

Indeed, CMR has emerged as the gold standard imaging modality for evaluating heart tumors, with excellent accuracy for differentiating tumors versus thrombi as well as assessing for myocardial invasion that may limit resectability [4].

In conclusion, large right ventricular carcinoid tumors growing into the right ventricular cavity can involve the tricuspid valve, and preoperative CMR provides valuable anatomic characterization that guides surgical planning.

References

1. Modlin IM, Sando A. An analysis of 8305 cases of carcinoid tumors. *Cancer* 1997;79:813-29.
2. Pandya UH, Pellikka PA, Sarano M, Edwards WD, Schaff HV, Connolly HM. Metastatic carcinoid tumor to the heart: echocardiographic-pathologic study of 11 patients. *J Am Coll Cardiol* 2002;40:1328-32.
3. Sareyyupoglu B, Connolly HM, Schaff HV. Surgical excision of right ventricular carcinoid tumor in a symptomatic patient without carcinoid valve disease. *J Thorac Cardiovasc Surg* 2010;140:e23-5.
4. Pazos-Lopez P, Pozo E, Siqueira ME, et al. Value of CMR for differential diagnosis of cardiac masses. *JACC Cardiovasc Imaging* 2014;7:896-905.

Neo-Left Atrium Construction on the Beating Heart After Extirpation of a Huge Mediastinal Tumor Invading Heart and Lung

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We report on construction of a neo-left atrium (LA) with 2 bovine pericardial patches after in toto removal of a huge mediastinal tumor invading the heart and lung. The procedure was performed on the beating heart using normothermic cardiopulmonary bypass (CPB) without cardioplegic arrest. Treatment consisted of tumor removal necessitating left pneumonectomy, excision of the LA, resection of the mitral annulus, excision of the tumor from the left ventricle, and construction of a new LA using 2 bovine pericardial patches and a new mitral bioprosthesis. Histologic examination revealed myofibrosarcoma. The patient died 22 months after the operation.

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We report on construction of a neo-left atrium (LA) with 2 bovine pericardial patches after in toto removal of a huge mediastinal tumor invading the heart

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and lung. The procedure was performed on the beating heart using normothermic cardiopulmonary bypass (CPB) without cardioplegic arrest.

A 35-year-old man presented with progressive dyspnea and amaurosis fugax after previous mechanical mitral valve replacement performed 4 months earlier. Chest radiography and computed tomography revealed a huge mediastinal tumor invading the heart and left lung and “wrapping” the descending aorta (Fig 1). Coronary angiography revealed strong movements of the circumflex artery during heart cycles, and immobility of the arteries arose from the circumflex coronary artery supplying the tumor. The tumor had broken through the left atrial appendage and the atrioventricular sulcus into the LA, invading the left lateral and posterior left atrial wall and the mitral valve annulus (P1 segment and the neighboring commissure). The tumor mass partially filled the left atrial cavity. The left pulmonary veins were completely enclosed in the tumorous process. A separate mobile tumor (40 × 60 mm) filled the left ventricle (LV) (Fig 1).

The patient was operated on through a left posterolateral thoracotomy in the sixth intercostal space. The thoracic tumor was mobilized, the pericardium (also invaded by the tumorous mass) was excised, and the tumor was then removed from the descending thoracic aorta and mediastinum. After complete exposure of the heart, normothermic CPB was instituted after femoral venous cannulation and cannulation of the aortic arch for the arterial line. The whole procedure was performed on the beating heart using CPB without aortic cross-clamping.

The LV was vented using a left ventricular vent placed transternally. The atrioventricular groove was opened distal from the tumor, and the circumflex coronary artery and the coronary sinus were identified. Next, the circumflex coronary artery was completely dissected from the tumorous tissue. After liberation of the left atrial roof and the posterior left atrial wall from the mediastinal tissue, dissection of the atrioventricular groove, and mobilization of the tumorous block (consisting of the LA and the tumor), the tumor and the LA were excised together with the left pulmonary veins. Only a strip of the noninvaded left atrial wall at the opposite side around the ostia of the right pulmonary veins and the interatrial septum remained. The old mechanical mitral prosthesis was explanted, and the tumor was completely dissected and excised from the annular region, necessitating partial resection of the mitral annulus and the neighboring myocardium. In addition, left ventricular ventriculotomy was performed and the separate tumor from the left ventricular cavity was completely excised, including the surrounding myocardium at the tumor attachment to the left ventricular wall. The left ventriculotomy line was then closed with 3-0 polypropylene sutures, and the excised part of the annulus was reconstructed with 2 strips of bovine pericardium. The next step was transection of the left

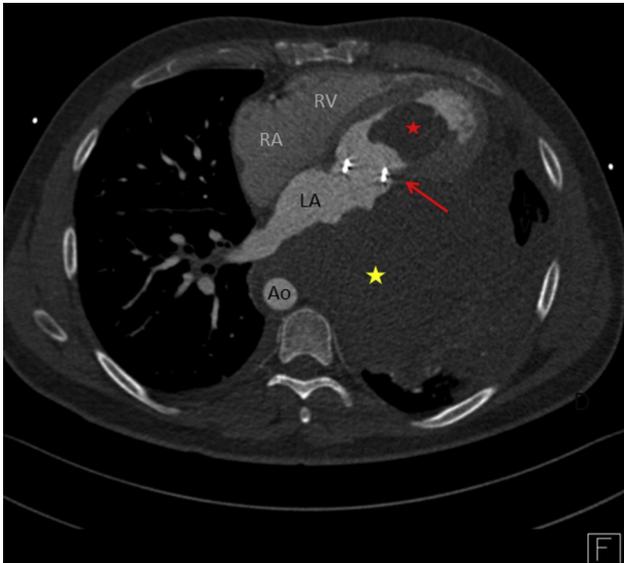


Fig 1. Preoperative computed tomography of the chest demonstrates mediastinal tumor (yellow asterisk) invading lung and heart and “wrapping” descending aorta. Tumor has broken into left atrium (LA), affecting mitral annulus. A separate 4 × 6 cm tumor (red asterisk) fills left ventricle (LV). Red arrow shows previously implanted bileaflet mechanical mitral valve prosthesis. (Ao = descending aorta; RA = right atrium; RV = right ventricle.)

pulmonary artery and the left main bronchus and removal of the left lung.

The LA was then reconstructed with 2 bovine pericardial patches (10 × 10 cm; Edwards Lifesciences,

Irvine, CA) (Fig 2). The patches were sutured to the reconstructed mitral valve annulus using 2 continuous 3-0 polypropylene sutures. The suturing started from the middle part of the P2 annular segment moving clockwise (first suture) and counterclockwise (second suture) toward the middle parts of the A2 annular segment. Next, the pericardial patches were combined using a 4-0 polypropylene continuous suture from the middle part of the P2 annular segment toward the right pulmonary veins. Conventional mitral valve replacement with a 33-mm biological Carpentier-Edwards mitral prosthesis (Edwards Lifesciences) was then easily performed. The combined pericardial patches were trimmed and sutured to the ostia of the right pulmonary veins. Finally, the free edges of the bovine pericardial patches were trimmed for the anastomoses to the interatrial septum that were performed as the final sutures. Removing air from the LA and ventricle was performed in the standard manner. Carbon dioxide was insufflated into the operative field throughout the procedure. There were no electrocardiographic changes during the procedure. Weaning from CPB was uneventful, and the procedure was finished in the usual manner. CPB time was 183 minutes. The postoperative course was also unremarkable, and the patient experienced relief of symptoms. Histologic results were consistent with myofibrosarcoma. The patient received radiation therapy and cytostatic therapy. The follow-up computed tomographic examinations revealed isolated small tumors in the pancreas and right lung that were treated by adjuvant therapy. The patient lived for 22 months after the operation and died in May 2014.

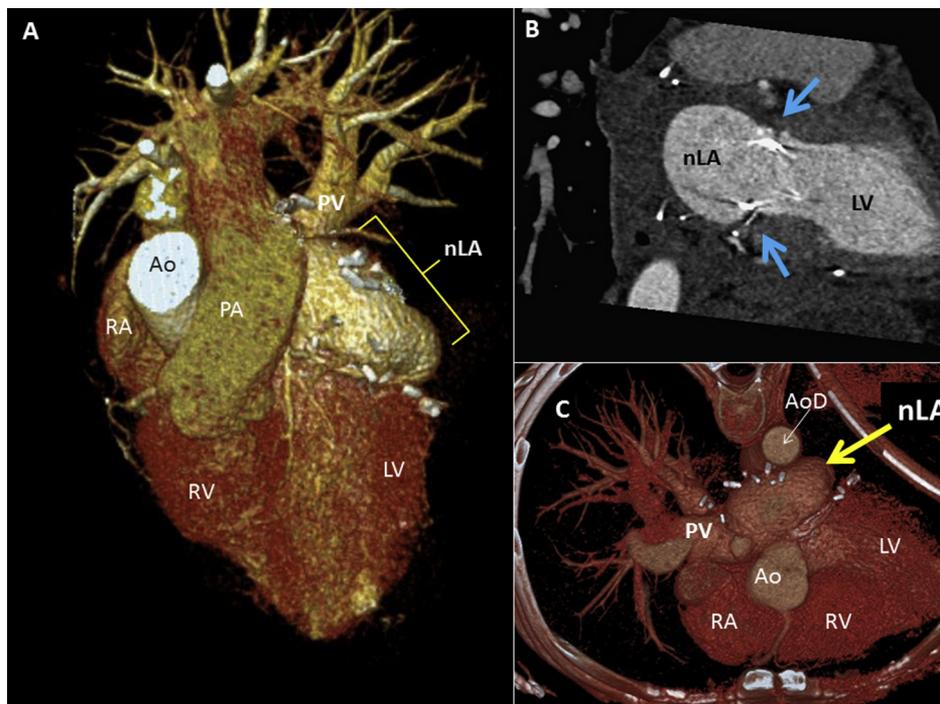


Fig 2. (A-C) Postoperative computed tomography of the chest shows the neo-left atrium (nLA) (yellow bracket in A; nLA in B; yellow arrow in C) constructed from 2 bovine pericardial patches after tumor removal in toto and implantation of new mitral bioprosthesis (blue arrow in B). (Ao = ascending aorta; AoD = descending aorta; LV = left ventricle; PA = pulmonary artery; PV = pulmonary veins; RA = right atrium; RV = right ventricle.)

Comment

This case confirms that even huge mediastinal tumors involving the heart and lungs, which seem at first sight to be inoperable, may be removed completely. The reported surgical therapy was considered a palliative approach because sarcomas of the heart have a poor prognosis [1-5]. The main cause of the symptoms was low cardiac output resulting from the presence of the separate tumor in the LV. The tumor mechanically prevented adequate filling of the LV with blood, similar to mitral stenosis. The main aim was relief of symptoms and this was immediately achieved. Our patient lived an additional 22 months after the operation. Therefore, complete tumor extraction may influence long-term survival and enable subsequent adjuvant therapy. A procedure of this magnitude can be considered at centers familiar with all aspects of this extensive operation. It is important that it is discussed at full length preoperatively with the patient and his or her relatives.

We made some important procedural observations from this single case: (1) optimal exposure of the operative field was achieved through a left thoracotomy; (2) the whole procedure could be performed on the beating heart (this enabled easy identification of any bleeding from the side branches of the circumflex coronary artery); (3) the tumor could be resected in toto even if it invaded mitral valve structures and neighboring left ventricular myocardium; (4) extensive dissection had to be done before the definitive judgment about operability was made (inoperability was our first impression because of the extent of the tumorous process, but dissection of the atrioventricular groove and mobilization of the complete LA with a tumorous block showed this impression to be incorrect); (5) intraoperative transesophageal echocardiography helped us to distinguish the tumorous mass from the normal tissue and also showed that the circumflex artery was not invaded by the tumor; and (6) the neatrium was easily reconstructed using bovine pericardial patches sutured at the mitral valve annulus.

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References

1. Cooley DA, Reardon MJ, Frazier OH, Angelini P. Human cardiac explantation and autotransplantation: application in a patient with a large cardiac pheochromocytoma. *Tex Heart Inst J* 1985;12:171-6.
2. Dan S, Hodhe AJ. Osteogenic sarcoma of the left atrium. *Ann Thorac Surg* 1997;63:1766-8.
3. Reardon MJ, DeFelice CA, Sheinbaum R, Baldwin JC. Cardiac autotransplant for surgical treatment of a malignant neoplasm. *Ann Thorac Surg* 1999;67:1793-5.
4. Wang C-H, Yu H-Y, Chi N-S, et al. Complete excision of primary cardiac malignant fibrous histiocytoma involving the left atrial free wall and mitral annulus by modified

autotransplantation. *J Thorac Cardiovasc Surg* 2006;131:731-3.

5. Shapira OM, Korach A, Izhar U, et al. Radical multidisciplinary approach to primary cardiac sarcomas. *Eur J Cardiothorac Surg* 2013;44:330-5.

Single-Stage Minimally Invasive Surgery for Synchronous Primary Pulmonary Adenocarcinoma and Left Atrial Myxoma

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We report the first successful short-term outcome of single-stage combined video-assisted thoracoscopic surgery lobectomy and port access surgery in a patient with operable primary right lower lobe adenocarcinoma and a synchronous cardiac myxoma. The video-assisted thoracic surgery right lower lobectomy with systematic lymph node dissection was performed first, followed by myxoma excision by port access surgery through the same working port incision. The histopathologic analysis confirmed a pT2a N0 M0 R0 (TNM 7th edition) primary poorly differentiated pulmonary adenocarcinoma and a completely excised cardiac myxoma. Postoperative recovery was uneventful, and follow-up at 6 weeks confirmed an excellent surgical and oncologic outcome.

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The clinical application of video-assisted thoracoscopic surgery (VATS) for pulmonary oncologic resection and port access surgery (PAS) for intracardiac tumor excisions is well established in experienced centers [1, 2]. Synchronous primary pulmonary and intracardiac neoplasms are rare and traditionally surgically approached by staged or simultaneous open strategies that present significant morbidities and surgical risks [3]. We performed 2,851 PAS procedures since the initiation of our program in 1997, which includes 58 intracardiac oncologic resections. Our VATS program

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