Thoracoscopic removal of a papillary fibroelastoma in the left ventricular apex

Yukihiro Kaneko, Jotaro Kobayashi, Fumie Saitoh, Minoru Ono

Departments of Cardiovascular Surgery, Japanese Red Cross Medical Center, 4-1-22 Hiroo, Shibuya-ku, Tokyo 150-8935, Japan
Department of Cardiac Surgery, University of Tokyo, 4-1-22 Hiroo, Shibuya-ku, Tokyo 150-8935, Japan

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Abstract

Primary cardiac tumors located deep in the left ventricle present a surgical challenge. A mobile tumor located in the left ventricular apex was incidentally discovered on echocardiography in an 81-year-old female. The tumor was removed using a combined sternotomy and chest-port approach assisted by thoracoscopy. The use of an endoscopic sucker, instead of an endoscopic grasper, to retract the tumor helped keep the removal of the tumor en bloc uncomplicated. Detailed preoperative information about tumor location, size, and attachment to the endocardium facilitated the planning of the surgical approach and the instrumentation needed, which led to the successful removal of the deeply located left ventricular tumor. The surgical approach and instrumentation of previous case reports are reviewed.

Keywords: Heart neoplasm; Cardiac surgical procedure; Thoracoscopes; Papillary fibroelastoma

1. Introduction

Primary cardiac tumors are uncommon. Myxomas, the most prevalent primary cardiac tumors, arise from the atrial septum in 90% of cases, and papillary fibroelastomas, the second most prevalent tumors, are attached to the cardiac valves in more than 80% of cases [1,2]. Only rarely are cardiac tumors located deep in the left ventricle, which presents a surgical challenge.

2. Patient

An 81-year-old woman visited the outpatient clinic for the evaluation of recent-onset palpitations. Holter monitoring showed normal sinus rhythm with multiple premature atrial contractions. On echocardiography, a round mobile mass, 1.5 cm in diameter, attached to the endocardium near the left ventricular apex (Video 1) was seen. Left ventricular and atrial dimensions were normal. A diagnosis of a primary left ventricular tumor prompted surgical removal.

Chest computed tomography indicated that the left ventricular apex containing the tumor pointed in the left anterior direction (Fig. 1). Therefore, we anticipated: (1) that the tumor would not be visualized with the naked eye through a median sternotomy via the aortic or mitral valve; (2) that a transaortic videoscopic exposure of the tumor would be hindered by the hypertrophied interventricular septum (Video 1); and (3) that accessing the tumor with surgical instruments would be optimal through surgical ports on the right chest wall and then passing via the mitral valve. Therefore, we decided to perform transmural thoracoscopic excision of the tumor using a combined sternotomy and chest-port approach.

3. Surgical technique

After median sternotomy, the right pleura was opened. Intraoperative ultrasonography was done to establish the mitral valve-left ventricular long axis. The axis was extended rightward, and a 5 mm trocar was inserted through the right 4th intercostal space where the extended axis intersected the chest wall. Two additional 5 mm trocars were inserted through the 3rd and 5th intercostal spaces near the first trocar. Cardiopulmonary bypass with bicaval and aortic cannulation was established, the aorta was cross-clamped, antegrade cardioplegia was administered, and a...
right-sided left atriotomy was made. The tumor could not be observed with the naked eye.

A 30-degree rigid videoscope inserted into the left ventricle through the trocar at the 3rd intercostal space provided an excellent view of the soft, gelatinous, fragile tumor (Video 2). An endoscopic sucker with its side holes obliterated and endoscopic scissors were inserted into the left ventricle through the other trocars. To avoid tumor fragmentation caused by retraction with an endoscopic grasper, the tumor was sucked and retracted with the sucker. Suction/retraction of the tumor confirmed that it was directly attached to a trabecula of the left ventricular inferior wall near the apex. The two ends of the trabecula were cut, and an additional connection between the trabecula and the endocardium was divided. The tumor was removed with the trabecula en bloc (Fig. 2). Inspection through the left and right atriotomies excluded additional cardiac tumors. The atriotomies were closed through the median sternotomy.

4. Result

The surgery was completed without difficulty. The operation time was 175 min, the cardiopulmonary bypass time was 79 min, and the myocardial ischemic time was 34 min. Histological examination revealed that the tumor was a papillary fibroelastoma (Fig. 2). The patient recovered uneventfully except for transient atrial fibrillation.

5. Discussion

At surgical removal of left ventricular tumors, every effort should be made to avoid left ventriculotomy with its potential complications. Recently, video-assisted removal of cardiac tumors, which avoids a left ventriculotomy, has been reported [3–10].

Some authors have reported on the video-assisted exposure of left ventricular tumors by going through an aortotomy and the aortic valve using a median sternotomy. Li and associates performed transaortic videoscopic excision of a recurrent left ventricular myxoma at the anterior ventricular septum [3]. Irie and associates performed a transaortic videoscopic removal of a papillary fibroelastoma at the left ventricular outflow [4]. Allen and associates performed transaortic removal of a papillary fibroelastoma on the posteromedia papillary muscle with a videoscope that allowed simultaneous visualization and biopsy [5]. Greco and associates did a transaortic videoscopic excision of a left ventricular myxoma originating from the apical part of the ventricular septum [6]. Reuthebuch reported 2 cases of transaortic cardioscopic removal of a left ventricular papillary fibroelastoma, but the tumor location was not detailed [7].

Other groups have reported on transmirtal video-assisted removal of left ventricular tumors. Espada and associates performed transmirtal thoracoscopic removal of a papillary fibroelastoma located between the anterolateral papillary muscle and the left ventricular wall through a median sternotomy [8]. Misumi and associates removed a papillary fibroelastoma with its stalk arising from trabecula of the left ventricular anterolateral wall using a flexible endoscope [9]. The tumor stalk was trapped in a biopsy snare that was passed through a channel of the endoscope and was cut using a high frequency current. Gulbins and associates removed a left ventricular myxoma attached to the cordae tendinae of the posterior mitral leaflet through a small right submammary incision using the Port-Access system (Heartport Inc., Redwood City, CA) and video-assistance [10].

Judging from the echocardiographic figures in the above-mentioned articles, the tumor in the present case was more deeply located near the apex than in any of the reported
cases. Since in the present case the tumor was directly attached to the trabecula without a stalk, a technique similar to a gastric polypectomy as was used in two previous reports was not applicable [5,9]. Piecemeal removal of the tumor, which was described in two reports, should be avoided because it increases the risk of tumor embolization [3,8]. In this case, the use of an endoscopic sucker to retract the tumor helped keep the removal of the tumor en bloc uncomplicated. A combined sternotomy and chest-port approach offered the optimal exposure of the tumor and easy access to the tumor with the instruments. Intuitively, this approach has no inherent oncological or surgical drawback.

Video-assisted surgery via a mini-thoracotomy may be a less-invasive alternative. However, conversion to left ventriculotomy would be time-consuming in the case of unsuccessful video-assisted surgery, and thorough intracardiac inspection for additional tumors is perhaps technically demanding.

In conclusion, our surgical experience of a left ventricular tumor indicates that detailed preoperative information about tumor location, size, and attachment to the endocardium facilitates the planning of the surgical approach and determining the instrumentation required to allow successful removal of a left ventricular tumor.

References