Abstract

Aneurysm of sinus of Valsalva is a rare cardiac lesion that may be acquired or congenital. The presentations of RSOV range from incidental detection to frank heart failure. Right sinus of Valsalva aneurysm usually ruptures into the right atrium. If non-coronary sinus is involved, most aneurysms erode into the right atrium. The problems described with surgical repair of RSOV include – distension of the communicating chamber at initiation of cardiopulmonary bypass (CPB), limited ability to achieve cardiac arrest if RSOV is misdiagnosed as ventricular septal defect, and air entrainment in venous drainage line on opening of the aorta, if tricuspid valve is regurgitant and total CPB is not established. We report severe hypotension and overflowing of the venous reservoir at initiation of CPB in a patient having RSOV with significant tricuspid regurgitation and discuss its optimal management.

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1. Introduction

Aneurysm of sinus of Valsalva (ASOV) is a rare cardiac lesion. A congenital lack of continuity between aortic media and annulus fibrosus [1], or a developmental defect in aortic annulus [2] can gradually give way under pressure to form an aneurysm. Diseases involving aortic root such as endocarditis, cystic medial necrosis, arteriosclerosis and trauma are also associated with ASOV [3]. Right sinus of Valsalva aneurysm usually ruptures into the right ventricle, while aneurysms of non-coronary sinus usually erode into the right atrium [4]. The periprooperative problems include distension of the communicating chamber and air entrainment at initiation of the cardiopulmonary bypass (CPB) and possibility of complete heart block after repair of the RSOV. We describe the extreme hypotension and flooding of venous reservoir at initiation of CPB in a patient undergoing RSOV repair and discuss its management issues.

2. Case report

A 33-year-old man was scheduled for repair of RSOV. On transthoracic echocardiography examination (TTE), right atrium (RA) was dilated, RA dimension was 72 mm x 72 mm, left and right ventricular (LV and RV) dimensions were 49/26 and 37 mm, the aortic annulus measured 25 mm, the aortic valve was tricuspid and showed mild regurgitation; the LV ejection fraction was 45%. The RSOV was committed to RV inflow and its opening measured approximately 6–8 mm. The RSOV sac was adherent to septal leaflet of tricuspid valve that resulted in noncoaptation of its leaflets and severe tricuspid regurgitation (TR).

Anesthetic management during prebypass period was uneventful. TEE during prebypass period confirmed RSOV, and severe TR (Figs 1 and 2). On sternotomy, the RA was grossly enlarged. After anticoagulation, purse string sutures were placed on aorta and RA appendage, however, purse string suture for the inferior vena cava (IVC) cannulation could not be placed because of supraventricular tachycardia induced severe hypotension. Therefore, CPB was rapidly initiated by aortic and RA cannulation. On initiation of CPB, the mean arterial pressure (MAP) decreased to <15 mmHg, and venous reservoir became flooded with bright red blood and started to overflow. To prevent blood spillage the venous drain line was partially clamped. Meanwhile IVC was cannulated, and RA cannula was repositioned in SVC. Thereafter, aorta was cross-clamped, IVC and SVC were looped and snugged and aorta was opened. Cardiac arrest was achieved by cardioplegia administration in the coronary ostium. Until clamping of aorta (~5 min), MAP remained <15 mmHg. Immediately after clamping of aorta, MAP increased to 55 mmHg and overflowing of venous reservoir stopped; remaining CPB was uneventful.
Aortic sinuses showed RSOV of the right coronary cusp (RCC). The aneurysm sac was very large; it had multiple openings committed to RV. The RSOV was repaired with a Dacron fiber patch and the septal leaflet of the tricuspid valve was freed from the RSOV sac. After ensuring competence of tricuspid valve, RA was closed. At 36°C rectal temperature, CPB was terminated with elective epinephrine infusion. A repeat TEE in postbypass period showed moderate TR. On the 3rd postoperative day the RSOV repair gave way, and the TR increased, the patient underwent emergent RSOV repair, and aortic and TV replacement. The patient was discharged on the 20th postoperative day.

3. Discussion

The problems described during repair of RSOV include – distension of the communicating chamber at initiation of CPB, limited ability to achieve cardiac arrest if RSOV is misdiagnosed as ventricular septal defect and air entrainment in venous drain line on opening of aorta if tricuspid valve is regurgitant and aorta is opened before establishment of total CPB. The logical solutions to prevent these complications are: (1) immediate cross clamping of aorta with initiation of bypass, (2) establishment of total bypass, followed by (3) aortotomy and (4) delivery of cardioplegia solution into coronary ostias. The cardioplegia solution can be suction aspirated through right atriotomy. Establishment of total CPB is essential before making an aortotomy; otherwise, aortotomy will result in air entrainment and venous-air-lock.

In our patient, CPB was rapidly initiated by RA-aorta cannulation without ensuring readiness for total CPB because of severe hypotension and RV distension. In such situations, partial bypass with SVC-aorta cannulation to partially unload heart can prevent flooding of the venous reservoir and allows IVC purse string to be placed. IVC and SVC should be looped and snared as soon as possible after initiation of CPB. Initiation of CPB without readiness to establish total CPB can result in severe hypotension and overflowing of the venous reservoir and distension of heart, as occurred in our patient. Further, because of the short-circuiting of the arterial blood through RSOV into venous reservoir, the perfusion of the whole body including brain is jeopardised. Any attempt to raise perfusion pressure by administration of a peripheral vasoconstrictor (phenylephrine) will further aggravate the shunt. The only effective solutions to problems are cross clamping of aorta and establishment of total CPB.

To summarise, a case of RSOV communicating with RV with severe TR is described. The patient developed profound hypotension and overflowing of venous reservoir at initiation of CPB. The solutions to ensure whole body perfusion and to prevent overflowing of venous reservoir are immediate cross clamping of aorta and establishment of total CPB. In situations when separate cannulation of IVC and SVC is not possible, initiation of partial bypass with SVC-aorta cannulation to partially unload heart can prevent flooding of the venous reservoir and allows IVC purse string to be placed. IVC and SVC should be looped and snared as soon as possible after initiation of CPB. Establishment of total CPB is essential before making an aortotomy; otherwise, air entrainment and venous-air-lock is likely.
References


