Case Report

Minimally Invasive Pulmonary Fibroelastoma Resection

Innovations
2019, Vol. 14(6) 577–580

DOI: 10.1177/1556984519884308
journals.sagepub.com/home/inv

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Abstract

Pulmonary fibroelastomas are a rare primary cardiac tumor with less than 50 cases reported in the literature to date. We performed a minimally invasive valve-sparing tumor resection through a left anterior mini-incision (LAMI).The procedure was performed without cardiac arrest or aortic cross clamp, expediting postoperative recovery and allowing for an uncomplicated discharge on postoperative day 5. LAMI is a safe and reliable alternative to median sternotomy for patients requiring interventions on the right ventricular outflow tract and main pulmonary artery, including pulmonary fibroelastoma resection and pulmonary valve replacement when needed.

Keywords

fibroelastoma, minimally invasive, pulmonary valve

Introduction

Primary cardiac tumors are rare, with an incidence of less than 0.3%.[1,2] Primary benign cardiac tumors are 3 times more common than primary malignant tumors.[3] The most common primary benign cardiac tumors are myxomas (30%-45%), lipomas (10%-15%), and fibroelastomas (8%-15%).[1,4,5] Described as a sea anemone by Remadi et al., fibroelastomas are mobile, 10-20 mm avascular fibrin masses with numerous short projections that are thought to develop secondary to turbulent flow.[1,2,6–8] They are most commonly associated with the aortic or mitral valve and rarely involve the pulmonary valve, with less than 50 cases documented in the literature.[6] Although benign, fibroelastomas are prone to generate emboli if left untreated even in the pulmonary position.[9] Therefore, elective surgical resection is always offered.[1,2,4–9]

Minimally invasive cardiac tumor resection has been previously described, although the tumors are often in the atria and cardiac arrest is utilized.[10–12] Over the last year, we have been performing procedures on the pulmonary valve and right ventricular outflow tract through a sternal sparing, left anterior mini-incision (LAMI). Given our success with this minimally invasive approach in pediatric and adult congenital cardiac cases, we offered it as an alternative to median sternotomy for a 55-year-old female presenting with a pulmonary fibroelastoma.

Case Report

An otherwise healthy 55-year-old female presented to her cardiologist after experiencing palpitations, tachycardia, angina, and near-syncope following a 3-mile walk. Her cardiac stress test was negative, but her echocardiogram demonstrated mild pulmonary insufficiency and a spherical vegetation on the pulmonic valve. She was referred to our clinic,

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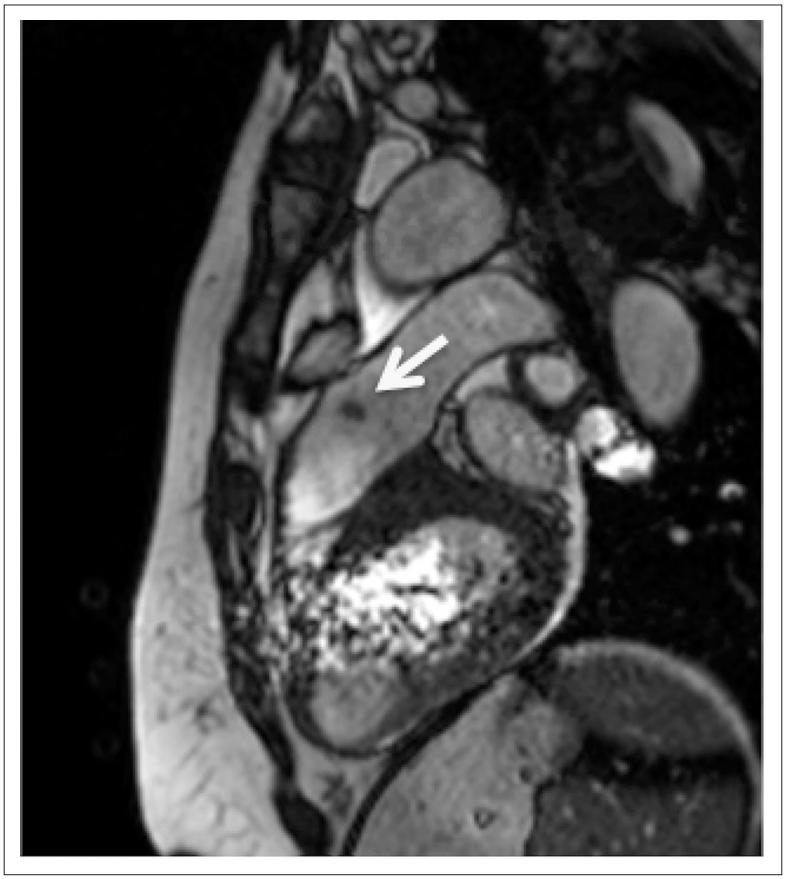

Fig. 1. Pulmonary fibroelastoma on cardiac MRI. The image demonstrates a well-circumscribed low-density pulmonary valve mass in a T2-contrast-enhanced weighted image.

where further characterization of the mass on cardiac magnetic resonance imaging demonstrated a well-defined 1 cm mass on the left cusp of the pulmonic valve consistent with a pulmonary fibroelastoma (Fig. 1). We offered her elective repair, and after discussing the risks and benefits of both median sternotomy and LAMI, she chose the minimally invasive approach.

She was taken to the operating room, placed supine with arms tucked, general anesthesia was induced, and she was prepped and draped in standard sterile fashion. Baseline transesophageal echocardiogram (TEE) with bubble study was completed, which demonstrated mild pulmonary insufficiency. Left groin cutdown was performed and left common femoral artery was cannulated with a 15 fr aortic cannula after heparinization. Right femoral percutaneous 25 fr venous cannula was placed. A 5 cm incision was made over the left third rib immediately adjacent to the sternum and the dissection was carried down to the pericardium through the second intercostal space while sparing the internal mammary artery (Fig. 2a). Great care should be taken to identify and protect the mammary artery—as the minithoracotomy is taken down to the intercostal muscles, dissection should proceed in a lateral to medial manner. A small rib retractor was used to maintain the field, while a pericardial cradle was created exposing the right ventricular outflow tract and main pulmonary artery (Fig. 2b). In this case, lung isolation was not required—pericardial stay sutures are almost always sufficient to obtain adequate exposure—the lung can be isolated with a bronchial blocker if needed.

The patient was then placed on cardiopulmonary bypass, decompressing the right ventricular outflow tract and bringing the pulmonary artery into view. A horizontal incision was made in the main pulmonary artery, and the fibroelastoma was exposed through the pulmonary valve (Fig. 2c). Blunt dissection was used to carefully remove the mass from the involved leaflet, which was not damaged. The pulmonary artery was closed in 2 layers with a running 5-0 prolene suture and the patient was weaned from cardiopulmonary bypass. Postprocedural TEE demonstrated trace pulmonary insufficiency. A single 24 F Blake drain was placed through the thoracotomy incision and externalized through a separate stab incision. The femoral artery was repaired primarily after decannulation and the right femoral venous

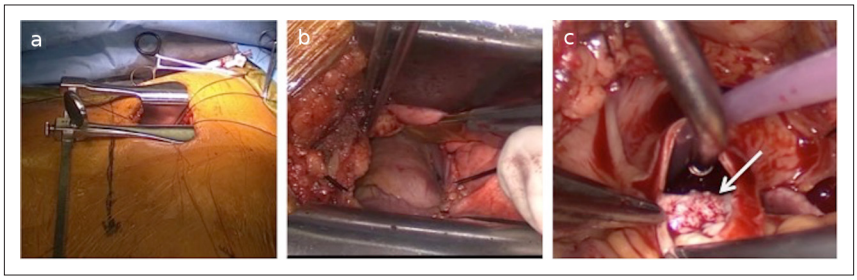

Fig. 2. Left anterior mini-incision for pulmonary fibroelastoma exposure. (a) Demonstrates the orientation of the initial 5 cm incision to the left of midline (marking pen) in the second intercostal space with a small rib retractor. (b) Demonstrates a pericardial cradle keeping the lung out of the field with the right ventricular outflow tract (inferiorly) and main pulmonary artery (superiorly) centered in the field. (c) Demonstrates the friable fibroelastoma (arrow) situated on the pulmonary valve after the main pulmonary artery is opened transversely.

cannula was removed as a deep dermal figure-of-eight suture was simultaneously tied down. Otherwise, all incisions were closed in 3 layers: muscle/fascia, dermis, skin. A regional pectoral muscle block was performed and the patient was extubated.

Postoperatively, the patient remained hemodynamically stable and was transferred from the intensive care unit on postoperative day 1 and discharged from the hospital on postoperative day 5 without complication. Final pathology confirmed the diagnosis of fibroelastoma.

Discussion

Pulmonary fibroelastomas are a rare form of primary cardiac tumors that are often found incidentally. Because of their tendency to cause embolic events, surgical resection is the recommended treatment for all fibroelastomas. Historically, these tumors were addressed through a median sternotomy, although now advances in minimally invasive surgery offer patients an expedited recovery and improved cosmetic outcome.[13–15]

We have learned several things through our experiences with minimally invasive pulmonary valve surgery via LAMI. Most often, a single femoral venous cannula provides adequate decompression of the right heart in combination with flexible drop suction tips. However, if drainage is not adequate, as is the case with athletes and larger patients, we prefer to percutaneously cannulate the left subclavian vein to drain the superior vena cava. We prefer contralateral percutaneous venous femoral cannulation as this allows for simple removal at the end of the case without the need for direct repair avoiding the risk of femoral venous stenosis.

Second, making incision directly over the third rib affords access to both second and third interspaces. We recommend preoperative cross-sectional computed tomography imaging to aid with planning of initial pleural access based on the relationship of the pulmonary root to the anterior chest wall. Occasionally, going 1 interspace up or down can vastly improve exposure.

Finally, without aortic clamping, cooling, or arresting the heart, postoperative recovery is greatly expedited. We always spare the left internal thoracic artery for future use—often these patients are young and may need conduit later in life. Furthermore, in the case that the pulmonary valve does need to be replaced, it can be done through the existing LAMI.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

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