

Surgery on a Patient with Iatrogenic Aortic Valve Leaflet Perforation after Repair of a Congenital Ventricular Septal Defect

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ABSTRACT

Aortic valve regurgitation caused by a leaflet perforation occurs most often with infective endocarditis involving the aortic valve. Although rare, leaflet perforation can be caused by suture-related injury during cardiac operations, such as mitral valve replacement, ventricular septal defect (VSD) repair, and repair of an ostium primum atrial septal defect. Few reports have described this form of iatrogenic aortic valve leaflet perforation. We used a pericardial patch in a successful repair of an iatrogenic perforation in an aortic valve leaflet that occurred after simple VSD repair.

INTRODUCTION

Aortic valve regurgitation caused by leaflet perforation is seen most frequently in the patient with infective endocarditis involving the aortic valve [Ballal 1991; Hill 1997]. Although rare, leaflet perforation can be due to suture-related injury during cardiac operations [Rey 1991; Hill 1997; Woo 2010], such as mitral valve replacement, ventricular septal defect (VSD) repair, and repair of an ostium primum atrial septal defect. Few reports have described the form of iatrogenic aortic valve leaflet perforation occurring after surgery performed near the aortic valve. We admitted a patient with iatrogenic aortic valve leaflet perforation that occurred after a simple VSD repair and successfully repaired the perforation with a pericardial patch.

CLINICAL SUMMARY

A 19-year-old woman presented with congestive heart failure due to severe aortic regurgitation of 1 year. The patient had a history of a simple closure of a membranous VSD 14 years previously. The patient had no history of endocarditis

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or chest trauma. A physical examination revealed a blood pressure of 150/50 mm Hg. There was a diastolic murmur over the aortic valvular area. A chest radiograph showed an enlarged cardiac silhouette and a normal pattern of pulmonary vascularity. An electrocardiogram revealed complete right bundle branch block, and a transthoracic echocardiographic study showed a perforation located near the aortic annulus in the noncoronary cusp. Continuous wave and color flow Doppler studies revealed severe regurgitant jet flow that originated from the perforation immediately beneath the aortic valve and proceeded into the left ventricle (Figure 1). The left ventricle was dilated, with an end-diastolic diameter of 62 mm; the global systolic function of the left ventricle was normal (ejection fraction, 59%).

The operation was performed through a median sternotomy and with standard cardiopulmonary bypass. The aortic valve was inspected through a standard aortotomy incision. A defect of approximately 6 mm in diameter was found in the noncoronary cusp, near the aortic annulus and close to the commissure of the right and noncoronary cusps. The same size of autologous pericardium was used to repair the defect, and our evaluation showed satisfactory cusp coaptation. The surgery was completed uneventfully (Figure 2).

The patient recovered uneventfully, and the echocardiography examination conducted a week later showed an intact repair of the leaflet perforation. There was no residual aortic regurgitation, and the dimension of the left ventricle was normal, with an end-diastolic diameter of 48 mm (Figure 3).

DISCUSSION

Iatrogenic aortic valve injury has been well described for cardiac surgeries that have used the transaortic approach. These operations include commissurotomy in patients with a bicuspid or unicuspid stenotic aortic valve [Morganroth 1977], surgical aortic valve decalcification [Freeman 1990], and septal myotomy-myectomy in patients with hypertrophic obstructive cardiomyopathy [Mohr 1989]. Just as in the case we describe, the aortic valve can also be injured inadvertently after nonaortic cardiac operations. The usual cause of an aortic leaflet tear or perforation is the placement of a suture through a leaflet, with laceration of the leaflet occurring as the suture is tied, or

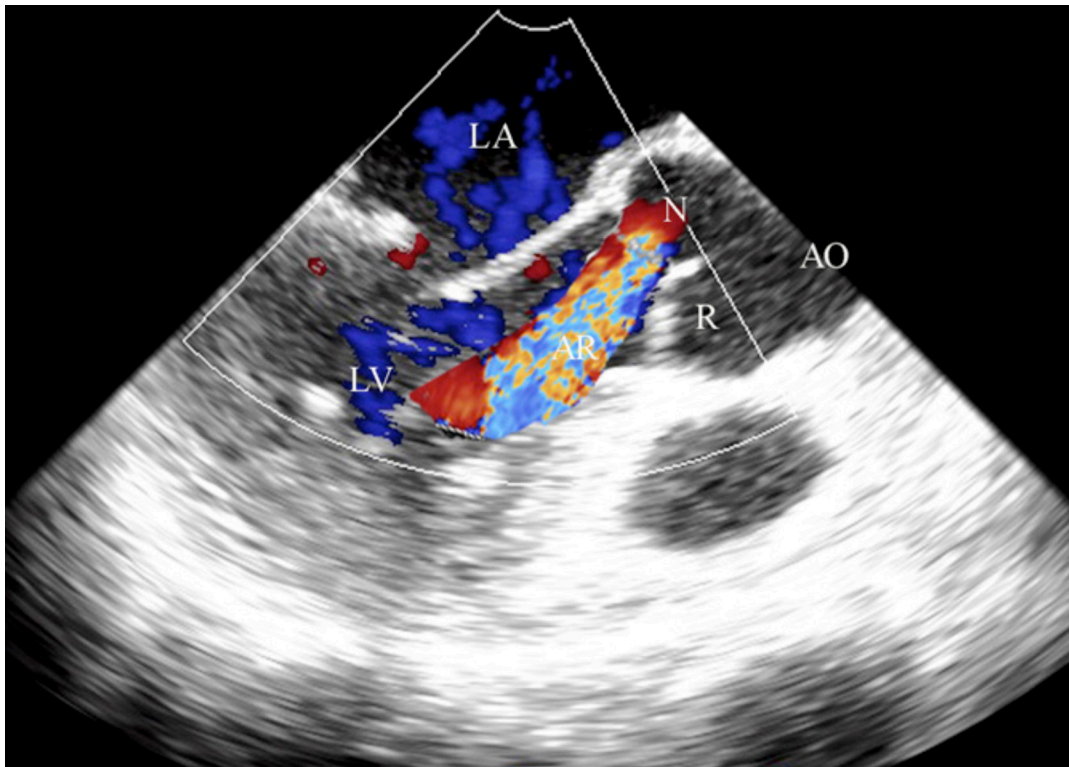


Figure 1. Color Doppler evaluation revealed severe aortic regurgitation that originated from a perforation in the noncoronary cusp. LA indicates left atrium; LV, left ventricle; AO, aorta; R, right coronary cusp; L, left coronary cusp.

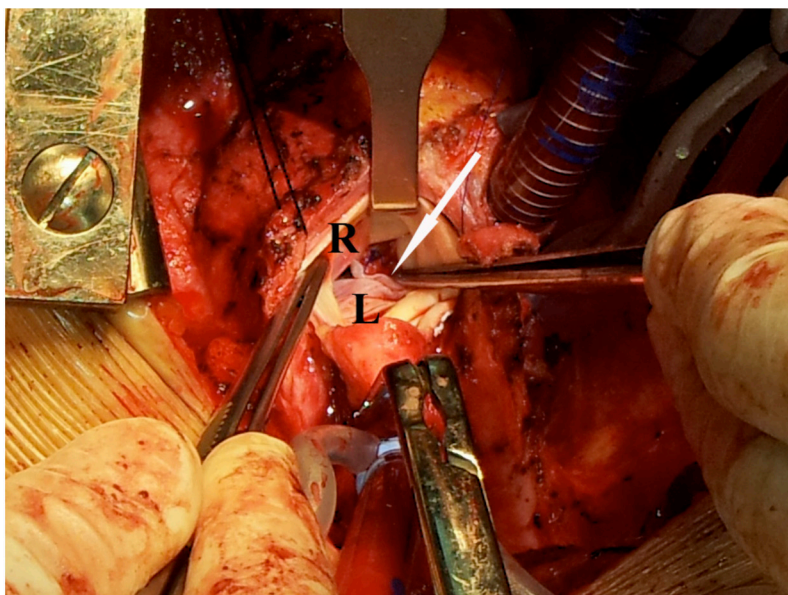


Figure 2. Autologous pericardium was used to repair the perforation in the noncoronary cusp. R indicates right coronary cusp; L, left coronary cusp. White arrow indicates the patch.

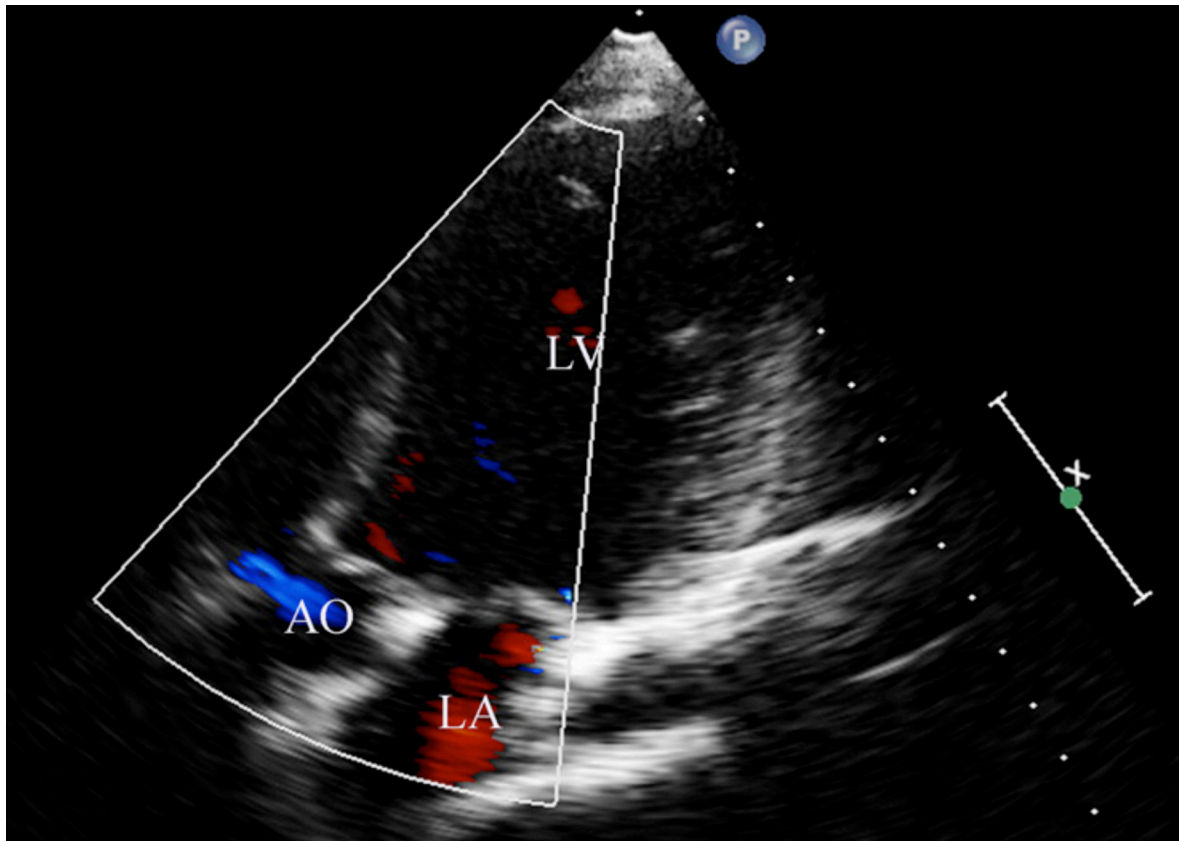


Figure 3. A color Doppler evaluation showed no residual aortic regurgitation. LV indicates the left ventricle postoperatively; LA, left atrium; AO, aorta.

it can occur with a needle as sutures are placed near the aortic annulus [Hill 1997]. In the patient with iatrogenic aortic injury after periaortic cardiac surgery, the location of the leaflet tear or perforation is site specific and depends on the type of procedure performed, eg, injury to the left coronary cusp or the noncoronary cusp during mitral valve repair or replacement, injury to the noncoronary cusp during repair of ostium primum atrial septal defect, or injury during repair of the tricuspid valve, the right coronary cusp, or the noncoronary cusp during repair of a membranous VSD [Hill 1997].

With an increased awareness of this iatrogenic injury, we are able to predict whether an increased risk exists for such an injury; thus, knowing the anatomic specifics can help prevent it [Hill 1997; Woo 2010]. For instance, we should take care not to traumatize the aortic cusps with the forceps or the stitching needle during VSD repair, because the aortic noncoronary and right coronary ring partly border the VSD ridge.

Iatrogenic perforation of an aortic valve leaflet should be suspected when a new aortic regurgitation murmur develops after cardiac operations on the periaortic structures. Although perforation is occasionally recognized during the original operation, it usually presents in the majority of patients several years later as progressive aortic regurgitation. Echocardiography and Doppler wave evaluations can confirm

the diagnosis of cusp perforation, usually by the presence of an eccentric jet of aortic regurgitant flow in the body of the aortic valve cusp close to the aortic root [Hill 1997].

Aortic valve repair or replacement should be done for those with severe aortic valve regurgitation caused by leaflet perforation. Autologous pericardium is usually used as the patch material for repair. Sometimes the coaptation of the leaflet edges may be reinforced by commissuroplasty. Although this complication is rarely reported, it may exist in a small fraction of patients with mild aortic regurgitation just because these patients with an iatrogenic leaflet perforation do not present for evaluation or need therapy [Hill 1997].

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