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Case report

An isolated ventricular septal defect as a consequence of penetrating injury to the heart

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Abstract

The authors describe, in a case report, an isolated defect of the ventricular septum developing due to a stab injury to the heart not requiring an emergency surgical intervention. Two months after the injury, the authors performed primary surgical correction of the defect.

Keywords: Ventricular septal defect; Traumatic ventricular septal defect; Penetrating injury to the heart; Cardiac tamponade; Heart injury

1. Introduction

In times of peace, heart injuries occur most often in road accidents and in connection with crime in large urban centers which is also where the biggest patient groups recruit from.

Penetrating injury to the heart generally occurs less often than blunt injury. In our country, the most frequent cause is stab injury. The right ventricle is injured in about half of surviving patients; the left ventricle less often, and one of the atria is perforated least often [1,2]. Almost 25% of patients are later diagnosed to have suffered injury also to one of the intracardiac structures [1], a ventricular septal defect (VSD) caused by penetrating injury to the heart is found in 2–10% of survivors [1–5].

In most cases, a stab injury to the heart leads to cardiac tamponade requiring – unless it is the immediate cause of death – emergency thoracotomy and simple cardiorrhaphy [3]. Less often, the injury causes only minor bleeding and surgical revision is not indicated.

In our department, we had a similar rare case: an isolated VSD was demonstrably caused by a stab injury to the heart with a knife and 2 months elapsed from the initial trauma before any surgical intervention. Similar case reports are very sparse in the literature, and we did not find a single such report from Europe in the literature available to us.

2. Case report

The patient was a 33-year-old man, an active sportsman with no evidence of heart disease. He sustained a stab chest injury with a kitchen knife that he himself pulled out from the wound immediately. In hospital, echocardiography (ECHO) excluded the presence of fluid in the pericardium, computed tomography established the diagnosis of left lung contusion, and left hemithorax drainage for hemothorax was performed. After 1-week hospitalization, the patient was discharged in good condition. In the ensuing 3 weeks, exertional dyspnea developed gradually and outpatient examination by a cardiologist revealed new cardiac murmur requiring re-hospitalization; atrial flutter paroxysms and pericardial exudate were diagnosed. Beta-blocker and corticoid therapy was initiated and, due to further deterioration

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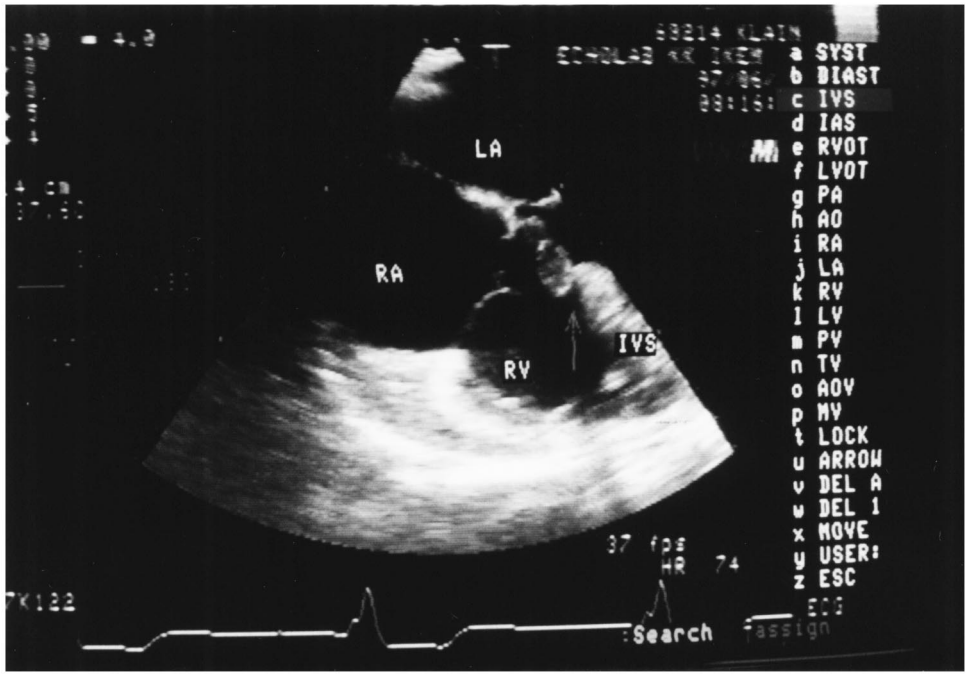

Fig. 1. Transesophageal echocardiogram of a post-traumatic ventricular septal defect. Arrow indicates the site of defect. RA, right atrium; RV, right ventricle; LA, left atrium; IVS, interventricular septum.

of dyspnea, progression of heart dilatation and a suspicious transthoracic ECHO finding, the patient was referred to our department.

The objective findings included a calm scar after a stab chest injury parasternally to the left above the third intercostal space, gross holosystolic murmur in the precordium with a maximum parasternally to the left. ECG showed intermittent right bundle branch block. Transesophageal ECHO confirmed VSD (Fig. 1), localized in the basal segment of the interventricular septum, without any signs of pulmonary hypertension. Angiocardiography and hemodynamic examination confirmed a hemodynamically significant left-to-right shunt at the level of the ventricular septum; the ratio of systemic to pulmonary blood flow (Qs:Qp) was 1.0:1.8; the patient was, 2 months after the injury, indicated for surgical correction of the defect.

The pericardial cavity contained blood coagula. There was an apparent 2-cm hole (already coalesced) on the anterior part of the pericardium (after the injury) and a 1.5-cm scar running alongside the myocardial fibbers on the right ventricular outflow tract.

We reached the ventricular septum via the right atrium through the tricuspid orifice and we found a defect measuring 1.5 cm in diameter running obliquely through the interventricular septum and one transected chorda of the tricuspid valve. The margins of the defect had already become partly fibrotic. The VSD was closed with a Goretex patch using eight single U-stitches Ethibond 2/0 with Teflon pledgets. Intraoperative transesophageal ECHO excluded any residual shunt.

The postoperative course was uneventful and the patient was discharged on postoperative day 6.

On outpatient follow-up 3 months after the procedure, the patient was asymptomatic, had no complaints, and ECHO again did not detect any shunt at the level of interventricular septum.

3. Discussion

There is one essential difference between the cases of post-traumatic VSDs due to penetrating injury to the heart described in the relevant literature, and in our case. Unlike the patient we report on - who did not require urgent thoracotomy - the VSDs are usually (with some exceptions [6]) associated with manifest (or suspected) perforation of one of the cardiac chambers, necessitating emergency thoracotomy to relieve cardiac tamponade and to suture lacerations on the external surface of the heart [1,3,7–10]. Consequently, only suture of the free cardiac wall is performed in stage one and, some time later (on post-operative day 1 to 11 years after the initial trauma), the diagnosis of a traumatic VSD is established, sometimes in combination with injury to another intracardiac structure [6,8].

The management of these patients depends on the size of the left-to-right shunt. In symptomatic patients (60–70%), usually with a Qs:Qp shunt of 1.0:1.5 and greater, VSD is corrected at a later time by elective re-do surgery [3,9,10]. About 30–40% of patients remain asymptomatic and hence do not require another surgical intervention [3,10]. Rare cases of spontaneous closure of a post-traumatic VSD have also been reported [10].

The fact that no congenital heart disease, asymptomatic until injury (active sportsman, new auscultation finding,

ECHO), was involved, was definitely demonstrated by the operative finding which revealed scars on the pericardium and right ventricular wall and thus discovered the mechanism of VSD development.

Our case confirmed that, in connection within penetrating injuries to the heart, damage to an intracardiac structure must also be considered and the patient must be further examined after managing the life-threatening condition; the method of choice is clearly echocardiography [1,3,7,8] demonstrating or excluding serious structural changes.

Stab injury to the heart was the subject of the first successful cardiac surgical procedure performed by Ludwig Rehn, a surgeon based in Frankfurt, in 1896. Since then, many patients suffering heart injury have been treated and a number of case reports and various groups of patients have been published. Still, to the best of our knowledge, this is the first case of an isolated VSD demonstrably caused by a penetrating injury to the heart not requiring early emergency operation, published in Europe, which was an indication for elective primary surgical repair.

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