

LATE PRESENTATION of COMPLEX CARDIAC DEFECT FOLLOWING PENETRATING CARDIAC TRAUMA: CASE REPORT

Aytül BELGİ MD, Atalay METE MD^a, Özgür AVŞAR MD, Dr. Fatma S. TOPUZOĞLU MD

Akdeniz University Medical Faculty, Department of Cardiology, and Cardiovascular Surgery^a
Antalya, Turkey

Summary

Six months ago, a 23-year-old man who involved in an altercation and received a stab wound (SW) to the chest, medial to the left nipple, he was admitted to our clinic with 2-month history of shortness of breath. Transthoracic echocardiography and Doppler color flow imaging showed a large amount of pericardial effusion, aorto-left atrial fistula and a defect in the upper part of the interventricular septum resulting in a left to right ventricular shunt. Successful surgical treatment including pericardial drainage and closure of the defects with Dacron graft was performed. Postoperatively, a complete atrioventricular block was developed, because of its persistence permanent pacemaker was implanted. This present case illustrates delayed presentation of complex cardiac SW that did not cause acute symptoms, optimal diagnosis and surgical management of the defects. (Arch Turk Soc Cardiol 2003;31:705-9)

Key Words: Echocardiography, penetrating cardiac trauma, stab wound

Özet

Penetran Kalp Travmasına Bağlı İzlenen Kompleks Kardiyak Defektin Geç Dönem Başvurusu

Altı ay önce memenin sol tarafından, göğüse kesici alet darbesi almış 23 yaşındaki erkek olgu, 2 aylık nefes darlığı yakınması ile başvurdu. Transtorasik ekokardiyografi ve renkli Doppler incelemede, masif perikardiyal effüzyon, aorto-sol atriyal fistül ve interventriküler septumun üst tarafında, soldan sağa şanta neden olan defekt izlendi. Perikardiyal drenaj ve 'Dacron grefti' ile tamirden oluşan başarılı cerrahi tedavi gerçekleştirildi. Postoperatif dönemde, kalıcı total atriyoventriküler blok gelişmesi nedeniyle, pacemaker implante edildi. Bu olgu ile, penetran kalp travmasına bağlı izlenen kompleks kardiyak defektin, geç dönem başvurusu, uygun tanı ve cerrahi tedavisi sunulmaktadır. (Türk Kardiyol Dern Arş 2003;31:705-9)

Anahtar Kelimeler: Ekokardiyografi, bıçak yarası, penetran kardiyak travma,

Address for Correspondence: Aytül Belgi MD, Akdeniz Üniversitesi Tıp Fakültesi Kardiyoloji Anabilim Dalı 07070, Antalya
Tel : (0242) 227 4343/ 55355 Fax: (0242) 227 9911
e-mail: aybel68@hotmail.com

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Interpersonal violence accounts for the vast majority of penetrating heart injuries⁽¹⁾. Patients with exsanguinating wounds frequently die before they reach medical attention or present with rapidly progressive hemorrhagic shock culminating in cardiac arrest. This present case illustrates delayed presentation of a complex cardiac stab wound injury that did not cause acute symptoms, optimal diagnosis and surgical management of the defects.

CASE REPORT

A 23-year-old man presented to our clinic complaining of shortness of breath 6 months after being hospitalized for a stab wound to the left chest. During his first hospitalization, series of examinations, including chest X-ray, two dimensional echocardiography, and biochemical tests were normal. He was discharged from hospital 24 hours later with the diagnosis of chest wall penetration. On second presentation, blood pressure was 90/60 mmHg, pulse rate was 115 beat/min, and respiratory rate was 24 breaths/min. On physical examination, a grade 4/6 pansystolic and a grade 3/6 diastolic murmur were audible in all locations, which were more intense at the lower left sternal border. Chest radiograph showed an enlarged cardiac silhouette, which was interpreted as a massive pericardial effusion. A hemogram showed a decreased hemoglobin level (9.6 g/dL). Transthoracic echocardiography (TTE) revealed a mildly dilated left ventricle (LV) with hyperdynamic function, massive pericardial effusion and mild aortic regurgitation. A defect was seen in the membranous portion of the ventricular septum and in the wall between aorta and left atrium (figure 1). Color Doppler study indicated turbulent flow between the aorta and left atrium. Pulse Doppler echocardiogram of the flow showed the diastolic and systolic flows from the aorta to the left atrium. A left-to-right shunt was also seen (figure 2). Because of suspected complication of the cardiac SW, the patient underwent operation. Cardiopulmonary bypass and cardiac arrest was used to stop the heart, allowing direct visualization of the injury. After opening the chest by means of a sternotomy, a large amount of hemorrhagic pericardial effusion was evacuated. Echocardiographic diagnosis was confirmed at operation. A laceration was seen on

the noncoronary cusp and, to a lesser degree, on the right coronary cusp. There was a defect on the right ventricular free wall. It was thought that the stab had entered the right ventricular cavity having traversed its outflow tract and penetrated the interventricular septum and the aortic cusps toward to left atrial medial wall and injured both posterior aortic wall and left atrial wall. Interventricular septal defect and aorta-left atrial fistula were closed with the Dacron graft. Aortic cusps were repaired by the superior sutures of the implanted grafts. In addition, the defect on the right ventricular free wall defect was repaired by Dacron graft. Intraoperative transesophageal echocardiogram showed residual shunt flow through defects. Therefore, by using left atrial and right ventricular approach, reimplantation was performed from opposite sites (figure 3). Mild to moderate aortic regurgitation was seen resulting from some degree of aortic valve distortion, but it was not severe enough for aortic valve replacement. Postoperative TTE confirmed the completed repair of these defects (figure 4). During postoperative follow-up, complete heart block was developed. Because of its persistence, a permanent pace-maker was implanted on day 15 after surgery. At three months after surgery, the patient reported that he was still feeling well.

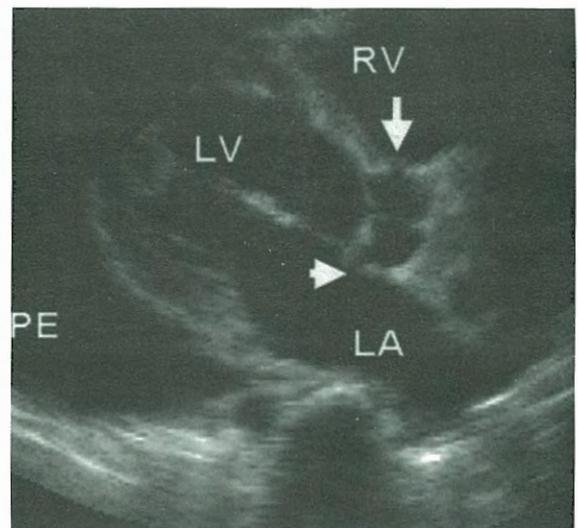


Figure 1: The parasternal long-axis view of the patient reveals the location of the defect between the aorta and the left atrium (arrowhead). A small defect located in the upper portion of the ventricular septum is seen (arrow). Left ventricle (LV) is mildly dilated. A large pericardial effusion (PE) is also seen. RV: right ventricle, LA: left atrium.

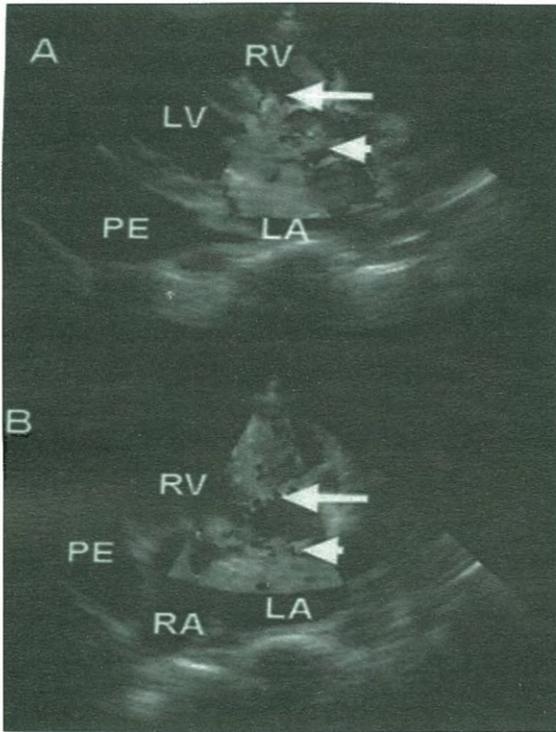


Figure 2: Color flow imaging in the parasternal long-axis view (A) and short-axis view (B) demonstrate left-to-right shunting across the ventricular septal defect (arrow) and reveal turbulent flow through the aorta-left atrial fistula from the aorta to left atrium (arrowhead). LV: left ventricle, LA: left atrium, RV: right ventricle, RA: right atrium, PE: pericardial effusion.

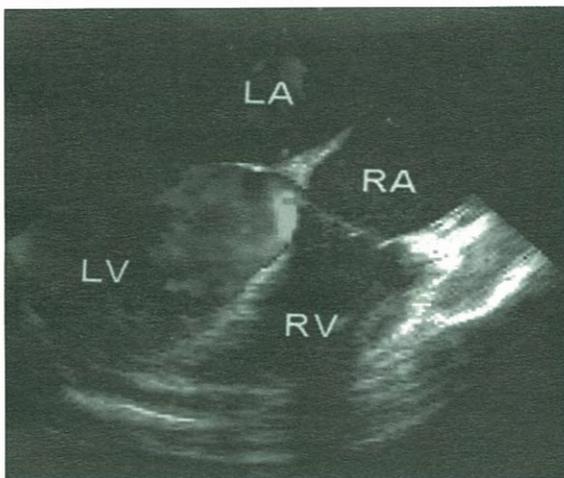


Figure 3: Intraoperative transesophageal echocardiogram of the patient following surgical repair demonstrates complete repair of the defects. LV: left ventricle, LA: left atrium, RV: right ventricle, RA: right atrium.

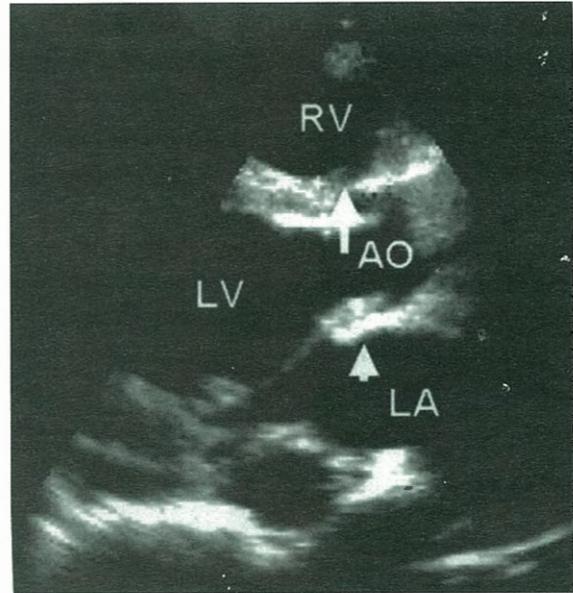


Figure 4: Parasternal long-axis examination from the patient after anatomic repair of penetrating cardiac trauma. Patches are noted in the area of the membranous ventricular septum (arrow), and in the area of fistulous connection between aorta and left atrium (arrowhead). LV: left ventricle, LA: left atrium, RV: right ventricle, AO: aorta.

DISCUSSION

Penetrating heart injuries with an approximately equal incidence of SWs and gunshot wounds (GSWs) among patients who are transported to the emergency department are often fatal (10% to 60%)⁽¹⁻⁴⁾. Gunshot wounds of the heart are generally associated with 2 to 4 times the mortality of SWs to the heart^(3,4); this is thought to be related to the surrounding tissue injury of the high velocity projectile vs the low velocity of the stab instrument. The right ventricle is affected more often than the LV due to its anterior anatomic location. The left or right atrium is affected in 20% of cases⁽⁵⁾. One third of penetrating cardiac wounds affect multiple chambers, and survival is much worse in these cases. In 5% of cases a coronary artery is lacerated, although these injuries usually involve a distal segment of the artery and rarely produce significant acute MI when they are ligated. More

proximal coronary artery lacerations require coronary bypass⁽⁶⁾. Rarely, the interventricular septum, a valve, papillary muscle, or chordae tendineae are lacerated, producing an acute shunt or valvular insufficiency. These lesions are poorly tolerated and can quickly cause massive pulmonary edema and cardiogenic shock. Our patient had a rare complication seen after penetrating cardiac injury and interestingly these lesions produced progressively worsening symptoms instead of acute clinical deterioration. To our knowledge, this case represents the first reported aorto-left atrial fistula resulting from penetrating cardiac trauma.

Penetrating heart injury may result in exsanguinating hemorrhage if the cardiac lesion communicates freely with the pleural cavity or cardiac tamponade if the hemorrhage is contained within the pericardium. The reported incidence of acute pericardial tamponade is approximately 2% in patients with penetrating trauma to the chest and upper abdomen⁽⁷⁾. Cardiac tamponade is itself a life-threatening condition but appears to offer some degree of protection and increased survival in patients with penetrating cardiac wounds. It occurs more commonly with SWs than GSWs, and 60% to 80% of patients with SWs involving the heart develop tamponade⁽⁸⁾. Intermittent hemorrhage from the intrapericardial space may cause an intermittently decompressing tamponade. This latter condition is tolerated for a long period. In our case, intermittent hemorrhage caused slowly rising intrapericardial pressure may lead to chronic massive pericardial effusion.

Several imaging modalities can be used to assess the lesions of the heart caused by penetrating cardiac trauma. According to electrocardiography, troponin I concentration measurements, when a coronary lesion is suspected, emergency coronary angiography and surgery should be performed. Aortography is considered as a gold standart for establishing the diagnosis of aortic disruption. Echocardiography is a commonly used imaging technique that has become an important tool in the diagnosis of cardiac SWs complications. Two-

dimensional echocardiography has the capacity to visualize cardiac defects very well⁽⁹⁾. It also has the advantage of being able to evaluate LV function and to determine whether there is pericardial effusion. Doppler echocardiography can be used to further visualize the flow one compartment to another. By the use of echocardiography, the disadvantages of angiography relate to use of radiologic contrast can be avoided. This noninvasive method can be performed safely even in critically ill patients. Computerized tomographic scanning and magnetic resonance imaging may be thought as less invasive and highly accurate procedures, but they necessitate moving the patient from the emergency department to the radiology department. In this case, echocardiography was able to demonstrate the whole pathology clearly. To avoid delaying and risk factors, cardiac catheterization and aortography were not performed, and an operation was performed following echocardiographic study. It is worth noting that transesophageal echocardiography provides an alternative semi-invasive technique that offers excellent image quality.

The lesions in patients with penetrating cardiac trauma are invariably required surgical correction if patients are able to reach hospital and do not have rapidly progressive hemorrhagic shock culminating in cardiac arrest. Pericardiocentesis should be performed if the diagnosis of pericardial tamponade is strongly suspected on clinical grounds or is diagnosed by echocardiography. Surgical repair techniques depend on the lesion characteristics⁽¹⁰⁾. Spontaneous closure of a small traumatic ventricular septal defect can occur, particularly if the defect is located entirely in the muscular portion of the ventricular septum. The fully healing is expected in 8 to 12 weeks. Continued presence of the shunt indicates fistulization or epithelialization of the tract, and elective surgical repair is indicated. In our case, patches were employed both for ventricular septal defect and aorto-left atrial fistula because of its effectiveness. Aortic cusps repair caused to some degree of aortic valve distortion and mild-to

moderate aortic insufficiency.

The prognosis of a patient with cardiac trauma depends on early diagnosis and rapid intervention as well as magnitude of the initial trauma. This case demonstrates that delayed presentation of unexpected complications can occur in patients with penetrating chest trauma and a normal initial evaluation. We think that detailed echocardiographic imaging provided by TTE should be performed in all patients with penetrating cardiac trauma and patients should be followed-up closely for overlooked complications if they have no abnormal findings in the initial evaluation.

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