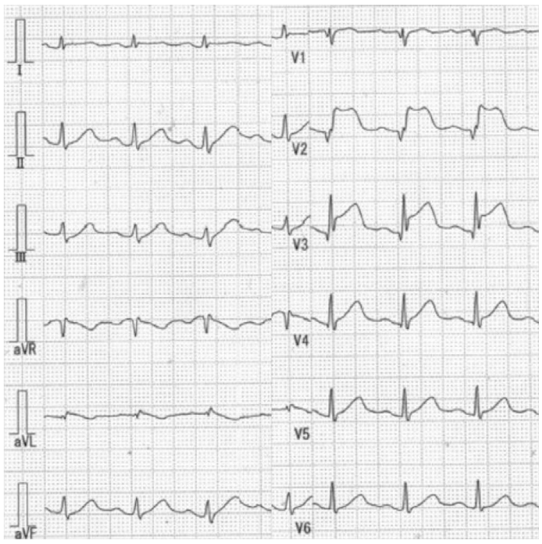

Fig. 1. Electrocardiogram revealed ST elevation in V1-4 leads.

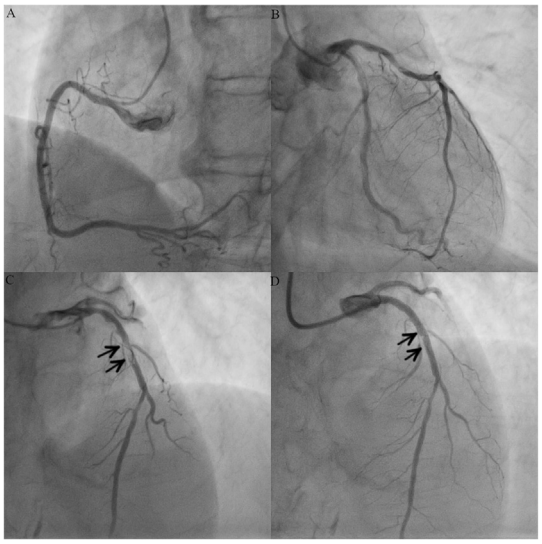

Fig. 2. (A) There was no significant stenosis in right coronary artery. (B) There was no significant stenosis in left circumflex artery. (C) Coronary angiography revealed a 99% stenosis (black arrows) lesion in proximal left anterior descending artery (LAD). (D) After drug-eluting stent implantation in a proximal LAD lesion (black arrows), thrombolysis in myocardial infarction 3 coronary flow was obtained.
LV, left ventricle; RV, right ventricle.

differential); red blood cell count, 373 × 10^4/μL; hemoglobin, 12.4 g/dl; platelet count, 15.3 × 10^4; creatinine kinase, 130 IU/L; aspartate aminotransferase, 368 U/L; alanine aminotransferase, 304 U/L; B-type natriuretic peptide, 17.6 pg/mL (normal range: <18.4 pg/mL). Aspirin 243 mg, prasugrel 20 mg, and intravenous unfractionated heparin 10,000 units were administered before emergent coronary angiography, which revealed a 99% stenosis of proximal left anterior descending artery (Fig. 2C). A drug-eluting stent was successfully implanted in the lesion (Fig. 2D). The patient was transferred to intensive care unit and his vital signs were stable including systolic blood pressure of 90–100 mmHg. The next day, his systolic blood pressure dropped to 60 mmHg despite using high-dose inotropic agents. His hemoglobin level dropped to 9.3 mg/dl from 12.4 mg/dl on admission. Echocardiography and chest computed tomography (CT) revealed large mediastinal hematoma (Fig. 3A,B). Echocardiography revealed collapsed left atrium (Fig. 4). A diagnosis of obstructive shock caused by massive mediastinal hematoma was made. We did not perform contrast-enhanced CT because of the patient's unstable condition. Emergency operation of evacuation of hematoma and hemostasis was performed. After a midline sternotomy, massive mediastinal hematoma was removed (Fig. 5A,B). Antiplatelets and anticoagulant agents were discontinued to stop bleeding. After blood transfusion of red blood cells, platelets, and fresh frozen plasma, his hemoglobin level had improved up to 13.4 mg/dl and hemodynamically stabilized. The postoperative course was uneventful, and repeat CT revealed resolution of mediastinal hematoma on postoperative day (POD) 28 (Fig. 3C,D). The patient was discharged from our hospital on POD 35 without any neurological sequelae.

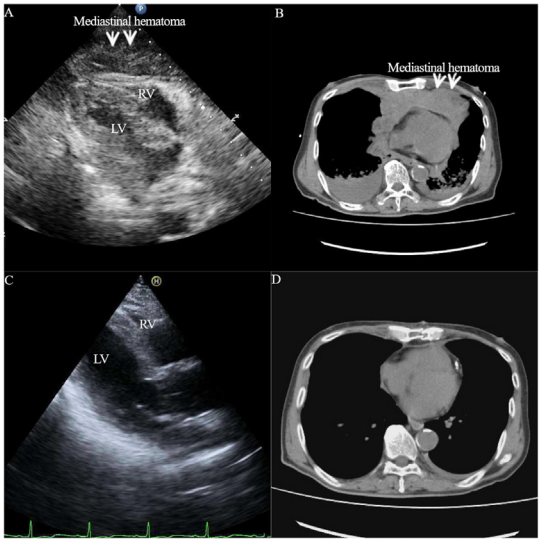

Fig. 3. (A) Echocardiography revealed massive mediastinal hematoma (white arrows). (B) Chest computed tomography (CT) revealed massive mediastinal hematoma (white arrows) and hemothorax. (C) Repeat echocardiography revealed resolusion of mediastinal hematoma. (D) Repeat CT revealed resolution of mediastinal hematoma and hemothorax on postoperative day 28.
LV, left ventricle; RV, right ventricle.

Discussion

High quality cardiopulmonary resuscitation is recommended for survival from cardiac arrest in the 2017 American Heart Association Guidelines for CPR and emergency cardiovascular medicine [2]. On the other hand, chest compressions sometimes cause chest injuries and it can progress to fatal hemorrhagic

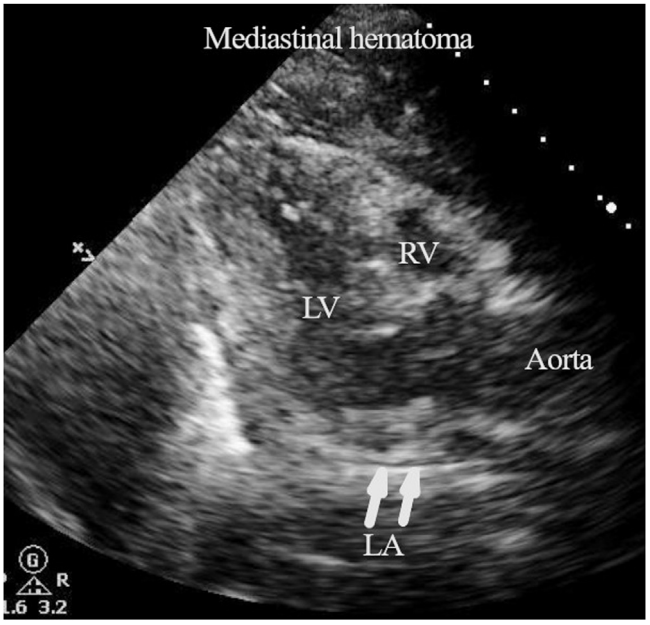

Fig. 4. Echocardiography (parasternal long-axis view) revealed mediastinal hematoma and collapsed left atrium (white arrows). LV, left ventricle; RV, right ventricle.

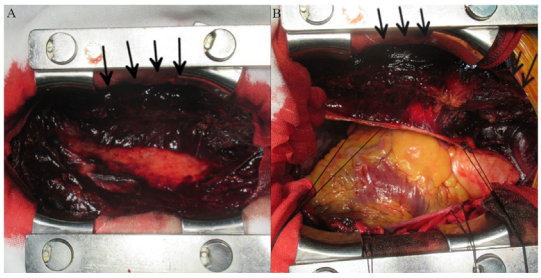

Fig. 5. (A) After a median sternotomy, massive mediastinal hematoma was visible (black arrows).(B) There were no signs of cardiac rupture. Origin of bleeding was not visible in mediastinal space.

complications such as hemothorax, cardiac tamponade, and mediastinal hematoma. In the present case, we speculated that DAPT and intravenous unfractionated heparin caused hemorrhagic complications after primary PCI, because there were no signs of mediastinal hematoma assessed by echocardiography on admission. In some cases, preoperative CT findings are useful to decide therapeutic options, because CT may reveal the anatomical location of the hematoma and indicate the probable vascular origin of the bleeding [3]. Therapeutic options for obstructive shock by mediastinal hematoma with cardiac compressions are thoracotomy and endovascular intervention. A previous study revealed that embolization therapy of internal mammary artery injury was effective and less invasive [4]. However, emergency thoracotomy was performed in the present case, because preoperative echocardiography and CT examination could not reveal the origin of bleeding. After evacuation of mediastinal hematoma, blood oozing from mediastinal tissue continued and we stopped administration of heparin and antiplatelet agents in spite of risk of stent thrombosis. Maeda et al. reported a similar case of mediastinal hematoma after primary PCI which required surgical evacuation of hematoma [5]. They used percutaneous cardio-pulmonary support system which required high dose of anticoagulant agents. In the present case, if we had used a percutaneous cardio-pulmonary support system, mediastinal hematoma might have enlarged rapidly. According to previous research, postmortem and post-resuscitation CT revealed that 70% of patients who received chest compressions had rib fracture [6]. Another report said that deeper chest compressions were associated with greater risk of injuries and also associated with higher success rate of ROSC [7]. Although rib fractures and sternal fractures after CPR were unlikely to increase mortality [8], subsequent bleeding complications such as mediastinal hematoma are fatal complications. In STEMI cases, primary PCI is necessary with DAPT [1]. To solve this medical treatment dilemma, it is important to detect bleeding complications as early as possible. CT and echocardiography are useful imaging modalities to improve patients' clinical outcome in such cases. On top of that, careful monitoring of hemodynamic parameters is necessary even after successful coronary revascularization.

In conclusion, we report a case with obstructive shock caused by mediastinal hematoma after successful primary PCI, which was successfully surgically treated.

Conflict ofinterest

None declared.

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