Entire Septal Patch Technique for Postinfarction Ventricular Septal Rupture
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Postinfarction ventricular septal rupture is still a surgically challenging situation with high operative mortality. We report a case of ventricular septal rupture in a 75-year-old woman successfully treated with our newly devised technique, in which a pliable large septal patch is fixed with transmural sutures placed in posterior left ventricular free wall and anterior ventriculotomy closing sutures, thus covering the septal wall almost entirely. Our method may simplify the operation and reduce the risk of residual leakage.


Ventricular septal rupture (VSR) is a rare but often fatal complication of acute myocardial infarction. Surgical closure of the defect is the only treatment of choice in most cases. Daggett and associates proposed infarctectomy and closure of the defect with Dacron patches [1]. Although that method is simple, it is reportedly associated with high operative mortality when performed on a patient in the acute phase of myocardial infarction [2, 3]. David and associates introduced an infarction exclusion technique with 14% operative mortality and very low risk of residual shunt in survivors [4]. Some surgeons report a significant incidence of residual shunt when the infarction exclusion technique is employed, however [3]. Although David’s infarction exclusion technique is a revolutionary method for treating VSR, it seems to be rather technically demanding [3, 5], because plain patch must be shaped into a domed configuration while it is being secured to the trabecular endocardium. Shibata and associates reported a modification of infarction exclusion technique that uses two separate patches which are more easily adjusted to conform to the endocardium [5]. The use of glue is an another approach for sealing the suture line on trabecular endocardium [6]. We propose a simple new method to treat VSR that particularly addresses tight fixation of the patch.

A 75-year-old woman was transferred to our institution with a diagnosis of VSR 3 days after the onset of broad anterior acute myocardial infarction in March 1999. On admission, she was in cardiogenic shock. The electrocardiogram showed Q waves and elevation of the ST segment in leads V1 through V6. Coronary angiography showed occlusion of proximal left anterior descending artery with no other significant lesion. The left-to-right shunt ratio measured by oximetry was 59% under support by an intraaortic balloon pump and mechanical ventilation. An emergency operation was performed 4 hours after admission. Total cardiopulmonary bypass with bivacal drainage was established. A left ventricular venting tube was introduced through the right upper pulmonary vein. The aorta was cross-clamped and cardiac arrest was obtained using tepid blood cardioplegia solution. The left ventricle was opened along the left anterior descending artery starting at the apex. Ventriculotomy was extended high enough toward the cardiac base to reach the margin of infarcted area. The VSR was found to be 7 by 25 mm and located anteriorly about 4 cm from the apex. The cardiac apex was lifted up, and several 3-0 Prolene (Ethicon, Somerville, NJ) horizontal mattress sutures buttressed with Teflon felt were passed from the outside to the inside of the posterior left ventricular free wall. Needles were inserted along the posterior descending artery with about 1 cm of clearance laterally. They were brought out from the interior of the left ventricle between the posterior margin of the ventricular septum and the posterior papillary muscle. Care was taken to avoid the posterior descending artery, papillary muscle, and mitral chordae.

The sutures were passed through a large bovine pericardial patch and tied down (Fig 1). The superior margin of the patch was then sutured to the endocardium of the ventricular septum, starting from the deepest point of septal wall and proceeding toward the upper edge of the ventriculotomy. This over-and-over suture was placed in noninfarcted tissue well beyond the infarcted area. The patch was then trimmed to match the septal wall, leaving a 2-cm margin. Finally the ventriculotomy was closed in two layers. The pericardial patch was incorporated into the sutures used to close the left ventricle, as shown in Figure 2. Seating of the patch and reinforcement of the ventriculotomy were accomplished at the same time. Thus the patch covered most of the septal wall and was anchored with transmural sutures both anteriorly and posteriorly.

Aortic clamp time, cardiopulmonary bypass time, and operative time were 72, 132, and 197 minutes, respectively. Intraoperative blood loss was 130 mL. The patient’s postoperative course was uneventful, including 4 days of stay in the intensive care unit. Echocardiography showed normal left ventricular wall contraction, except at the infarcted area, with no evidence of residual leak. The postoperative coronary angiogram was almost identical to the preoperative angiogram, showing the posterior descending artery to be preserved intact. Ventriculography of the left ventricle showed akinesis in the anteroseptal wall. The left ventricular ejection fraction was 38%. The patient was discharged as New York Heart Association functional class II.
Comment

Avoiding the residual shunt and minimizing damage to noninfarcted areas are key points in the treatment of postinfarction VSR. David and associates emphasized the advantages of their method over the traditional technique in this setting [4]. Nevertheless, the problem of residual shunt persists [3]. In our method, the patch is secured tight with transfixation sutures placed posteriorly and with left ventricular closing sutures placed anteriorly; the septum is thus almost entirely covered. The weakest part of the suture line may be its superior margin, where the patch is seated on the endocardium of the septum with a simple over-and-over suture. However, this suture would seem to be durable because the endocardium in the basal septum is usually smooth and relatively thick with little trabecular tissue.

One possible drawback of our method is potential damage to posterior myocardium by the transfixation sutures. This risk can be minimized, however, by placing the sutures carefully, avoiding the major coronary arteries and tying the sutures with appropriate strength. Postoperative echocardiography in this case showed normal contraction of the posterior left ventricular wall. Our technique may be a simple and easily reproducible technique for decreasing the risk of residual shunt in the treatment of VSR.

References


INVITED COMMENTARY

This case report of a technique for ventricular septal rupture repair by Ito and colleagues is not entirely new in terms of a large patch covering the entire septum, that aspect of the technique having been first reported by Iben and coworkers from Stanford many years ago. What is new about this technique are the through-and-through sutures used to fix the septal patch, the sutures being brought through the ventricle on the side opposite the infarct. This method overcomes a weakness in the David technique, which is an application of the Vincent Dorr principle of infarct exclusion, wherein the weak point is along the base of the septum, an area in which sutures may tear out. We have modified David’s technique, as suggested by Cooley, by bringing sutures through the