Double aneurysm of the left ventricular wall following cardiac perforation after aortic valvuloplasty

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In this report we present the case of a double aneurysm, which developed 1 week after pericardiocentesis because of cardiac perforation following aortic valvuloplasty in a newborn. The patient underwent successful surgical treatment through normothermic cardiopulmonary bypass with external plication of double aneurysm.

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Introduction

Although the interventional pediatric catheterization technique was introduced in the early 1950s, it has become a frequently used treatment in patients with congenital heart defects only in the last decade. Dilation procedures such as angioplasty and valvuloplasty and closure techniques such as embolization and device closure of cardiac defects are widely used.

In fact, balloon valvuloplasty has become the method of choice for patients with pulmonary stenosis and, although non-curative, the first treatment for newborns with congenital aortic stenosis. However, it has been proven that these procedures increase the incidence of cardiac perforations.

We report the case of a rare and life-threatening cardiac perforation caused by balloon aortic valvuloplasty in a newborn who developed a double aneurysm of the left ventricular wall 1 week after the procedure.

Case report

A 3.7 kg, 3-day-old infant was referred to our department for suspected congenital cardiac defect.

Ultrasound examination showed an aortic valvular stenosis with a systolic gradient of 100 mmHg. On the first day, after performing balloon valvuloplasty, the patient gradient decreased from 100 to 30 mmHg. Just a trivial aortic regurgitation occurred. Afterwards, the patient was transferred to the intensive care unit where suddenly he had a cardiac arrest. The suspicion that a cardiac tamponade had followed the patient's heart perforation during valvuloplasty, was confirmed. The patient underwent ultrasound-guided pericardiocentesis, which restored his cardiac function, without causing cerebral damage. On the second day, the infant was transferred to the cardiology unit. On the seventh day, ultrasound monitoring evidenced two aneurysms on the left ventricular wall, which were interconnected by a hole caused by the previous cardiac perforation (Fig. 1).

However, since the aneurysms were increasing, we decided to operate on 3 days after their discovery. The patient underwent corrective surgery with normothermic cardiopulmonary bypass. After inserting cannulae into the aorta and the right atrium, the heart was pulled up, and on the left ventricular wall near the descending posterior coronary artery we found two aneurysms 1.5×0.5 cm in size. We decided to occlude with external suture the aneurysms with two felt strips each (Fig. 2).

An epicardial echocardiography control in the operating room showed no evidence of the primitive hole and a complete restoration of the left ventricular wall. The day after, the infant was extubated, and the next ultrasound examination showed good cardiopulmonary performance without evidence of aneurysms.

On the third day, the infant was transferred to the cardiology unit. The clinical course was uneventful and 10 days after surgery the patient was discharged. He was followed up by our cardiologist but only because of primitive aortic stenosis.

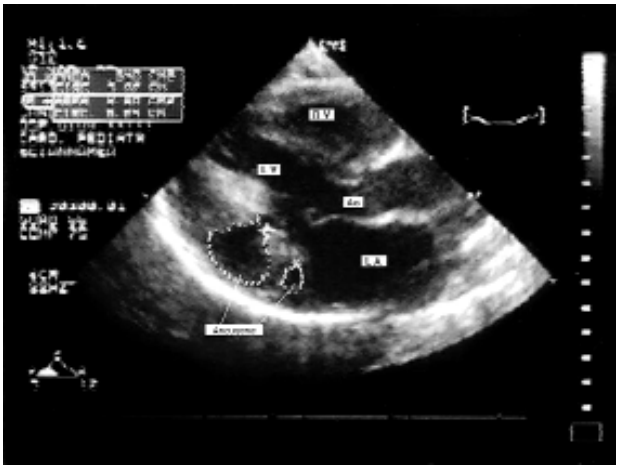

Figure 1. *Transthoracic echocardiography (parasternal long-axis view): note the two aneurysms of the left ventricle signed by the outline. Ao = aorta; LA = left atrium; LV = left ventricle; RV = right ventricle.*

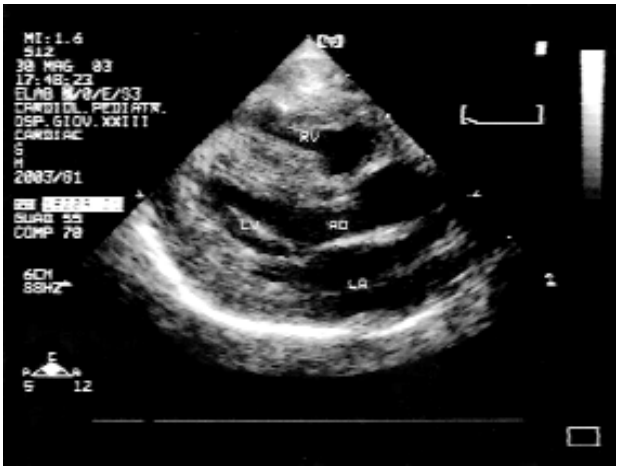

Figure 3. *Follow-up transthoracic echocardiography (parasternal long-axis view): ultrasound examination shows complete integrity of the left ventricular wall, without evidence of aneurysms. AO = aorta; LA = left atrium; LV = left ventricle; RV = right ventricle.*

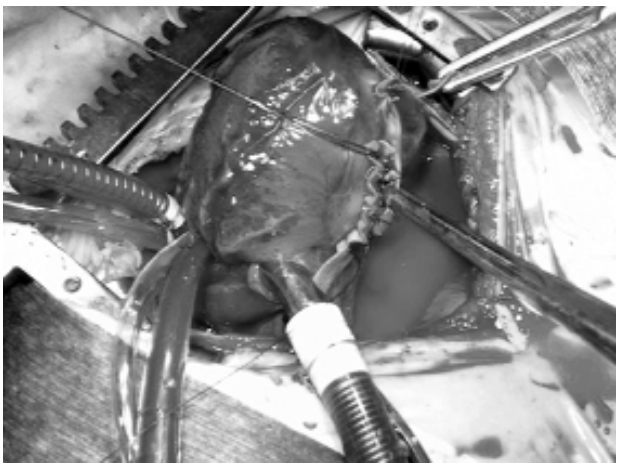

Figure 2. *Operating photo: the two aneurysms are occluded with two felt strips each.*

Follow-up. Six months later the patient was readmitted to the cardiology unit because of supraventricular tachycardia which was successfully treated by pharmacological approach. During the same hospitalization he underwent a 24-hour ECG Holter monitoring showing any evidence of myocardial ischemia and any other arrhythmias, while an ultrasound examination showed complete integrity of the left ventricular wall due to perfect surgical correction of the aneurysms and normal left ventricular function (Fig. 3).

At present the patient is asymptomatic without therapy.

Discussion

Pediatric interventional procedures have become increasingly important in the treatment of congenital cardiac defects. Balloon valvuloplasty has become the method of choice in the treatment of patients with valvular pulmonary stenosis and, although non-curative, in patients with congenital aortic stenosis.

However, balloon valvuloplasty has increased the incidence of complications which represents 20.5% of all procedures including 11% of vascular injuries, 2.2% of embolic phenomena, 1.8% of cardiac perforations resulting in tamponade, 1% of massive aortic regurgitations, 0.8% of non-fatal arrhythmias, and 0.2% of myocardial infarction[1]. Cardiac perforation may occur in the catheterization laboratory 1 hour after the procedure or even later. While pericardiocentesis is the definitive therapy for half of these cases, surgical repair is required for the rest[2]. In fact, surgery is required in 1.9% of all interventional catheter procedures[3]. Close ultrasound surveillance seems to be necessary during the post-pericardiocentesis period first to control the complete closure of cardiac perforations, second because it is a *locus minoris resistentiae* through which the blood could infiltrate the myocardial layers and allow the development of left ventricular aneurysms.

Pediatric interventional catheterization procedures are associated more frequently with myocardial injuries with respect to diagnostic procedures. In fact, when they are compared with adult studies, pediatric patients seem to be at higher risk for myocardial injury caused by cardiac catheterization[4].

External closure of the aneurysm with normothermic cardiopulmonary bypass seems to be a good and easy approach especially because it reduces surgical maneuvers.

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