

Delayed Complication of Penetrating Cardiac Injury: Traumatic VSD

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INTRODUCTION

Penetrating heart injuries can be lethal. But post-traumatic ventricular septal defect (VSD) is a rare complication of penetrating heart injuries and has a tendency to present late. Here we report a case of delayed complication of cardiac injury with little sharp knife.

CASE PRESENTATION

We present a case of a 20-year-old female who was brought into the emergent department after a self-inflicted injury by a little knife. On examination, a 2 cm stabbing injury to the left parasternal area at the 3rd intercostal space was noted. Vital signs were relative stable with a systolic blood pressure of 121 mmHg, heart rate of 114 beats per minute, respiratory rate of 14 breaths per minute and an oxygen saturation of 100%. Chest auscultation revealed bilateral clear breath sounds without heart murmur. Chest X-ray did not show any remarkable findings. The ECG showed sinus rhythm without ST-T change, however, troponin-I was elevated up to 4.51 ng/ml. Under the impression of cardiac injury, computed tomographic scan of the chest was done and revealed pneumomediastinum and pneumopericardium without pericardial effusion (Figure 1). The patient was then admitted to ward for further treatment. The patient was discharged against medical advice the following day due to no significant discomfort prior to scheduled echocardiography.

Eight days later after discharge, she returned to outpatient without new complaints. Followed-up chest X-ray did not reveal significant findings. On day 16 after discharge, she suffered from sudden onset persistent sharp pain and was brought back to our hospital. Vital signs were within normal limits. Computed tomographic scan of the chest was repeated and revealed only mild pericardial effusion. Echocardiography was performed and revealed pulmonary trunk dilation and possible ventricular septal defect at 11 o'clock direction in midventricular level of the septum in parasternal short-axis view (Figure 2A). Strong mosaic flow was found at the right ventricular outflow tract. Both pulmonary valve regurgitation and ventricular septal defect were suspected. In addition to the above findings, a new left sided parasternal harsh murmur at the level of second rib with ongoing chest sharp pain was noted. Under the impression of cardiac injury with traumatic VSD, she underwent surgical intervention.

Sternotomy was performed, during operation, there was a 2 cm fibrotic scar over right ventricular wall (Figure 2B), about 1 cm away from pulmonary annulus. Blood samples were collected from the superior vena cava and main pulmonary artery; oxygen step-up pattern was seen. The main pulmonary artery was opened and a trau-



Figure 1. Computed tomographic scan of the chest revealed pneumomediastinum and pneumopericardium without remarkable pericardial effusion.

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matic ventricular septal rupture about 2×1 cm in size at right ventricular outflow tract (RVOT) (Figure 2C) was discovered. The pulmonary valve and mitral valve were intact. The ventricular septal defect was repaired with a piece of knitted Dacron patch smoothly. After repair, oxygen step-up pattern disappeared. The patient was discharged 7 days later with no postoperative complications.

DISCUSSION

Penetrating cardiac trauma still carries significant morbidity and mortality, Ivatury's 20-year experience with penetrating cardiac trauma showed a mortality rate of greater than 57.6%.¹ Cardiac injury occurs in about 20-30% of cases of major chest trauma.² Penetrating chest injury can cause intracardiac injury at various sites. 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 The incidence of traumatic VSD is 1% to 5%.⁴ Traumatic VSD is a rare complication of penetrating heart injuries and has a tendency to present late. In other words, traumatic VSD is a delayed complication of penetrating heart injury. It has been postulated that the reason for the delayed presentation may be due to muscular spasm or blood clot sealing the defect.⁵

In cases of penetrating chest injury, the suspicion of intracardiac injury is usually raised by persistent hemodynamic instability or the incidental discovery of a cardiac murmur. However it is difficult to find a delayed complication such as traumatic VSD at the first time. Like this case, ventricular septal defects usually present with 'new onset' systolic murmur, cardiomegaly, dyspnea, and signs of congestive heart failure during the follow-up period.⁴

Cha EK and colleagues reported the incidence of delayed sequelae of penetrating cardiac injury to be 23% using echocardiography.⁶ So, the presence of pericardial effusion on the initial echocardiography might be the only clue to serious cardiac damage in the absence of definite evidence of anatomical defect in heart. Therefore, high level of suspicion is mandatory even if solid evidence of myocardial damage is not found on initial evaluation. A protocol suggested by Rozick et al.⁵ sug-

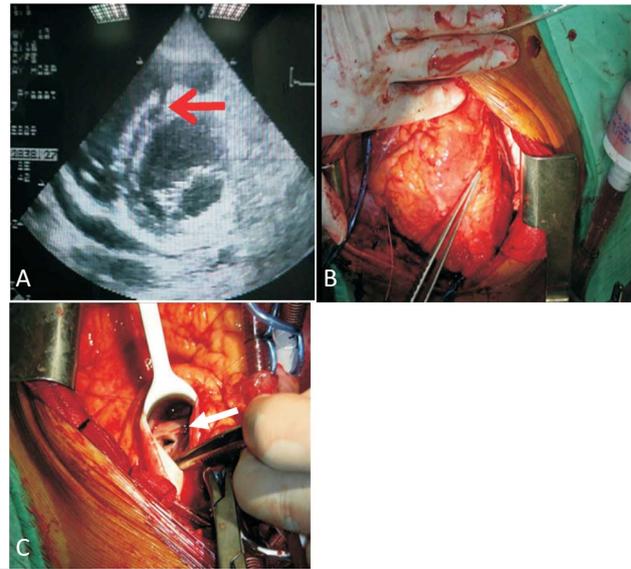


Figure 2. (A) Possible ventricular septal defect at 11 o'clock direction in parasternal short-axis view. (B) 2 cm fibrotic change scar over right ventricular wall, which was 1 cm away from pulmonary annulus. (C) Traumatic ventricular septal rupture about 2×1 cm in size at right ventricular outflow tract (RVOT).

gests a follow-up echocardiography in the case of equivocal initial echocardiographic results and is recommended to be performed again before discharge if initial results were negative. Furthermore echocardiography, computed tomography angiography, cardiac magnetic resonance imaging or their combination may sometimes be necessary when only a small amount of pericardial effusion is present without other myocardial damage in patients with penetrating chest injury.⁷ In equivocal situations, cardiac catheterization allows for accurate diagnosis of VSDs. It allows visualization and quantification of the defect, as well as visualization of the coronary anatomy.

Timing of surgical intervention is controversial. Rozick et al.⁵ suggests proceeding to surgery if hemopericardium is confirmed on echocardiography. In contrast, Olsovsky et al. suggests that the decision to repair the defect lays on patient's clinical status, as well as the findings from the cardiac catheterization.⁴ With a shunt fraction of less than 1.5, it may be feasible to give a trial of medical management to the patient. When the patient becomes symptomatic, as in our case, or a large defect is detected, it is imperative that the patient undergo repair of the VSD. Some authors advocate that a VSD secondary to traumatic injury can be delayed until the

patient's clinical status improves. This delay in operative intervention will allow for better recovery from the traumatic injury and formation of fibrotic tissue that will allow for easier suture placement.

LEARNING POINTS

Delayed complications of penetrating heart injuries are rare. Follow up of such cases is recommended with repeated physical examinations and echocardiography.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

REFERENCES

1. Ivatury RR, Rohman M, Steichen FM, et al. Penetrating cardiac injuries: twenty-year experience. *Am Surg* 1987;53:310-7.
2. Argento G, Fiorilli R, Del Prete G. A rare case of a posttraumatic intraventricular defect. *Ital Heart J Suppl* 2002;3:352-4.
3. Karrel R, Shaffer MA, Franaszek JB. Emergency diagnosis, resuscitation, and treatment of acute penetrating cardiac trauma. *Ann Emerg Med* 1982;11:504-17.
4. Olsovsky MR, DiSciascio G, Vetrovec GW. Acute traumatic ventricular septal rupture. *Am Heart J* 1996;131:1039-41.
5. Rozycki GS, Feliciano DV, Ochsner MG, et al. The role of ultrasound in patients with possible penetrating cardiac wounds: a prospective multicenter study. *J Trauma* 1999;46:543-51.
6. Cha EK, Mittal V, Allaben RD. Delayed sequelae of penetrating cardiac injury. *Arch Surgery* 1993;128:836-41.
7. Jeon KH, Lim WH. Delayed diagnosis of traumatic ventricular septal defect in penetrating chest injury: small evidence on echocardiography makes big difference. *J Cardiovasc Ultrasound* 2010; 18:28-30.

