

Subacute Aortic Regurgitation as a Rare Presentation of Iatrogenic Aortic Valve Leaflet Perforation

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Abstract- There is a paucity of literature regarding iatrogenic aortic valve perforation after cardiac operation is performed in the vicinity of the aortic valve. This report describes the clinical, echocardiographic, and angiographic recognition of iatrogenic aortic valve perforation in a patient who had previously undergone membranous ventricular septal defect and pulmonary stenosis. Five days after the operation, the patient showed subacute signs and symptoms of congestive heart failure in surgical ward. Echocardiographic examination revealed free aortic regurgitation. The patient was scheduled for operation, which was performed using cardiopulmonary bypass and cardioplegic arrest. During the operation, exploration of the aortic root revealed tearing non-coronary aortic cusp at the level of the aortic ring and slightly dilated the left sinus. Despite close examination, no suture could be identified. It was reasoned that the tension created by the dacron patch pulled on the adjacent tissue and caused the separation of the non-coronary cusp from its ring and the patient was treated by aortic valve replacement with prosthetic aortic valve. We did not have the facility to use transesophageal echocardiography for the examination of aortic valve repair and the poor condition of the patient did not permit us to repair the valve. Precise preoperative diagnosis of this lesion allows optimal surgical planning and treatment.

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Introduction

Normal valve function requires integrity and coordinated interaction among all components in the system. For the atrioventricular valves, these elements include leaflets, commissures, annulus, chordae tendineae, papillary muscles, and atrial and ventricular myocardium. For the semilunar valves (aortic and pulmonary), the key structures are the cusps, commissures and their respective supporting structure in the aortic and pulmonary roots. In aorta, although the pressure differential across the closed aortic valve during the diastolic phase induces a large load on the cusp, the geometry of the whole valve and the fibrous networks within the cusp effectively transfer the resultant stresses to the annulus and aortic valve. One of the supporting systems below the aortic valve is aortomitral fibrous continuity and some types of

VSD are located in membranous septum near this system and close to aortic ring, and tension created by Dacron patch during VSD repairs distorts the aortic ring and the resultant unharmonious forces to aortic cusp cause cusp perforation in border between ring and valve as in this case. Rarely, suture-related, inadvertent injury to an aortic valve leaflet can produce leaflet perforation with regurgitation after cardiac operations performed in the vicinity of aortic valve (1). Infective endocarditis can also cause aortic regurgitation associated with leaflet perforation (2).

The report describes the clinical and angiographic finding of subacute aortic regurgitation in one patient with iatrogenic aortic leaflet perforation that was treated with aortic valve replacement. An increase in the awareness of this entity may help prevent such injuries and improve its recognition.

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Case Report

A 15 year-old male suffering from cyanosis was admitted to our center. Cardiac catheterization revealed membranous VSD and severe pulmonary stenosis (subvalvular). The patient was scheduled for operation, which was performed using cardiopulmonary bypass, cardioplegic arrest and VSD was approached by opening of right atrium and right ventricular outlet.

VSD was closed with Dacron patch and with continued method by 4/0 proline sutures, and subvalvular pulmonary stenosis was repaired with right ventricular outflow tract muscle resection and pericardial patch, and in order to prevent aortic valve injuries during VSD repairs, the aortic valve bulging was seen by cardioplegic injection in aortic root from inside of VSD defect during its repair.

The patient recovered from operation uneventfully. Five days after the operation, the patient became anxious with increasing shortness of breath, and his condition rapidly deteriorated. Systolic blood pressure decreased to 60 mmHg and the heart rate increased to 160 beats per minute. The patient was returned to intensive care unit and intubated, and continued to be hemodynamically unstable, requiring multiple doses of epinephrine. Trans-thoracic echocardiography in the intensive care unit revealed a mild subvalvar aortic stenosis (30-mmHg gradient), a mild pulmonary regurgitation, no aortic regurgitation, and no pericardial effusion. The patient was returned to the surgical ward after improvement of his general condition. In the ward, he developed peripheral edema, upper abdominal pain, nausea, vomiting, and elevation of Bun-Creatinine, with a clinical picture suggestive of congestive heart failure requiring a diuretic, digoxin, and inotropic agents. Six days later, he developed signs and symptoms of severe aortic regurgitation and angiography revealed free aortic regurgitation. The patient was scheduled to repeat the operation using cardiopulmonary bypass and cardioplegic arrest. During the operation, exploration of the aortic root revealed tearing non-coronary aortic cusp at the level of aortic ring and slightly dilated left sinus. Despite close examination, no suture could be identified. It was reasoned that tension created by the dacron patch pulled on the adjacent tissue and caused the separation of the non-coronary cusp from its ring. The poor condition of the patient (low cardiac output, high dose inotropic drug support, acute renal failure, and severe respiratory edema) did not permit the surgical team to perform aortic valve sparing operation. Meanwhile we did not have the facilities to use transesophageal echocardiogra-

phy for examination of aortic valve repair. The aortic valve was replaced with carbomedics prosthetic valve.

The postoperative course was uneventful; the patient was discharged home on the tenth postoperative day.

Discussion

Iatrogenic aortic valve injury occurs after operations. Although the transaortic approach in patients with bicuspid aortic valve (4,5) and hypertrophic obstructive cardiomyopathy (HOCM) (1) are well described in the literature, we describe it briefly. During aortic approach for repairs of bicuspid aortic valve, the surgeon assistant pulled up one cusp to his or her site; and sometimes these unordinary forces caused valve rupture. In resection of subvalvar stenosis, this incident also occurred by pulling up of the valve. During the repair of HOCM due to wide resection of subvalvar muscles of ventricular septum, and long time of pulling of the valve by assistant, the chance of injuries to the valve is high, and sometimes, wide resection of muscles near the aortic ring causes weakening of aortic valve support and its prolapses giving rise to unharmonious forces to cusp and its rupture. This report describes a lesser-known entity of aortic valve perforation, which was found in our patient. The proximity of the cusps of the aortic valve to the adjacent structures can lead to a site-specific injury of aortic valve that is described by Hill and colleges (6). In one study, the mean interval between the original intra cardiac operation and second operation for repair of aortic regurgitation was seven years (6). The aortic valve is not accessible for direct examination during these operations, the usual cause of aortic leaflet injuries is placement of a suture through a leaflet, with laceration of the leaflet as the suture is tied or laceration of the leaflet by a needle as sutures are placed near the aortic annulus. Iatrogenic aortic valve cusp perforation should be suspected when a new regurgitation murmur, low cardiac output, or renal failure develops after cardiac operation on the vicinity of aorta and aortic valve repair or replacement should be done. This complication appears to be rare but under-reported and the benefit of increased awareness of this condition is improved prevention of this complication in cardiac operation (1). This case report underlines the importance of obtaining a complete intraoperative TEE after VSD repairs.

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