CASE STUDY

POSTTRAUMATIC LEFT VENTRICULAR PSEUDOANEURYSM IN A CHILD

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ABSTRACT

A 7-year-old boy developed a left ventricular pseudoaneurysm after being struck by a tractor. The pseudoaneurysm was diagnosed and successfully resected 5 years after the accident.

(Asian Cardiovasc Thorac Ann 2001;9:135–7)

INTRODUCTION

Nonpenetrating chest trauma may cause a wide spectrum of cardiac injury ranging from myocardial contusion to coronary artery fistula to a cardiac chamber, intraventricular septal or cardiac valve tears, and rupture of the heart.[1,2] The most important cause of cardiac trauma in peacetime is traffic accidents. Damage to the heart is not usually foremost in the minds of physicians dealing with acutely injured persons, and the manifestations of cardiac trauma can be easily overlooked when other more obvious injuries are present. In some cases, the patients' complaints may develop after a long period.

CASE REPORT

A previously healthy 7-year-old boy was struck by a tractor and received a heavy blunt blow to the sternum. He experienced only central chest pain and because physical examination and chest radiography were normal and his pain eased in a few days, no further investigation was planned. When he was 12 years old, he was hospitalized with a respiratory infection. His physician diagnosed mild congestive heart failure, and echocardiography showed a wide dyskinetic segment of the left ventricle. The patient was referred to our hospital for further investigation. On admission, he was in sinus rhythm of 88 beats per minute. His blood pressure was 120/80 mm Hg. His cardiologic examination was normal except for a mild apical systolic murmur. Echocardiography in apical 4-chamber view revealed an intact ventricular septum and left ventriculomegaly. A slightly anterior angulation of the parasternal long-axis view showed an interventricular septal aneurysm of 6.2 × 3.8 cm. Left ventricular dimensions were 5.9 × 2.9 cm (Figure 1). At cardiac catheterization, pulmonary artery and systemic arterial pressures were 31/22 and 117/60 mm Hg, respectively. Cineangiocardiograms demonstrated a small right ventricular cavity and the calcified wall of an aneurysm in the diaphragmatic region of the right atrium (Figure 2). Radiopaque solution injected into the left ventricle filled a large chamber in the left anterior part of the heart, and the interventricular septum was displaced to a horizontal position. The coronary arteries were normal. Based on these findings, a large interventricular septal aneurysm extending from the left ventricle was diagnosed.

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Surgical repair was performed under cardiopulmonary bypass with aortic crossclamping and cold crystalloid cardioplegia. A large yellow-white partially calcified pseudoaneurysm was found arising from the left ventricle and extending into the right ventricle. The inferior wall of the pseudoaneurysm was adherent to the diaphragm. After dissection of the fibrinous adhesions, ventriculotomy was performed in the region of the pseudoaneurysm. Aneurysmectomy was carried out as far as possible into the intact part of the left ventricle. The ventriculotomy incision was closed with two Teflon strips by linear suturing. The heart was de-aired through the ventricular wall before completing closure. After defibrillating the heart, cardiopulmonary bypass was terminated uneventfully. The postoperative period was smooth and the patient was discharged on the 8th postoperative day. Echocardiography revealed a significant improvement in left ventricular function one month after the operation; the interventricular septum was intact and the left ventricle was smaller, measuring 5.4 × 2.6 cm (Figure 3). Table 1 shows the preoperative and postoperative echocardiographic data. At the 3-year follow-up, the operation appeared to have improved the patient's prognosis.

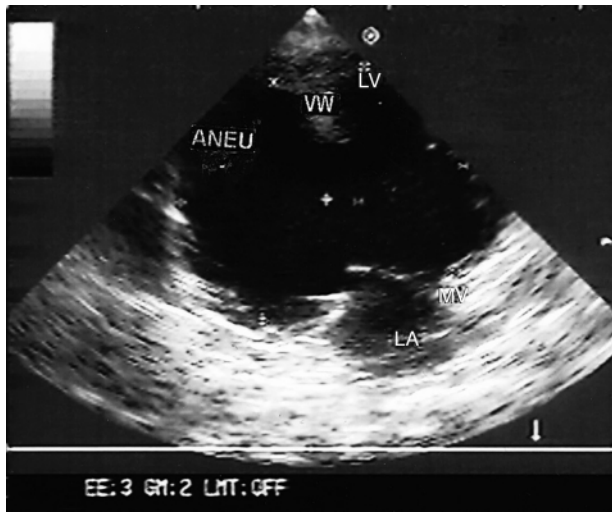

Figure 1. Preoperative echocardiographic view of the pseudoaneurysm. ANEU = pseudoaneurysm, LA = left atrium, LV = left ventricle, MV = mitral value, VW = ventricular wall.

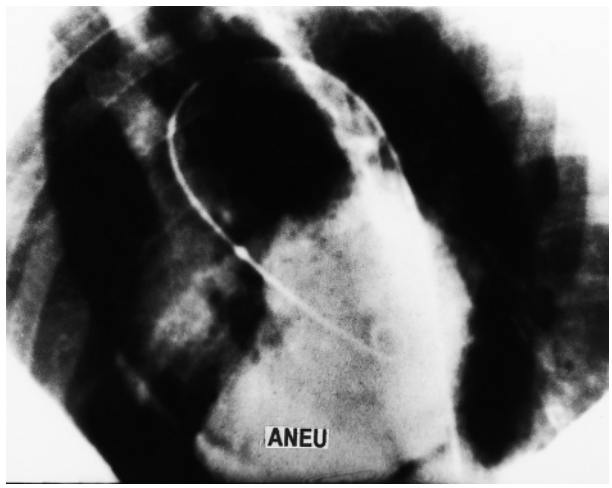

Figure 2. Right ventricular cineangiocardiogram. ANEU = pseudoaneurysm.

DISCUSSION

Cardiothoracic trauma occurs in approximately 30% of all traumatized patients, mostly due to traffic accidents.[3] When the heart is compressed between two objects such as the sternum and the vertebral column, or when there is sudden deceleration of the chest with the heart thrust forward against the sternum, intracardiac, and particularly intraventricular pressure, suddenly increases and the free cardiac wall, ventricular septum, the tensor apparatus of the atrioventricular valves, or the cusps of the aortic valve may rupture. Less violent blunt trauma may result simply in contusion of the myocardium. Such a contusion may vary from a small area of subepicardial or subendocardial petechia to the full thickness of the cardiac wall.[4] Rarely, a pseudoaneurysm develops after acute rupture of an infarcted area of the left ventricle. Acquired left ventricular pseudoaneurysms develop after transmural myocardial infarction (55%), surgery (33%), trauma (7%), or infection (5%).[5,6] Traumatic pseudoaneurysms are rare, especially in children. Unlike true aneurysms that have a resistant wall, pseudoaneurysms initially consist of loose tissues and have an excessively high propensity for secondary rupture.[7] Such ruptures are usually fatal, but when the pericardium is sufficiently adherent to the epicardium, only localized hemopericardium may result. Rupture can be diagnosed on the basis of pericardial pain or effusion or by recognition of a pseudoaneurysm on a 2-dimensional echocardiogram. Although the parietal pericardium may prevent the expanding pseudoaneurysm from rupturing, with time it may rupture, usually into the left pleural cavity.

In some cases, a left ventricular pseudoaneurysm may occur due to myocardial infarction after blunt chest

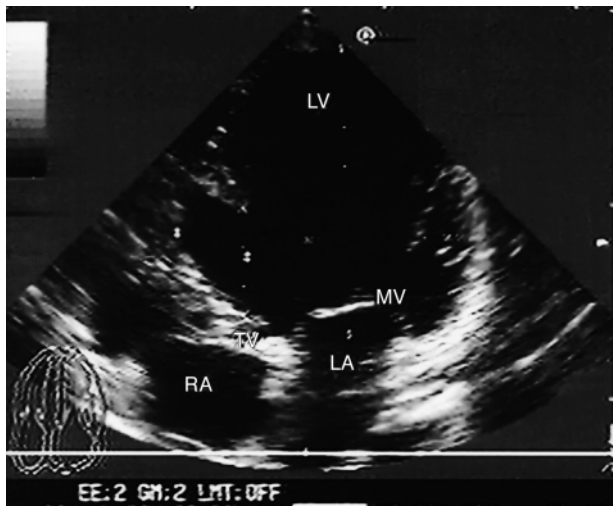

Figure 3. Postoperative echocardiogram. LA = left atrium, LV = left ventricle, MV = mitral value, RA = right atrium, TV = tricuspid valve.

Table 1. **Preoperative and Postoperative Echocardiographic Data**

Data	Preoperative	Postoperative
LV end-diastolic diameter (mm)	59	54
LV end-systolic diameter (mm)	46	40
Ejection fraction (%)	43.09	59.03
Fractional shortening (%)	21.60	31.07

LV = left ventricular.

trauma.[8] Since the patient's electrocardiograms did not indicate chronic myocardial infarction, we believe that the blunt chest trauma directly caused an acute rupture of the left ventricle and a pseudoaneurysm developed at the site. Because the rupture was tamponaded by the diaphragm, hypovolemia and pericardial tamponade did not occur. The hematoma became organized and encapsulated in the course of time.

Some patients may have cardiac failure after blunt chest trauma, due to myocardial contusion or infarction. In those with mild left ventricular damage, cardiac failure may respond to medical treatment with digoxin, diuretics, and vasodilators. Because of the uncertainties surrounding their natural history and the relative safety of surgical repair, the decision to operate should prevail over conservative management in cases of large or expanding pseudoaneurysms. Although asymptomatic small pseudoaneurysms have a more stable course, any increase in size should lead to surgical treatment.[5,7] Surgical techniques include resection of the pseudoaneurysm and linear closure of the ventricle with Teflon strips and reconstruction of the ventricular cavity using a patch. We chose resection and linear closure in this case as it was considered that this technique would not cause ventricular dysfunction. Although our patient denied having symptoms, his parents mentioned that his activities had been limited and he had complained of fatigue for almost 2 years. They noticed a marked improvement in his exercise tolerance after the operation.

This case is of interest because in spite of the development of a large left ventricular pseudoaneurysm, the patient was diagnosed to have a serious cardiac disorder during routine physical examination 5 years after blunt chest trauma. Electrocardiography and echocardiography are valuable screening tools for the evaluation of potential cardiac involvement following nonpenetrating trauma to the chest.

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