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Heart Transplantation in a Patient with Persistent Left Superior Vena Cava

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A 56-year-old male presented with severe exertional dyspnea and pitting edema in the lower extremities. The preoperative evaluation demonstrated biventricular dysfunction associated with severe tricuspid valve regurgitation and a persistent left superior vena cava. He was registered as a transplantation candidate, and orthotopic heart transplantation was performed using the standard bicaval technique. The left superior vena cava was connected to the right atrial appendage after the construction of a conduit using the recipient's autologous coronary sinus tissue. One-month postoperatively, computed tomography imagery demonstrated a patent conduit between the left superior vena cava and right atrial appendage.

Key words: 1. Heart transplantation
2. Tricuspid valve

CASE REPORT

A 56-year-old male visited our hospital with New York Heart Association functional class IV dyspnea and pitting edema in his lower extremities. The patient had been diagnosed with tricuspid valve regurgitation and atrial fibrillation at an outside institution 10 years ago. However, the patient had refused surgical treatment at that time. Physical examination and laboratory tests demonstrated severe hepatomegaly, ascites, azotemia, and cardiac cirrhosis (Child-Pugh class B). Echocardiography and cardiac magnetic resonance imaging showed severe tricuspid valve regurgitation, with a persistent left superior vena cava (SVC) draining into the coronary sinus and absence of the innominate vein. Magnetic resonance imaging revealed left and right ventricular ejection fractions of 31.5% and 34.2%, respectively. Heart transplantation rather than a tricuspid valve surgery was recommended because of the biventricular dysfunction.

Preoperative computed tomographic venography of the neck and brain was performed to evaluate the probable risk of a left SVC ligation. The diameters of the right and left SVCs were 17 mm and 16 mm, respectively. Abundant collaterals were built up at the sigmoid sinus, which was considered adequate for draining venous blood from the left part of the head to the right SVC. This finding suggested that the risk of cerebral venous congestion after left SVC ligation was minimal.

When opening the pericardium during heart transplantation, the recipient heart showed a large dilated distal part of the

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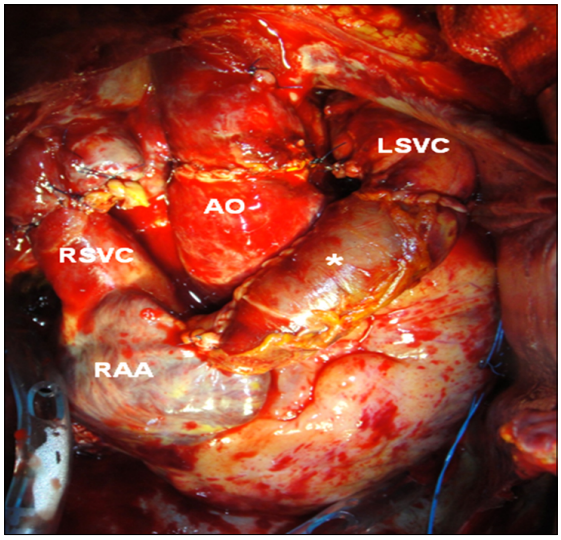

Fig. 1. Anastomosis of the LSVC with the right atrial appendage in an end-to-end fashion (asterisk). AO, ascending aorta; LSVC, left superior vena cava; RAA, right atrial appendage; RSVC, right superior vena cava.

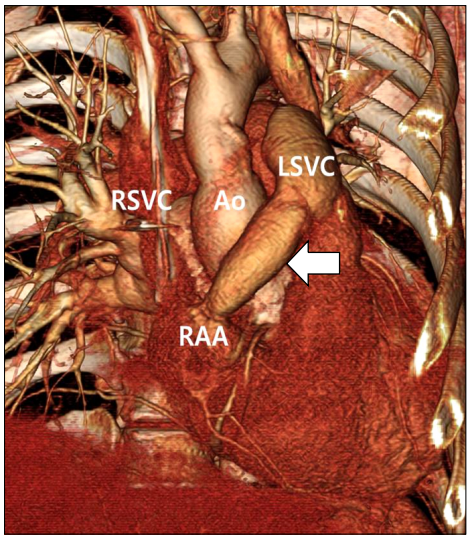

Fig. 2. Postoperative computed tomographic angiogram performed one month after heart transplantation demonstrated a patent conduit interconnected between the left superior vena cava and right atrial appendage (arrow). AO, ascending aorta; LSVC, left superior vena cava; RAA, right atrial appendage; RSVC, right superior vena cava.

left SVC draining into the coronary sinus. Under moderate hypothermia, orthotopic heart transplantation was performed with the standard aorto-bicaval cannulation technique using an additional venous cannula on the left SVC. The donor heart was implanted using the standard bicaval technique. Despite the preoperative evaluation suggesting left SVC ligation would be safe in this patient, the left SVC was anastomosed to the right atrial appendage using an interconnecting conduit (Fig. 1). A tubular conduit 16 mm in diameter and 4 cm in length was constructed using the resected coronary sinus tissue to avoid size discrepancy and kinking. After the orthotopic cardiac transplantation was completed using the bicaval anastomosis technique, the tubular conduit was anastomosed to the distal part of the left SVC and to the right atrial appendage using continuous 5-0 polypropylene sutures. The cardiopulmonary bypass and donor ischemic times were 354 minutes and 125 minutes, respectively. The postoperative course was uneventful. A computed tomography angiogram at one month after the surgery demonstrated a patent conduit between the left SVC and right atrial appendage (Fig. 2). The patient was discharged without any complications and did not show any sign of upper-body venous congestion at the six-month follow-up visit.

DISCUSSION

A left SVC is an infrequent congenital abnormality with a prevalence of 0.3% to 0.5% in the normal population and 2.8% to 4.3% in patients with congenital heart disease [1]. In the setting of cardiac transplantation, a persistent left SVC deserves consideration to determine the level of venous return during bypass as well as the bicaval anastomosis.

If a well-developed innominate vein is present, occlusion of the left SVC by simple ligation or division will recreate a normal venous drainage through the innominate vein. However, if the innominate vein is small or absent, occluding the left SVC may increase the risk of neurovascular complications [2].

A persistent left SVC can be preserved with several surgical techniques during orthotopic heart transplantation. These surgical approaches include end-to-side anastomosis of the left SVC to the right SVC, end-to-end anastomosis of the left SVC to the right atrial appendage (direct anastomosis or anastomosis using a conduit), and anastomosis of both right and left SVCs to the innominate vein of the donor graft [2-6].

A previous study presented a case of orthotopic heart trans-

plantation in a patient with a persistent left SVC [6]. In that patient, the left SVC was passed between the ascending aorta and pulmonary artery, and anastomosed to the right SVC in an end-to-side fashion.

In the present case, there were abundant collaterals present at the sigmoid sinus, which might have prevented venous congestion if the left SVC was occluded. However, we decided to preserve the left SVC to minimize this risk. Connecting the left SVC to the right SVC behind the ascending aorta was avoided because its passage was right-angled and posed a risk of compression by the aorta and pulmonary artery. In addition, we constructed an interconnecting graft instead of using an in situ conduit, because there were issues such as a size discrepancy and risks of kinking and resultant blood stasis. The coronary sinus tissue was resected, made into a tubular conduit with a diameter of 16 mm, and placed between the left SVC and the right atrial appendage. Artificial conduits were not considered due to the risk of thrombo-occlusion and infection.

In conclusion, we successfully performed an orthotopic heart transplantation in a patient with a persistent left SVC by reconstructing the left SVC with an interconnecting conduit made from autologous coronary sinus tissue, which was anastomosed to the distal part of the left SVC and to the right atrial appendage.

CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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