Interval Surgery for Unstable Traumatic Ventricular Septal Defect

Mohammad Anwer¹, Syed Usman Bin Mahmood¹*, Kelly Brown¹, Makoto Mori¹, Ayyaz Ali¹

¹Section of Cardiac Surgery, Yale University School of Medicine, New Haven, CT IRB protocol ID: 2000020356

Abstract

Blunt or penetrating thoracic wall trauma can lead to formation of a traumatic ventricular septal defect. This is a serious cardiac complication that can have dire hemodynamic consequences in a setting of ongoing hemorrhage. This demands urgent surgical repair to cease further deterioration. We describe a patient with traumatic VSD who underwent successful interval repair after management of acute abdomen and stabilization of hemodynamics using vasopressor and Intra-Aortic Balloon Pump (IABP).

Keywords: Traumatic VSD; patch repair; left ventricle

Introduction

Traumatic Ventricular Septal Defect (VSD) is a form of Blunt Cardiac Injury (BCI). According to the American Association for the Surgery of Trauma, traumatic VSD can be a Grade III or IV BCI depending on the severity of hemodynamic compromise. Ensuing mortality rates from blunt cardiac injury can be as high as 13.9% [1]. Incidence of traumatic VSD ranges around 2-10% of patients who suffer thoracic trauma in the U.S. [2].

After exclusion of any congenital defects rapid treatment for a traumatic VSD is usually emphasized. We define an instance of interval repair for a traumatic VSD after stabilization of hemodynamics.

Case Report

A 36-year-old male presented after a MVA involving car crashing against pole. On initial triage, the patient was hemodynamically unstable with increasing troponin values. Bilateral pulmonary contusions and free abdominal fluid were also found. He underwent a diagnostic cardiac catheterization. The coronary vasculature was normal although a shunt fraction (Qp/Qs) equivalent to 4:1 was revealed.

On bedside Transthoracic Echocardiogram (TTE) a large VSD was observed Figure 2. The size of the VSD and ensuing hemodynamic compromise pointed towards a traumatic origin. The patient received multiple transfusions but was difficult to stabilize in a background of gradually increasing abdominal free fluid level and a large VSD. The cardiology team ruled for open repair due to the large size (3.5 cm) and hemodynamics of the patient. He subsequently underwent an IABP placement to provide time for stabilization of the acute abdomen.

Over the next couple of days, the patient remained febrile and dependent on inotropic support. Sequential CT scans demonstrated increasing abdominal free fluid resulting in plan to delay correction of VSD. Eleven days after admission the patient underwent laparotomy with right hemicolectomy due to increasing abdominal free fluid, pneumatisis and leukocytosis.

Two weeks after initial admission the patient was considered for VSD repair albeit still requiring IABP Figure 1. Cardiac catheterization demonstrated significant shunting with progressive dilatation of the right ventricle. The timing for surgery was not ideal and was carefully deliberated considering the operative risk during ongoing sepsis. The team decided to proceed with surgery due to increasing right ventricular dilation and pressures.

A standard VSD repair with patch closure was performed. The patient had prolonged intubation necessitating percutaneous tracheostomy. The patient stabilized within 4 weeks on trach mask. During this period the patient had an episode of hypoxic respiratory arrest necessitating CPR and was stabilized after removal of clot near the carina. The patient did not have further complications during the course of his hospitalization.

Discussion

A VSD can occur spontaneously on impact at the time of accident or it may gradually form as de-vascularized tissue reorganizes after a cardiac contusion [3]. VSD may be overlooked during triage of a patient presenting with multiple manifest injuries in the emergency department. A moderately sized VSD presents with multiple signs and symptoms. It may result in a persistent hemodynamical instability and/or rising troponin values. A traumatic VSD complicated with hemodynamic instability is a surgical emergency and requires immediate definitive surgical management. However, in most cases there may be simultaneous multi-organ dysfunction that warrants careful stabilization of the patient before surgical management. For these cases the use of an intra-aortic balloon pump or pressors to stabilize the patient for an interval of up to two weeks before performing an invasive procedure may be beneficial.
Interval Surgery for Unstable Traumatic Ventricular Septal Defect

Figure 1: VSD repair through left ventriculotomy

Figure 2: Echocardiogram demonstrating VSD and significant intra-cardiac shunting (white arrow)

cardiac operation may be the ideal management strategy. This delay is typically suggested for patients who are not eligible for an urgent percutaneous closure. Interval surgery can help stabilize the patient and allow for control on bleeding. An open VSD repair involves heparinizing that may increase the chances of bleeding complications in a patient already compromised.

The most common surgical approach to repair a traumatic VSD is through the ventricle with subsequent patch closure [4]. Postoperatively patients are commonly known to present with complete heart block (most likely due to septal manipulation) requiring permanent pacemaker placement however, other complications may also arise [4].

Our case demonstrates that delayed closure of a traumatic VSD in a hemodynamically unstable patient is possible. Judicious use of an intra-aortic balloon pump and optimization with vasopressors is necessary in the interim period. These cases are associated with extreme risk of mortality and an inter-team collaborative decision making process is necessary.

Discussion

A VSD can occur spontaneously on impact at the time of accident or it may gradually form as de-vascularized tissue reorganizes after a cardiac contusion [3]. VSD may be overlooked during triage of a patient presenting with multiple manifest injuries in the emergency department. A moderately sized VSD presents with multiple signs and symptoms. It may result in a persistent hemodynamic instability and/or rising troponin values. A traumatic VSD complicated with hemodynamic instability is a surgical emergency and requires immediate definitive surgical management. However, in most cases there may be simultaneous multi-organ dysfunction that warrants careful stabilization of the patient before surgical management. For these cases the use of an intra-aortic balloon pump or pressors to stabilize the patient for an interval of up to two weeks before performing an invasive cardiac operation may be the ideal management strategy. This
delay is typically suggested for patients who are not eligible for an urgent percutaneous closure. Interval surgery can help stabilize the patient and allow for control on bleeding. An open VSD repair involves heparinizing that may increase the chances of bleeding complications in a patient already compromised.

The most common surgical approach to repair a traumatic VSD is through the ventricle with subsequent patch closure [4]. Postoperatively patients are commonly known to present with complete heart block (most likely due to septal manipulation) requiring permanent pacemaker placement however, other complications may also arise [4].

Our case demonstrates that delayed closure of a traumatic VSD in a hemodynamically unstable patient is possible. Judicious use of an intra-aortic balloon pump and optimization with vaspressors is necessary in the interim period. These cases are associated with extreme risk of mortality and an inter-team collaborative decision making process is necessary.

References


