Modified Extended Double Patch Repair for Interventricular Septum Dissection with Ventricular Septal Rupture

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Abstract

Ventricular septal rupture with dissection of the interventricular septum is an extremely rare complication following myocardial infarction, and the optimal surgical strategy remains unclear because of the limited number of surgical cases. Here we report a case of ventricular septal rupture with dissection of the interventricular septum, which we treated using a modification of the extended double patch technique via false lumen incision to close the ventricular septal rupture and exclude the dissection cavity.

Introduction

Ventricular septal rupture (VSR) is a rare and life-threatening complication following myocardial infarction, and ventricular septal dissection is even less common. The VSR can extend into the intraventricular wall, right ventricular free wall, left ventricular free wall, and ventricular septum as an intramyocardial dissection. A few reports describe how to repair a right and left ventricular free wall dissection with VSR (1-4). However, a repair technique for a ventricular septal dissection with VSR has rarely been described. We report here an extremely rare case of ventricular septum dissection and how we treated it.

Case Report

A 71-year-old male was referred to the emergency department of our hospital for out-of-hospital cardiopulmonary arrest. He was transferred to our hospital under cardiopulmonary resuscitation. By the time he arrived at the emergency room, spontaneous circulation had returned. The electrocardiogram revealed ST-segment–elevation myocardial infarction. Emergent coronary angiography was performed, and 99% stenosis of the left anterior descending coronary artery (#8) was detected. Transthoracic echocardiography (TTE) revealed VSR with left-to-right shunting. An intra-aortic balloon pump (IABP) and a Swan-Ganz catheter were inserted, and the patient was admitted to the intensive care unit. Fortunately, his hemodynamics were almost stable under IABP support without high-dose catecholamine administration. Our heart team decided that the best timing for the surgical intervention would be not immediately but within a week. Before the surgery, we assessed the TTE daily to confirm that the VSR was not growing and the extent of left-to-right shunting was not increasing. After day 3, the TTE revealed the VSR with interventricular septum dissection (Fig. 1), but the hemodynamics were stable, and the extent of shunting was also constant. The VSR was about 15 mm in diameter and the pulmonary artery pressure was 34/18 mmHg (mean, 23 mmHg). We conducted electrocardiogram-synchronized contrast computed tomography (CT) to determine the extent of the dissection of the interventricular septum (Fig. 2). Based on these factors, our heart team decided that the surgical intervention should be performed one week after admission.

The operation was performed under a full median sternotomy. A cardiopulmonary bypass (CPB) was established using the ascending aorta for arterial cannulation and the superior and inferior vena cava for vein cannulation. We used epicardial echocardiography to detect the dissecting intraventricular false lumen

and incised the false lumen cavity directly to approach the VSR site of the ventricular septum. After antegrade cold blood cardioplegia was infused to arrest the heart, a longitudinal incision was made along the intraventricular false lumen. The fragile myocardium surrounding the VSR was excised. We decided to repair the VSR and interventricular septum dissection using a modification of the extended double patch technique. A bovine pericardium patch was trimmed to make a circle with a diameter of 3 cm, to be used as the first patch for inside of the left ventricle (LV) cavity. The first patch was sutured with eight 3-0 polypropylene sutures; each suture was placed transmurally from the LV cavity via the false cavity to the right ventricle (RV) side or the outside of the LV. The second patch was trimmed in the same way as the first patch and fixed to the false cavity using transseptal sutures brought into the false cavity and to the RV. Sutures brought outside of the heart were secured with Teflon felt. Glue was inserted into the VSR before final knotting. The false cavity was closed with two Teflon felt strips with 3-0 polypropylene sutures (Fig. 3). The CPB time and aortic cross-clamp time were 163 min and 115 min, respectively.

The patient's postoperative course was almost completely stable. His hemodynamics were almost stable without IABP support on postoperative day 2. The postoperative TTE and CT revealed no residual shunt and no false lumen. However, a massive melena was detected on postoperative day 5. The CT revealed bowel ischemia, based on a thrombus from the shaggy aorta, and unfortunately the extent of the bowel ischemia was too massive to resect. The patient died on postoperative day 6.

Comment

Ventricular septal dissection with VSR is an extremely rare complication following myocardial infarction, and the optimal surgical strategy remains unclear because of the limited number of cases who have survived. In ventricular septal dissection, an entry that originates in the infarcted septal myocardium extends into the ventricular septum as an intramyocardial dissection.

Only a few cases of ventricular free wall dissection with VSR have been reported as having been successfully treated (1–3). However, ventricular septal dissection with VSR that has been treated surgically has only rarely been reported (4).

In this case, our approach started from the dissected cavity, as reported in a previous case (3). This approach was chosen to minimize damage to the non-infarcted myocardium. Additionally, to reliably prevent residual shunt and maintain cardiac function after surgery, the VSR was closed, and the dissection was excluded via the modified extended double patch repair (5). In this approach, the second patch is easily placed on the side of the dissected cavity side through the cavity.

With the extended double patch method based on the right ventricular approach to a VSR caused by myocardial infarction, right heart failure due to the right ventricular incision may be a problem after surgery (5). From this perspective, our approach via the dissected cavity can reasonably be said to be the safer procedure. Furthermore, with the extended double patch method, the patch is sutured more securely, with large transseptal/transmural mattress sutures rather than a continuous suture, minimizing the perioperative risk of shunt recurrence and securing the closure of the dissected cavity.

For these reasons, we believe this to be an optimal procedure, since the extended double patch prevents residual shunt more effectively, and also prevents postoperative RV and LV remodeling. The modified extended double patch technique with the approach via the dissected cavity to the septal dissection offers an apparently very secure anchorage plus double coverage, provides secure closure of the dissected cavity, spares the contractile area, and facilitates safe glue placement.

In summary, we have reported an extremely rare case of ventricular septal dissection with VSR, which was treated successfully using a modification of the extended double patch method.

References

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Figure legends

Fig. 1

Transthoracic echocardiography revealed an intraventricular septal dissection and a ventricular septal rupture with left-to-right shunt (white arrow). The asterisk indicates the intraventricular septal false cavity. LV, left ventricle; RV, right ventricle.

Fig. 2

Electrocardiogram-synchronized contrast CT revealed the dissection of the interventricular septum. The asterisks indicate the intraventricular septal false cavity. LV, left ventricle; RV, right ventricle.

Fig. 3

Cross-sectional view of how we repaired the VSR with septum dissection using the extended double patch technique via a false lumen approach. Glue (green, indicated by black arrow) was inserted between the two patches (red lines). Blue lines indicate stitches and the asterisk indicates the intraventricular septal false cavity. LV, left ventricle; RV, right ventricle.