Patch detachment after mitral valve repair with posterior leaflet augmentation: a case report

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Abstract

Mitral valve (MV) repair is indicated for patients with severe MR. We report a case of acute MR caused by patch detachment after posterior leaflet augmentation in MV repair. A 65-year-old male underwent MV repair with posterior leaflet augmentation and coronary artery bypass graft 1 month prior to this study. An inverted T-shaped incision was made on the posterior mitral leaflet (PML), and a piece of autologous fresh pericardium was sewn in the PML defect. Seven days after hospital discharge, he started feeling chest pain and presented with pulseless electrical activity. Ultrasonic cardiography showed severe mitral regurgitation (MR), which was suggestive of acute MR. We performed emergency reoperation. The edge of the autologous pericardial patch was detached from the anterior papillary muscle, and MV replacement was performed. He was discharged from the hospital 55 days after the reoperation and returned to his normal daily life. We conclude that avoidance of tension focalization during MV repair may be important.

Keywords: Ischemic mitral regurgitation, Cardiopulmonary arrest, Mitral valve repair

Background

Ischemic mitral regurgitation (MR) results from left ventricular remodeling after myocardial infarction and significantly affects prognosis. Mitral valve (MV) repair or replacement is indicated for patients with severe MR. Ring annuloplasty is most commonly used for MV repair [1] although long-term outcomes are often unsatisfactory [2, 3]. The use of standard surgical techniques in MV repair are still under debate; however, it is proposed that chordae cutting, papillary muscle approximation and leaflet augmentation combined with annuloplasty greatly improve clinical outcomes in MV repair [4–6]. We report a case of acute MR caused by patch detachment after posterior leaflet augmentation in MV repair.

Case presentation

A 65-year-old male underwent MV repair with posterior leaflet augmentation and coronary artery bypass grafting (aorta-oblique marginal branch-posterior descending with saphenous vein graft) in another hospital 1 month prior to this study. Preoperative transthoracic echocardiography showed dilated left ventricle (LV) with inferoposterior wall akinesis and over all impaired LV function with 39 % of ejection fraction. There was severe mitral regurgitation (MR) with 19.6 mm of tethering height, and coaptation depth was 13 mm. Augmentation of the posterior mitral leaflet (PML) was chosen because there was fear of MR recurrence if only mitral annuloplasty was done. An inverted T-shaped incision was made on the PML, and a piece of autologous fresh pericardium was cut to a pentagonal shape and sewn in the PML defect. The edge of the patch was directly fixed to the anterior papillary muscle by pericardium pledgeted single suture with 4–0 polypropylene. Annuloplasty was performed with Physio II 32 mm (Edwards Lifesciences, Inc, Irvine, CA, USA) (Fig. 1). Intraoperative transesophageal echocardiography showed no MR, but postoperative transthoracic echocardiography showed mild-to moderate MR in the medial scallop. He was discharged from the hospital 21 days after the surgery.

Seven days after discharge, he started feeling chest pain while driving and called the emergency services. When they arrived, he had pulseless electrical activity.
Cardiopulmonary resuscitation was started immediately
and adrenaline and atropine were administered twice. He
regained spontaneous circulation after two minutes of re-
suscitation and then transferred to our hospital by a heli-
copter after tracheal intubation. Echocardiography showed
prolapsing pericardium attached to the PML and massive
MR. Coronary angiography revealed saphenous vein graft
occlusion. Percutaneous coronary intervention was per-
formed on the occluded graft; however, his blood pressure
gradually decreased and he developed anuria, even with
inotropic support using dopamine, dobutamine and intra-
aortic balloon pump (IABP). Repeated ultrasonic cardiog-
raphy showed severe hypokinesis in the inferoposterior
wall of the left ventricle, equivalent to that before coronary
intervention, and pulse Doppler showed severe MR with
rapid decrease of regurgitation flow “cut off sign” in the
late systolic phase, which was suggestive of acute MR.

Emergency surgery was performed. Cardiopulmonary
bypass (CPB) was initiated with cannulation of the as-
cending aorta, superior vena cava and right femoral vein.
The ascending aorta was cross-clamped and a left-sided
atriotomy was made. The mitral annuloplasty ring
remained fixed at the annulus; however, the edge of the
autologous pericardial patch was detached from the an-
terior papillary muscle so that the posterior leaflet exten-
sively prolapsed toward the left atrium (Fig. 2). Papillary

Discussion

Although MR is one of the severe complications after
myocardial infarction, the most preferable surgical pro-
cedure for ischemic MR has not been established [1, 2].
MV repair has a higher recurrence rate than MV re-
placement, although a recent meta-analysis showed
lower perioperative mortality and better survival with
MV repair at 5 years compared with that of MV replace-
ment [1, 2]. There are various surgical procedures to im-
prove surgical outcome in MV repair. Anterior leaflet
augmentation was reported 81 % of actuarial freedom
from moderate or greater MR in 25 patients [5]. An ani-
mal study revealed that posterior leaflet augmentation,
attained more coaptation than annuloplasty alone [4].
Here we report a case and highlight the risk of sudden
patch detachment after MV repair with posterior leaflet
augmentation.

Generally, leaflet preservation during the MV replace-
ment was recommended for ischemic mitral regurgita-
tion [7]. Preservation of subvalvular apparatus and valve-ventricular interaction was proved to play an im-
portant role in preserving left ventricular regional wall
motion and global function. Leaflet preservation may
help prevent serious complications after MV replace-
ment [8]. However, it was impossible to perform re-
repair or valve replacement with leaflet preservation
because there was necrosis in residual posterior leaflet
in the presenting case.

Cardiac arrest caused by severe MR because of detach-
ment of artificial structures from the papillary muscle is
extremely rare, and we were unable to find any other re-
port in which the patient was successfully treated with
emergency surgery. The cause of cardiac arrest in our
case could have been because of either graft occlusion of
the previous coronary artery bypass or acute MR. How-
ever, the hemodynamic status was unstable after successful
surgical intervention and echocardiography
showed acute MR. Therefore, acute MR was considered to be the primary cause of cardiac arrest. There is a possibility that cardiopulmonary resuscitation caused the patch detachment after cardiac arrest because of bypass occlusion. This is also extremely rare, but it is worth being aware of the risk of chest compression that causes patch detachment after mitral repair.

In this case, the center of the posterior leaflet was incised in a T-shape and an edge of the pericardial patch, which was sutured to the incised posterior leaflet, was directly fixed to the papillary muscle with a single point in the initial surgery. Therefore, there may have been excessive tension focalization on the patch edge during systole, causing the patch to detach suddenly from the papillary muscle leading to acute MR and cardiopulmonary arrest. Thus, it may be important to avoid tension focalization during MV repair.

**Conclusion**

We report a case of patch detachment after MV repair with posterior leaflet augmentation, which highlights the potential importance of avoiding tension focalization during MV repair.

**Consent**

Written informed consent was obtained from the patients for publication of this Case report. Copies of the written consent forms are available for review by the Editor-in-Chief of this journal.

**Abbreviations**

MV: Mitral valve; PML: Posterior mitral leaflet; MR: Mitral regurgitation; IABP: Intra-aortic balloon pump; CPB: Cardiopulmonary bypass.

**Competing interests**

The authors declare that they have no competing interests.

**Authors’ contributions**

TG presented design of the report and completed the manuscript. YW, TT, TS, and DF are in charge of patient care. TT directed all the work. All authors read and approved the final manuscript.

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