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Intra-atrial coronary artery reconstruction during surgery for cardiac angiosarcoma

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Abstract

A cardiac angiosarcoma is usually located in the right atrium and tends to involve the right coronary artery. Our goal was to report a novel reconstruction technique after en bloc resection of a cardiac angiosarcoma with right coronary artery invasion. This technique includes orthotopic reconstruction of the invaded artery and atrial patch suturing onto the epicardium lateral to the reconstructed right coronary artery. Intra-atrial reconstruction with an end-to-end anastomosis can enhance the graft patency compared to a distal side-to-end anastomosis and can reduce the risk of anastomotic stenosis. Moreover, suturing the graft patch to the epicardium did not increase the risk of bleeding because the pressure in the right atrium was low.

Keywords: Cardiac angiosarcoma • Right atrium • Right coronary artery

INTRODUCTION

A cardiac sarcoma is a rare malignancy with a poor prognosis. The most common subtype is an angiosarcoma [1], which is usually located in the right atrium (RA) and tends to involve the right coronary artery (RCA). The traditional technique used to reconstruct the RCA has been distal coronary artery bypass grafting. However, in that case, perfusion of the right ventricle would be dependent on the quality of its downstream arteries, and the patency of the graft would be impaired by the side-to-end anastomosis [2]. We describe an intra-atrial coronary artery reconstruction technique that allows simple and effective reconstruction of the RCA and the RA.

CASE DESCRIPTION

A 61-year-old man was referred to our hospital for investigation of dyspnoea. Transthoracic echocardiography demonstrated pericardial effusion, chronic cardiac tamponade and a mass in the RA. Computed tomography angiography showed that the tumour involved the RA and right atrioventricular groove with invasion of the RCA (Fig. 1A). Given that the segment involved was short and without main branches, we considered the tumour to be completely removable. The surgical plan involved en bloc resection of the tumour and reconstruction of the RA and the RCA.

Details of the operation are shown in the (Fig. 2) and the Video 1. After complete resection of the tumour and all abnormal tissue, the involved portion of the RCA was removed; then

its proximal and distal ends were exposed and trimmed. A section of saphenous vein was harvested, and the RCA was reconstructed using 2 end-to-end anastomoses. A bovine pericardial patch was used to reconstruct the RA. The tumour margin was so close to the tricuspid annulus that very little atrial endocardium was left for low-tension suturing. Thus, sutures were placed on the epicardium lateral to the reconstructed RCA. After the patient was weaned from cardiopulmonary bypass, no suture bleeding was seen.

The patient was extubated 12 h after the operation, recovered well and was discharged on postoperative day 6. Postoperative computed tomography angiography 6 months after the operation (Fig. 1B) showed that the RCA traveled through the RA and that the blood flow was unobstructed. A postoperative pathology report indicated a clear margin. The patient has now finished his 4 cycles of chemotherapy; no recurrence or metastasis has been detected.

DISCUSSION

The prognosis of patients who have a cardiac angiosarcoma has been reported to be better in those who undergo surgery than in those who receive chemotherapy alone [3]. Patients who had an R0 resection were reported to have a better prognosis [4, 5]. The operation is difficult because of the need for reconstruction after the resection. Without an optimal technique, a cardiac sarcoma involving the RCA could be assessed as unresectable or as converted to a palliative resection.

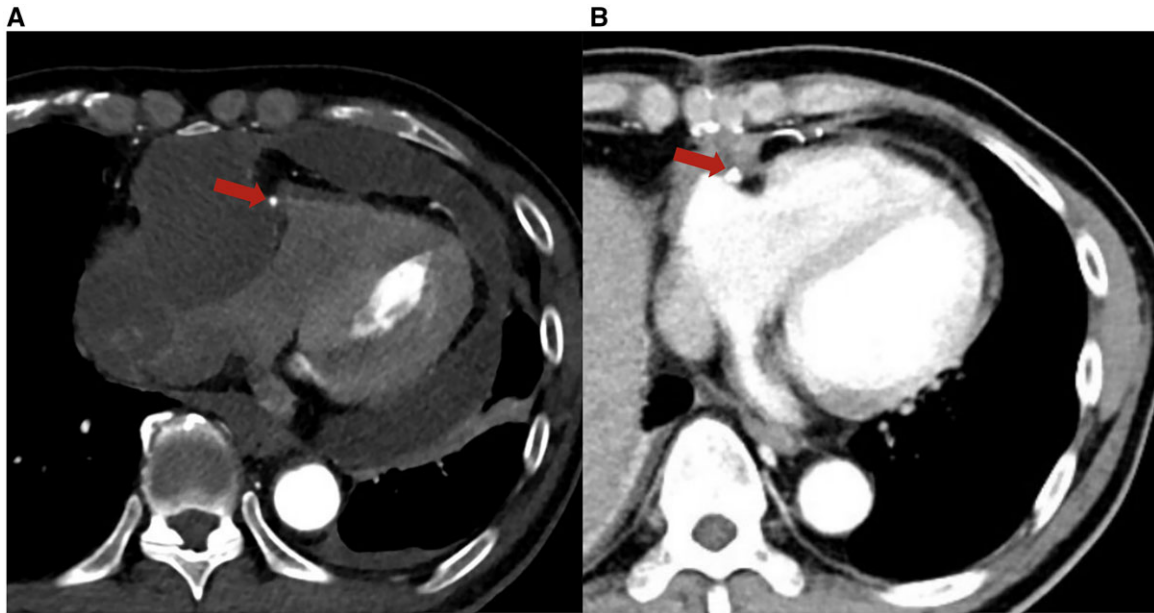


Figure 1: Computed tomography angiography before and after surgery. **(A)** Preoperatively, the right coronary artery (red arrow) was invaded by the tumour. **(B)** Postoperatively, the saphenous vein graft (red arrow) was seen passing through the right atrium.

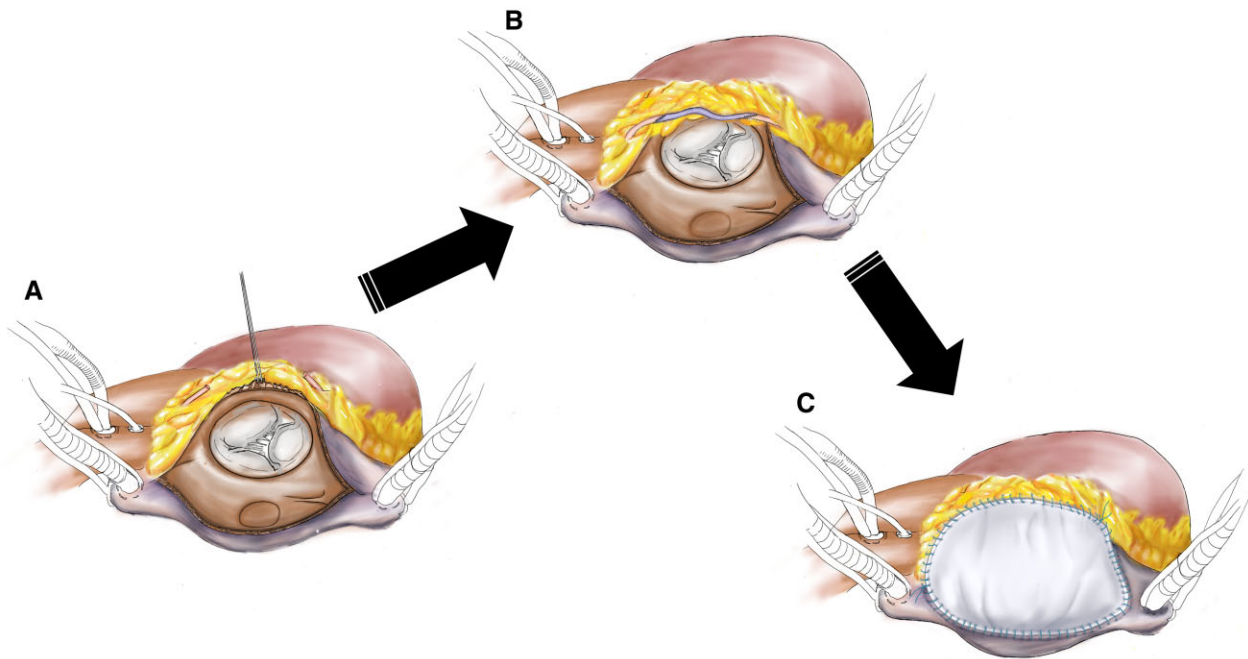


Figure 2: Schematic diagram of this technique. **(A)** The involved portion of the right coronary artery was removed; its proximal and distal ends were trimmed. **(B)** The right coronary artery was reconstructed orthotopically using a saphenous vein graft. **(C)** The right atrium patch was sutured onto the epicardium when closing the atrioventricular groove.

When reconstructing the RCA, the effectiveness of the traditional distal bypass graft depended on the quality of the arteries downstream from the involved segment. Compared to a bypass graft with a distal side-to-end anastomosis, an orthotopic reconstruction using an end-to-end anastomosis can avoid intimal hyperplasia and improve graft patency [2]. Moreover, in our experience, suturing the graft patch to the epicardium did not

increase the risk of bleeding because the pressure in the RA is relatively low. Furthermore, intra-atrial coronary anastomoses made a small anastomotic leak negligible and reduced the risk of anastomotic stenosis.

However, this technique may not be appropriate in all cases. The tricuspid valve annulus and the right ventricular inflow tract must remain intact for successful intra-atrial reconstruction of



Video 1 During the procedure, the involved portion of the RCA was dissected from the epicardial fat and removed. The right coronary artery is reconstructed orthotopically using a segment of the saphenous vein. A trimmed bovine pericardial patch was used to reconstruct the RA. The patch was sutured directly onto the epicardium lateral to the reconstructed RCA. After weaning from cardiopulmonary bypass, no anastomotic bleeding was seen.

the RCA. The epicardium should also be of good quality to hold the suture. Besides, this technique is inappropriate for patients with elevated RA pressure.

By reporting this case, we provide a way of reconstructing the RA and RCA other than by a traditional distal bypass graft. We hope it can help surgeons who are faced with similar cases to achieve complete tumour resection simply and safely and improve the postoperative prognosis.

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Conflict of interest

None of the authors reports a conflict of interest.

Data availability

The detailed data about this case is available from the corresponding author upon request.

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