Repair of traumatic ventricular septal defect following blunt chest trauma by septal obliteration technique

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Introduction

Closed chest trauma may lead to cardiovascular lesions, especially in children. Here, we present such a case with a history of blunt chest trauma and referred to our institution for the surgical repair of traumatic septal defect after 2 years.

Case Report

A 12 years old male patient was referred to our institution with the echocardiographic diagnosis of muscular ventricular septal defect. In his history, there was a fall from 6th floor to his right side when he was 10 years old. He had spontaneous breathing and heart beat; but also there were tachypnea, tachycardia and hypotension. On the abdominal wall, variable sized echimoses were present and the abdomen was painful with palpation. Free blood was aspirated by paracentesis from the abdominal cavity. Computed tomography of the head and neck did not reveal any intracranial hemorrhage or bone fracture. He was transfused with whole blood and laparotomy was decided. He was followed in the intensive care unit (ICU) and as his condition rapidly got better, laparotomy was not performed.

Two days following the accident, a pansystolic heart murmur became audible on the chest wall. By transthoracic echocardiography (TTE), a 4.8mm ventricular septal defect with a gradient of 49 mmHg was detected. Stable hemodynamic status directed physicians to follow the patient periodically with echocardiographic examinations. However, family reported a decrease in the exercise capacity over time and they were directed to the pediatric cardiology clinic. TTE examination, after two years, revealed a 6.8 mm muscular VSD with a gradient of 70.8 mmHg (Fig. 1). Surgical closure of the VSD, was decided.

After induction of the anesthesia, transesophageal echocardiography (TEE) was performed. VSD with left to right shunt was observed. The operation was performed through median sternotomy under low flow cardiopulmonary bypass with standard aortic and bicaval cannulation at moderate hypothermia (25°C). A left ventricular vent was placed via the right superior pulmonary vein. Myocardial protection was achieved with antegrade cold crystalloid cardioplegia and topical ice saline. After the establishment of cardiopulmonary arrest, a right atriotomy parallel to the right atrioventricular groove was performed. We identified four apical muscular defects. The defects were covered by an appropriate sized pericardial patch with 11 interrupted pledgeted sutures. The first suture was anchored on the trabeculae septomarginalis further away from the rim of the defects. The patch was positioned over the defect.

Fig. 1. Transthoracic echocardiography of the patient revealed 6.8mm in diameter muscular VSD with a gradient of 70.8mmHg.
by the remaining interrupted sutures incorporating a portion of even the anterior right ventricular wall. As a final position, a new apical blind-ending chamber was created between the patch and the ventricular septum. Pledged sutures were strategically placed circumferentially in order to secure the patch and prevent the diminution of the right ventricle (Fig. 2). The tricuspid valve was tested for functional competence injection by insufflation of saline into the right ventricle. The left side of the heart was carefully deaired followed by the removal of cross-clamp. Weaning from cardiopulmonary bypass was possible with inotropic support. The cardiopulmonary bypass and aortic cross-clamp times were 55 minutes and 34 minutes, respectively. Intraoperative comparison of right atrial and pulmonary arterial blood samples showed an oxygen saturation difference less than 5%. Intraoperative TEE again was performed and there was no residual shunt. The operation was completed successfully. The patient was extubated after 8 hours and post operative period in the ICU was 2 days. Postoperative echocardiography confirmed the effective closure of the defect and revealed the non-communicating left to right ventricular shunt at the blind ending neo-apical chamber created by the pericardial patch material (Fig. 3). The child was discharged from the hospital after 10 days.

**Discussion**

In a patient suffering from closed chest trauma, a detailed physical and cardiovascular examination should always be performed. Compression of the chest may lead to excessive intraventricular pressure and result in acute rupture of the ventricular free wall or interventricular septum. These defects are mostly symptomatic immediately after the event, however, very few of them may be silent in the acute period and can show a gradual decompensation.

Early closure of these defects is recommended. For asymptomatic cases, the appropriate approach is still debatable. Some authors advise conservative approach, because the margins of the defect will become fibrous in time and this will provide easy and safe suture lines. On the other hand, as the probability of the patients becoming decompensated in time is very high, patients not managed surgically in the acute phase must be followed periodically by echocardiography.

In an acutely developing traumatic septal defect,