

DELAYED DIAGNOSIS OF TRAUMATIC VENTRICULAR SEPTAL DEFECT IN PENETRATING CHEST INJURY: SMALL EVIDENCE ON ECHOCARDIOGRAPHY MAKES BIG DIFFERENCE

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Cardiac trauma from penetrating chest injury is a life-threatening condition. It was reported that < 10% of patients arrives at the emergency department alive. Penetrating chest injury can cause serious damage in more than 1 cardiac structure, including myocardial lacerations, ventricular septal defect (VSD), fistula between aorta and right cardiac chamber and valves. The presence of pericardial effusion (even a small amount) on the initial echocardiography might be the only clue to serious cardiac damage in the absence of definite evidence of anatomical defect in heart. We here present a case, in which clear diagnosis of VSD and pseudoaneurysmal formation was delayed a few days after penetrating chest injury due to the lack of anatomical evidence of damage.

KEY WORDS: Stress-induced cardiomyopathy · Acute coronary syndrome · Echocardiography.

INTRODUCTION

Cardiac trauma from penetrating chest injury is a life-threatening situation. It was reported that less than 10% of patients arrives at the emergency department alive.¹⁾ It may produce massive hemorrhage, cardiac tamponade, injury of myocardial free wall or interventricular septum, laceration of coronary arteries, and serious damage to conduction system.²⁾ Because most of patients with penetrating cardiac injury warrant emergent surgical management and have little time to evaluate associated conditions, additional surgical procedures are frequently required to correct injuries that are not found during the initial evaluation. Noninvasive detection of pericardial effusion on transthoracic echocardiography in patients with penetrating chest injury can provide a clue to the presence of serious cardiac damages even without a clear demonstration of objective evidence of myocardial injury.

We report here a case of a patient, in whom the presence of a small amount of pericardial effusion on the initial echo-

cardiography made repeated echocardiographic examination for evaluation of delayed manifestation of myocardial injury, despite no evidence of myocardial damage on initial cardiac imaging examinations. As a result, penetrating injury-related muscular ventricular septal defect (VSD) was finally found and successfully repaired.

CASE

A 22-year-old female presented to the emergency department due to stabbing a dagger into herself, after struggling with her boyfriend. Her medical history was unremarkable except that she had suffered from major depression. On arrival at the emergency department, the patient was alert and well-oriented. Her vital signs were blood pressure of 88/48 mmHg, heart rate of 148 beats/min, respiratory rate of 23 breaths/min, and body temperature of 36.6°C. Oxygen saturation obtained using arterial blood gas analysis was 94% under the oxygen of 4 L/min via nasal prong. At

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physical examination, her breath sounds were diminished on the left side, but cardiac murmur was not audible. Emergent insertion of a tube on the left chest was performed, resulting in the evacuation of 1,000 mL of blood. Q wave in V1 and V2 was suspected in her electrocardiogram. Laboratory parameters and chest X-ray showed no specific abnormal findings. Echocardiography was performed immediately, showed a hyperdynamic left ventricle and small amount of pericardial effusion without myocardial injury or shunt. Shortly thereafter, her mental status began to deteriorate and her vital sign got unstable. Endotracheal intubation was conducted without delay. With the administration of the packed red blood cells and the infusion of a dopamine, the patient's hemodynamic status was stabilized. For further evaluation, she underwent computed tomographic angiography (CTA), in which hemo-pneumothorax in the left chest cavity and a small extent of low attenuation lesion at the mid anteroseptal myocardium was revealed (Fig. 1). For close observation, she was admitted to the intensive care unit without a plan of emergency surgery. The next day after admission, the patient got hemodynamically stabilized but hemoglobin gradually decreased in spite of transfusion. Follow-up CTA was performed and revealed a small myocardial defect in the mid anteroseptal segment of the left ventricle with a width of 5 mm, which was sealed off by pericardium (Fig. 2). Follow-up transthoracic echocardiography clearly demonstrated the VSD at the junction of the basal and mid anteroseptal segment as well as hemopericardium producing constrictive physiology (Fig. 3), all of which were again confirmed with cardiac magnetic resonance (cMRI) imaging (Fig. 4). She was operated to repair the traumatic VSD with patch and obliterate pseudoaneurysm without complication. At operation, VSD at infundibular septum about 1.5 cm in diameter and pseudoaneurysm at RV free wall were noted. Postoperative course was

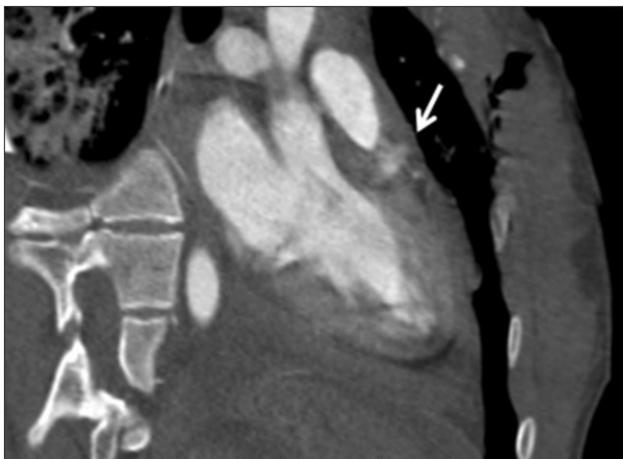


Fig. 1. Initial CT angiography reveals a small extent of low attenuation lesion at the mid anteroseptal myocardium (arrow).

uneventful and the patient was allowed to leave hospital, with an appointment of an outpatient clinic visit. At 6-month after operation, echocardiography revealed no specific abnormal finding.

DISCUSSION

Penetrating chest trauma may cause serious damages to a variety of internal organs including heart, lung and esophagus. Most of patients with penetrating cardiac injury pass away without receiving medical care due to massive hemorrhage, cardiac tamponade and/or coronary artery injury.² Penetrating chest injury can cause intracardiac injury in various site. Right ventricle (43%) is the most common, followed by the left ventricle (33%), right atrium (15%), left atrium (6%), and intrapericardial great vessels (6%).³ In this situation, the most important prognostic indicator includes accurate diagnosis and establishment of immediate treatment.⁴ However, because a large proportion of patients are hemodynamically unstable, sufficient preoperative evaluation cannot be performed in many cases. Transthoracic echocardiography is the

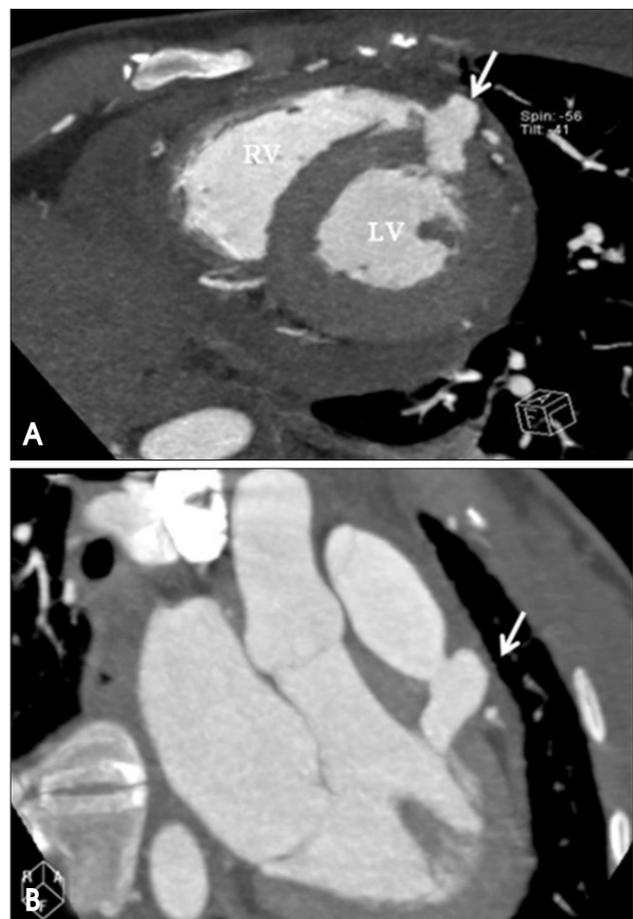


Fig. 2. Follow up CT angiography performed at 3 days after injury. Short axis plane (A) and coronal plane (B) shows traumatic ventricular septal defect (VSD) at left ventricular mid-anteroseptal wall (arrow). LV: left ventricle, RV: right ventricle.

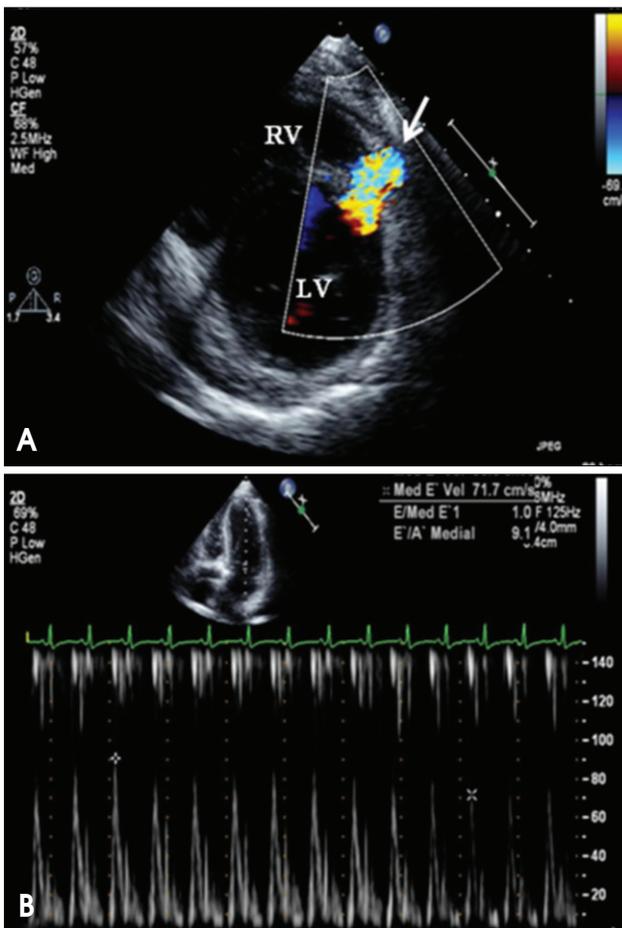


Fig. 3. Follow up echocardiography showing traumatic ventricular septal defect (VSD). Parasternal short axis view (A) shows the VSD at the basal to mid junction of anteroseptum (arrow) and a Doppler image (B) reveals mitral flow variation according to respiratory cycle, suggestive of constrictive physiology. LV: left ventricle, RV: right ventricle.

most effective tool that can rapidly and accurately evaluate the status of cardiac injury and provides an anatomic and hemodynamic information at the patient's bedside.⁵⁻⁷⁾ But in patients with poor image quality, pneumothoax, wound or chest tube at the site where transducer should be placed, it is difficult to give enough information. In these cases, additional cardiac imaging modalities such as CT or cMRI can play an important role.

In the current case, although the initial echocardiography and CTA did not illustrate the presence of VSD, we decided to keep a close eye on the patient's status due to the presence of a small amount of pericardial effusion. Given the prognostic implication of traumatic VSD with associated pseudoaneurysm,⁸⁾ their detection are of pivotal value. Therefore, a high grade of suspicion is mandatory even without solid evidence of myocardial damage on the initial evaluation. Echocardiography, CTA, cMRI or their combination may be

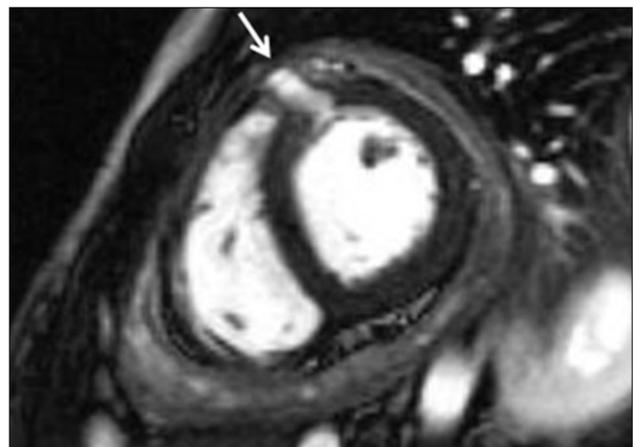


Fig. 4. Cardiac magnetic resonance image for preoperative evaluation. Cardiac MRI shows traumatic ventricular septal defect (VSD) in the mid-anterior septal wall (arrow).

sometimes necessary when only a small amount of pericardial effusion is present without other myocardial damage in patients with penetrating chest injury.

We report here a case of penetrating chest injury-related muscular VSD and pseudoaneurysm. It should be kept in mind that the absence of myocardial damage on the initial evaluation cannot exclude its presence and, thus, serial cardiac examination using echocardiography, CT and/or cMRI should be strongly recommended when even pericardial effusion was not detected on the initial cardiac evaluation. In this respect, echocardiography can play the most important role in serial follow-up examination, taking its lack of radiation, easy performance at patient's bedside and hemodynamic evaluation into account.

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