Case report

Ruptured sinus of Valsalva aneurysm associated with aortic regurgitation caused by hemodynamic effect solely

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Abstract

We describe a case of ruptured sinus of Valsalva aneurysm (RSVA) with moderate aortic regurgitation (AR), which developed on the second day after admission. The AR was caused by a hemodynamic effect solely, in which the shunt blood flow through ruptured site pulled the right aortic cusp away from closure. The pathological mechanism of the AR was clearly visualized by intraoperative transesophageal echocardiography (TEE) and the AR was successfully resolved after simple closure of the RSVA without any additional procedure to the aortic valve.

Keywords: Ruptured sinus of Valsalva aneurysm; Aortic regurgitation; Surgical repair

1. Introduction

Ruptured sinus of Valsalva aneurysms (RSVA) is often associated with aortic valve regurgitation (AR). We describe a rare case of RSVA, where the patient suddenly developed severe AR because the right aortic cusp was fixed in the open position by shunt flow through the RSVA.

2. Case

A 31-year-old female was referred to our institute because of congestive heart failure. One month before admission, she delivered her first baby transvaginally without complications. Three weeks later, she developed cough and palpitations. Her functional status was New York Heart Association (NYHA) class II. On admission, she had a grade 4/6, laud continuous murmur with an associated thrill at the left third intercostal space. The internal jugular veins were distended. Chest radiograph revealed moderate cardiomegaly and increased pulmonary vascularity. Trans-thoracic echocardiography (TTE) revealed an aneurysm of the sinus of Valsalva arising from the right coronary sinus, which had ruptured into the right atrium. The ventricular septum was intact and AR did not present at this point. Cardiac catheterization revealed an aortocardiac shunt and a Qp/Qs of 1.53. Aortography also did not show AR. On the day after admission, the patient developed severe AR, which was detected by bedside TTE study, and an urgent surgery was performed.

Intraoperative transesophageal echocardiography (TEE) performed just after the induction of general anesthesia revealed severe AR caused by shunt flow pulling the right coronary cusp into the open position during diastole (Fig. 1). A median sternotomy was performed, and cardiopulmonary bypass was instituted with rapid hypothermia (32.5°C). Retrograde continuous cold blood cardioplegia was used during cardiac arrest. Both right atriotomy and aortotomy were performed. The aneurysm created a ‘windsock’ deformity arising from the right coronary sinus and entering into the right atrium adjacent to the tricuspid annulus. The maximum diameter of the aneurysm was 8 mm and its orifice was narrow and the tissue was steady enough to allow direct closure. The ruptured aneurysm was excised and closed at the orifice using direct continuous suture reinforced with pledgeted mattress sutures. There was no distortion of the right coronary sinus. Excellent coaptation of three aortic cusps was obtained without any adjunctive procedure. TEE following weaning from cardiopulmonary...
bypass showed complete resolution of the AR. The patient had an uneventful course and was discharged on the 14th postoperative day. After 2 years follow-up, no murmur has been detected.

3. Discussion

Aortic valve abnormalities and incompetence are common in patients with RASV and sometimes have influences on its prognosis. In the reported series, the incidence of AR is 25–45% [1–5]. Associated ventricular septal defect (VSD) is recognized in 60–92% of the patients and is a predisposing factor for AR [1,2,6]. When there is the coexisted subarterial VSD, prolapsed aortic cusps with a lack of supporting tissues cause the AR. In addition to this anatomical prolapse of the aortic cusp, a second mechanism is the Bernoulli effect during systole, which tends to pull the related cusp into VSD [2,7]. Similar to this mechanism, the shunt flow through the ruptured site of sinus of Valsalva pulled the cusp of the aortic valve in diastole also [1]. In our patient, we unexpectedly discovered severe AR on the day after admission, which did not exist on the previous day. Intraoperative TEE certainly visualized that the right coronary cusp of the aortic valve was pulled into open position by blood flow through the RASV during diastole (Fig. 1) and resulting severe AR, except during few beats when the aortic cusps showed good coaptation. Therefore, the AR in our patient most likely occurred by the hemodynamic mechanism alone. Shunt flow might have increased resulting in development of the AR, although there is no evidence of shunt flow increase.

As to the surgical approach for correction of RSVA, there are three different methods. It can be done through only the cardiac chamber into which the aneurysm ruptures [8]. In some cases, only transaortic approach might be enough [2,4, 9]. To accomplish an appropriate repair, however, it seems a combined approach both from the aortic root and chamber involved is favored by more surgeons [2–4,8]. This approach allows investigating the aortic cusps and annulus and results in appropriate repair and avoiding injury to the cusps or coronary ostium.

If the associated AR is mild, no surgical intervention may be necessary. However, most patients with moderate or severe AR require surgical intervention. AR resulting from cusp prolapse associated with VSD can be repaired by correction of RSVA and VSD or valvuloplasty [2]. In case the cusps are very deformed by some secondary changes, aortic valve replacement is necessary [1,10]. It is not usual that closure of the RSVA alone achieves complete repair of moderate AR.

In conclusion, we experienced a case of RSVA with AR developed unexpectedly by the hemodynamic mechanism solely. We successfully repaired RSVA resulting in resolution of associated AR without any additional procedure. Intraoperative TEE and the combined surgical approach both through the chamber involved and aortotomy were useful to evaluate pathophysiology and also completion of surgical procedure.

References