

Successful surgical resection and reconstruction for a huge primary cardiac lymphoma filling the right heart

Takura Taguchi¹, Satsuki Fukushima¹, Shin Yajima¹, Tetsuya Saito¹, Naonori Kawamoto¹, Naoki Tadokoro¹, Takashi Kakuta¹, and Tomoyuki Fujita¹

¹National Cerebral and Cardiovascular Center

October 5, 2020

Abstract

Primary cardiac lymphoma is rare, with a frequency of 1.0% to 1.6% among cardiac malignant tumors. Chemotherapy is often selected as first-line treatment for primary cardiac lymphoma. However, when the tumor causes heart failure or life-threatening hemodynamic collapse, antecedent urgent surgery is required. We herein report a successful case of complete tumor resection and reconstruction of the right atrium and right ventricle using a bovine pericardial patch combined with tricuspid valve replacement in a patient with a huge primary cardiac lymphoma filling the right heart that manifested as tricuspid valve stenosis and subsequent heart failure.

Introduction

Primary cardiac lymphoma (PCL) is rare, with a frequency of 1.0% to 1.6% among cardiac malignant tumors [1]. Treatment options include surgery, chemotherapy, radiation therapy, or combined techniques; the optimal strategy remains unclear. We herein report successful resection and reconstruction using a bovine pericardial patch for a huge cardiac malignant lymphoma occupying the right heart. The patient gave written informed consent for surgery and the use of his data for diagnostic and research purposes prior to the surgery. The case report was approved by the Institutional Review Board.

Case Description

A 70-year-old man presented with dyspnea on effort and lower limb edema. Chest radiography showed cardiomegaly (cardiothoracic ratio of 57%). Transthoracic echocardiography showed a huge mass measuring 44 × 56 mm originating from the right atrium and right ventricle. The mass was almost completely adhered to the tricuspid valve, resulting in moderate stenosis with a mean pressure gradient of 9 mmHg (Video 1). Enhanced computed tomography showed that the tumor had invaded the anterior wall of the right atrium and right ventricle, totally involving the right coronary artery (Figure 1A, B). The interleukin-2 receptor level was extremely high (890 U/mL). Fluorodeoxyglucose positron emission tomography revealed abnormal accumulation in the right atrium, right ventricle, atrial septum near the mitral valve annulus, and intestinal and prepericardial lymph nodes (Figure 2).

Cardiopulmonary bypass was established through ascending aortic cannulation and bicaval drainage, and the heart was arrested. The tumor had invaded the anterior and posterior tricuspid annulus, but not the septal leaflet or coronary sinus. We performed complete en bloc resection of the tumor and most of the right atrium, right ventricle, tricuspid valve, and right coronary artery, preserving the coronary sinus. The tricuspid septal annulus was also preserved, and we applied several everting mattress stitches for placement of a biological valve. A large double-folded bovine pericardial patch was then sutured to the remaining biological cuff; one side of the patch was trimmed and sutured to the right ventricle, while the other side was sutured to the right atrium. Finally, coronary bypass was performed from the great saphenous vein to the posterior descending

artery (Video 2). No atrioventricular block was present postoperatively. The operation, cardiopulmonary bypass, and cross-clamping times were 332, 175, and 121 minutes, respectively. Pathological examination revealed diffuse large B-cell lymphoma.

Postoperative transthoracic echocardiography revealed no tumor or thrombus and showed good performance of the biological valve with a mean pressure gradient of 5 mmHg (Video 1). Postoperative enhanced computed tomography showed a well-reorganized right atrium and right ventricle. The patient was discharged on postoperative day 14 with no signs of heart failure. Although the excised end of the tumor was pathologically positive, the patient was able to receive optimal chemotherapy because an accurate qualitative diagnosis had been obtained by surgery. The chemotherapy resulted in a partial response at 6 months postoperatively.

Conclusion

Malignant lymphoma is generally responsive to chemotherapy, with a reported response rate of 79% [2]; therefore, chemotherapy is often selected as a first-line treatment for PCL [3]. However, chemotherapy requires a large infusion volume, is associated with a likelihood of pulmonary tumor embolization, and carries a risk of cardiac tamponade due to tumor hemorrhage. Furthermore, in cases less responsive to chemotherapy, a growing tumor could cause hemodynamic instability or fatal cardiac arrhythmia [3]. Our patient had signs of heart failure (exertional dyspnea and lower limb edema), and his tumor occupied most of the right heart and caused tricuspid stenosis. Therefore, we performed tumor resection as quickly as possible to avoid fatal cardiac events.

Partial tumor resection to relieve the tricuspid stenosis might have been enough to prevent fatal hemodynamic collapse [5]. However, the tumor involved the anterior and posterior tricuspid leaflets and was too fragile to be sutured with biological materials. Therefore, complete resection of the PCL was required to ensure security of the stitches within the cardiac tissue. Although the excised end of the tumor was pathologically positive, subsequent chemotherapy showed promising efficacy; therefore, two-stage treatment for this patient's PCL was a justified strategy [6].

In conclusion, we successfully performed complete surgical tumor resection and reconstruction of the right atrium and right ventricle using a bovine pericardial patch for a huge PCL filling the right heart. Urgent surgery enables timely administration of postoperative chemotherapy without heart failure.

Acknowledgment: We thank Angela Morben, DVM, ELS, from Edanz Group (<https://en-author-services.edanzgroup.com/ac>), for editing a draft of this manuscript.

Author contribution statement: Takura Taguchi was responsible for acquisition of the data and writing of the original manuscript. Satsuki Fukushima, Shin Yajima, and Tomoyuki Fujita made substantial contributions to the conception of the study and design of this report and assisted with critical revision of the manuscript. All authors provided final approval of the version to be published.

References

1. Burazor I, Aviel-Ronen S, Imazio M, Markel G, Grossman Y, Yosepovich A, et al. Primary malignancies of the heart and pericardium. *Clinical Cardiology* , 2014;37(9):582-8.
2. Butany J, Nair V, Naseemuddin A, Nair GM, Catton C, Yau T. Cardiac tumours: diagnosis and management. *Lancet Oncology* , 2005;6(4):219-28.
3. Allain G, Hajj-Chahine J, Lacroix C, Jayle C. Primary cardiac lymphoma complicated by cardiogenic shock: successful treatment with chemotherapy delivered under extracorporeal membrane oxygenation support. *Eur J Cardiothorac Surg* 2015;48:968–70
4. Petrich A, Cho SI, Billett H. Primary cardiac lymphoma: an analysis of presentation, treatment, and outcome patterns. *Cancer* , 2011;117(3):581-9.
5. Jeudy J, Burke AP, Frazier AA. Cardiac Lymphoma. *Radiol Clin North Am* , 2016;54(4):689-710.

6. Yamamoto M, Nishimori H, Kondo N, Terauchi Y, Tashiro M, et al. Multidisciplinary approach for primary cardiac lymphoma associated with hemodynamic failure caused by tricuspid valve obstruction. *Journal of cardiology cases* 13, 2016;189-192

Figure Legends

Figure 1. Preoperative contrast-enhanced computed tomography. (A) The coronal view showed that the tumor was present in the right atrium and right ventricle. (B) The axial view showed that the right coronary artery was wholly surrounded by the tumor. Asterisk, tumor, Ao, aorta; LV, left ventricle; RA, right atrium; RCA, right coronary artery; RV, right ventricle.

Figure 2. Fluorodeoxyglucose positron emission tomography showed abnormal accumulation in the right atrium, right ventricle, and intestine. RA, right atrium; RV, right ventricle.

Video Legends

Video 1. Performance of operation

Video 2. Preoperative and postoperative transthoracic echocardiography

Hosted file

Figure.pptx available at <https://authorea.com/users/364223/articles/484698-successful-surgical-resection-and-reconstruction-for-a-huge-primary-cardiac-lymphoma-filling-the-right-heart>