

Minimal invasive surgical resection of myxomas: a three case series study

Resección quirúrgica mínimamente invasiva de mixomas: estudio de tres casos

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Abstract

Introduction and Objective: Cardiac tumors are often unrecognized until autopsies are performed or diagnosed from routine studies based on unspecific symptoms. The most common type of tumor is the myxoma, although rare, upon diagnosis an urgent surgical resection is often required. Previously the ideal surgical approach was a standard median sternotomy, however recently newer surgical techniques have been employed with excellent results. We describe a recent surgical approach via the right lateral minithoracotomy as a minimally invasive intervention with three cases that evidence an appropriate and ideal surgical approach. **Method and Patients:** We present three cases of minimally invasive myxoma resection via the right lateral minithoracotomy. **Results and discussion:** In this three-case series study, no complications were reported peri-operatively nor at the 6 and 12-month follow-ups. In comparison with international literature, surgical approaches in Colombia are comparable with successful resection and little or no complications peri-operatively. **Conclusions:** The right lateral minithoracotomy appears to be a safe approach in myxoma resection. We hope to enhance and promote the surgical community in Colombia to opt for alternative less invasive approaches in these type of cases, to ensure excellent results and promote further research as seen in other countries.

Key words: Cardiac myxoma. Minithoracotomy. Cardiovascular surgery.

Resumen

Introducción y Objetivo: Los tumores cardíacos no suelen ser diagnosticados hasta la realización de autopsia o en otros casos como hallazgos incidentales. El tumor cardíaco más común es el mixoma, aunque es poco frecuente; en el momento del diagnóstico a menudo se requiere una resección quirúrgica urgente. Anteriormente el enfoque quirúrgico era una atriotomía abierta derecha; sin embargo, recientemente se han empleado técnicas quirúrgicas nuevas con excelentes resultados. Describimos una técnica quirúrgica reciente a través de la minitoracotomía lateral derecha como un método mínimamente invasivo con tres casos que evidencian un método quirúrgico apropiado e ideal. **Métodos y pacientes:** Se presentan tres casos de resección mínimamente invasiva de mixomas a través de una minitoracotomía lateral derecha. **Resultados y discusión:** Es estos tres casos no se reportaron complicaciones perioperatorias ni durante el seguimiento a los 6 y 12 meses. En comparación con otras series de casos en la literatura, el enfoque en Colombia ha sido comparable tanto en los resultados exitosos como con las técnicas quirúrgicas, sin complicaciones asociadas. **Conclusiones:** La minitoracotomía lateral derecha puede ser

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considerada segura en resección de mixoma. Con este tipo de reportes se espera suscitar en la comunidad médica la elección de alternativas quirúrgicas mínimamente invasivas para garantizar excelentes resultados y promover la investigación, como se evidencia en el resto del mundo.

Palabras clave: Mixoma cardíaco. Minitoracotomía. Cirugía Cardiovascular.

Introduction

Cardiac tumors are rare and often unrecognized until autopsies are performed, before 1951 diagnosis was exclusively post-mortem¹. Primary cardiac tumors are mostly benign (75 %), the most common type being myxoma in half of those cases¹⁻⁴. Although myxomas' incidence is rare (0.001-0.1 %) ³⁻⁴, it is prevalent in all ages and appears in the left atrium in 60-85 % of the cases, rarely biatrial (5 %), with an average size of 5-6cm³⁻⁵. It is believed that myxomas arise at the cardiac septation from mesenchymal multipotent cells that persist as embryonal residues or from endocardial neural cells⁵.

Their clinical course varies depending on: attachment site, number of masses, comorbidities, recurrence, calcification and/or necrosis, and symptoms. Some can be completely asymptomatic (10 %) ⁴, while others can have systemic symptoms (34-90 %) ⁴⁻⁵ or valvular syndrome including sudden death⁶. A large percentage of patients debut with embolic complications (30-50 %) ²⁻⁵.

The diagnosis is often incidental via non-invasive images such as echocardiography, computed tomography (CT) scan, or magnetic resonance imaging (MRI)⁶, often as a result of heart failure/angina (67 %) or constitutional symptoms (13-34 %) ³. The main diagnostical tool and follow-up is the echocardiography^{3,4,6}, either transthoracic or transesophageal, however often more extensive images are required to characterize the tumor.

Symptomatic patients require urgent surgical resection to prevent complications^{2,3,6}, with a postoperative mortality of 1.7-7.5 % ^{3,5}, recurrence of 1-4 % ^{3,4,6}, and 5-year survival rate of 83 % ². Classically, in left atrium myxomas, a standard median sternotomy with a bicaval cardiopulmonary bypass has been performed, with resection through a right atriotomy and transseptal access. Interatrial septum defect is then corrected directly or with a pericardial (PTFE or Dacron) patch³. In complex tumors, a biatrial approach is often considered.

Recently, minithoracotomy with robotic and video-assisted resection has been performed, however the risk of incomplete resection is higher. Other accessible

minimally invasive surgical alternatives such as a minithoracotomy with direct vision have been applied⁶⁻⁷.

Cases

It is presented three cases of minimally invasive myxoma resection via the right lateral minithoracotomy. In all three cases, diagnosis was made via echocardiography (Fig. 1). Patient one is a 59-year-old female with a 1.5 cm myxoma, patient two is a 74-year-old male with a 6x4 cm myxoma (Fig. 2) and patient three is a 24-year-old female with a 3.8 cm x 3.3 cm myxoma.

Under general anesthesia, previously inserting a central venous access (internal jugular right vein) and arterial line (left radial artery), patient was heparinized at a dose of 3 mg/kg. The right lateral minithoracotomy incision was performed, dissection of femoral blood vessels with posterior distal and proximal repair (purse string suture with 5/0 prolene in right common femoral arterial and purse string suture with 5/0 prolene in right femoral vein with Seldinger technique for superior vena cava cannulation through the right jugular vein). Once the activated coagulation time was >500 ms, the cannulation of the femoral artery was achieved with Bio-Medicus 17 fr (patient 3)/19 fr (patient 2)/21 fr (patient 1), the femoral vein with a multiperforated cannula 25 fr, and the jugular vein with 15 fr. The MiAR cardioplegia cannula was inserted in the aortic root, then the corporal temperature was reduced to 34°C to ensure an adequate pinching of the aortic root and posterior infusion of the high-potassium concentration crystalloid cardioplegic solution as well as cold topic saline solution until achieving complete cardioplegia. This allowed the extracorporeal circulation to be completed without any complications.

Once the myxoma resection was completed, the left atrium is closed with a continuous sutured with prolene with previous lavage to remove any thrombi. The corporal temperature was increased to 32°C to uncinch the aortic root and allow reperfusion. The heart regained electrical activity with a sinus rhythm, to posteriorly suspend the extracorporeal circulation pump at 37°C. In patient 2, the heart regained electrical activity

Table 1. Characteristics of the three patients who underwent minimally invasive myxoma resection via the right lateral minithoracotomy

Patient	Gender	Age	Location and LVEF (%)	Size (cm)	Symptoms	Pump time (min)	Clamp time (min)	Bleeding	Days hospitalized
1	Female	59	Posterior interatrial septum (0.9 x 0.7 cm) and LVEF 74%	1.5 x 1.5	Presyncope	103	37	Limited (< 300 ml)	Pre-Op: 10 ICU Post: 6 Floor: 3 Total: 19
2	Male	74	Left atrium (4.9 x 4.6 cm) and LVEF 63%	6 x 4	Progressive dyspnea	90	45	Limited (< 300 ml)	Pre-Op: 6 ICU Post: 2 Floor: 2 Total: 10
3	Female	24	Left atrium embedded in septum and LVEF 57%	3.8 x 3.3	6 months of atypical chest pain, progressive dyspnea	91	44	Limited (< 300 ml)	Pre-Op: 1 ICU Post: 4 Floor: 1 Total: 6

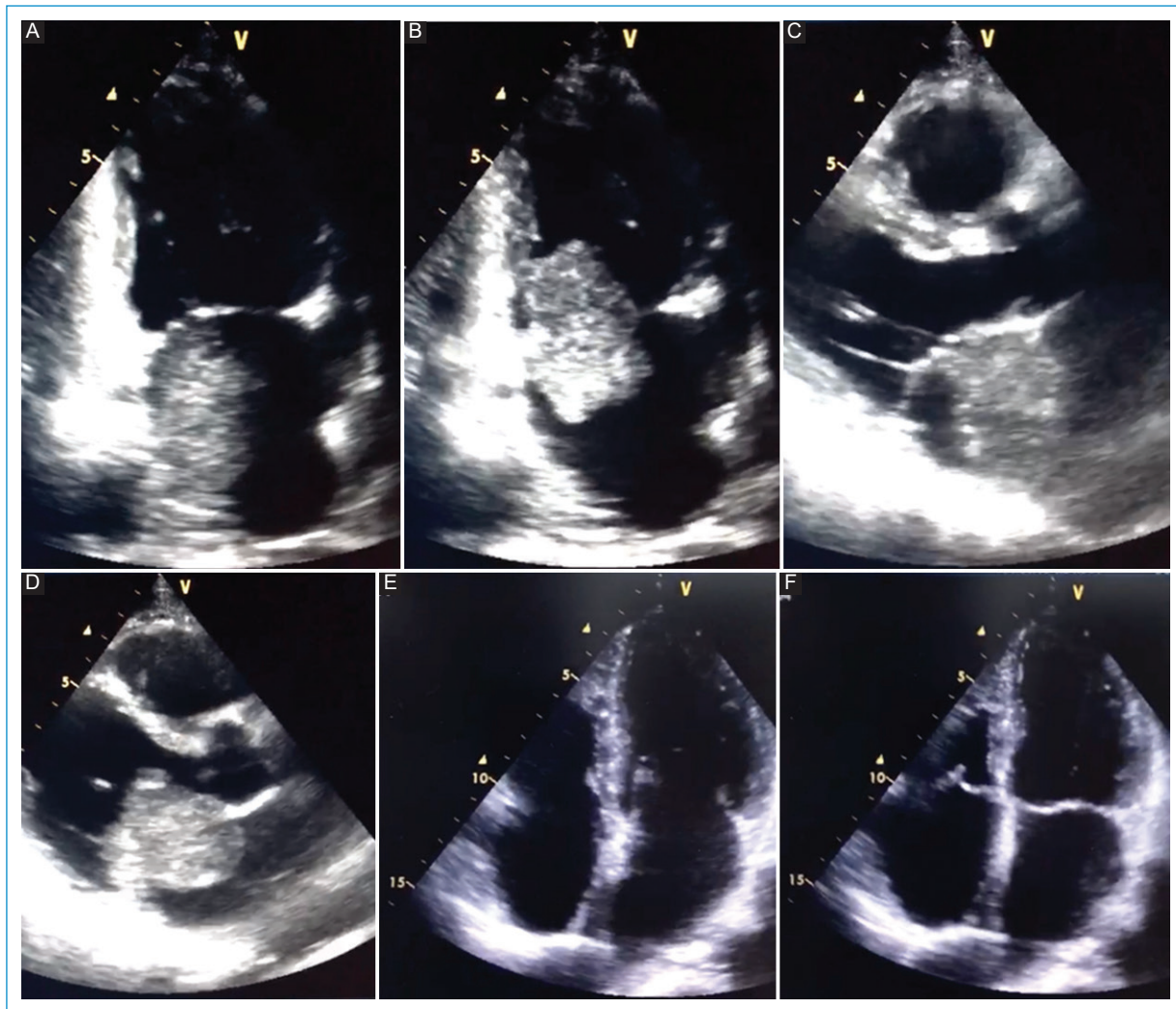
**Figure 1.** Echocardiography of patient 1 with the myxoma visible (A-D) as well as out-patient echocardiography posterior to resection (E-F).

Table 2. Characteristics of other case series reported in the literature (n>17) as comparison

Authors	Patients	Symptoms	Mortality	Complications
Pinede et al.	122	Cardiac failure signs (43%). Syncope (14%). Palpitations and thoracic pain (30%). Fever (20%). Constitutional (18%). Embolic events (29%).	3.5%.	Arrhythmias 29%. Recurrence (5%).
Barnes et al.	18	Cardiac failure signs (44%). Embolic events (27%). Arrhythmias (27%).	0%.	Atrial fibrillation (5%).
Muthubaskaran et al.	32	Cardiac failure signs (47%). Embolic events (34%). Constitutional (32%).	0%.	Recurrence (6%). Peripheral embolus (6%). Pulmonary embolism (3%).
Garatti et al.	98	Dyspnea (68%). Palpitations (38%). Cardiac failure signs (30%). Embolic events (35%). Constitutional (57%).	3%.	Recurrence (1%).
Lee et al.	93	Dyspnea (38.7%). Thoracic pain (21.5%). Palpitations (8.6%). Embolic events (10.8%). Syncope (5.4%).	3.2%.	Recurrence (2.1%).
Lin et al.	68	Dyspnea (57%). Palpitations (46%). Syncope (21%). Cardiac failure signs (21%). Constitutional (35%). Embolic events (24%).	2.8%.	Pleural effusion (22%). Low output syndrome (7%). Atrial fibrillation (6%). Pericardial effusion (4%). Pneumothorax (3%). Pneumonia (3%). Respiratory failure (1.5%).
Jawad et al.	269	Dyspnea (34.9%). Arrhythmias (21.2%). Embolic events (13.4%). Thoracic pain (10.8%).	1.9%.	Arrhythmias (28.3%). Syncope (10%). Respiratory insufficiency (3.3%). Pericardial effusion (3.3%). Peripheral embolus (1.1%).
Gandara et al.	18	Dyspnea (35%). Thoracic pain (28%). Constitutional symptoms (20-22%). Syncope (14%).	17%.	Not reported.

with a ventricular fibrillation requiring 200 J discharge with reversion to sinus rhythm. Decannulation was then completed with suture reinforcement and once hemostasis was completed, an electrode was placed in the ventricular epicardium as well as mediastinal and pleural tubes to posteriorly close the thoracic cavity with one or two 1/0 vicryl sutures, fascia with 2/0 vicryl, and skin with 4/0 vicryl. Coagulation time control was completed using 5 cartridges in the Automated Coagulation Timer.

Results

Resulting biopsies of all excisions confirmed complete resection of each mass as well as confirmation of a myxoma. All patients had an in-hospital stay without any complications reported, requiring ICU-stance as routine post-operatively cautionary follow-up (Table 1) and intravenous ionotropic drugs during the immediate post-op. The only slight intra-operative complication was with patient 2 whom presented ventricular fibrillation in the return of electrical activity, successfully

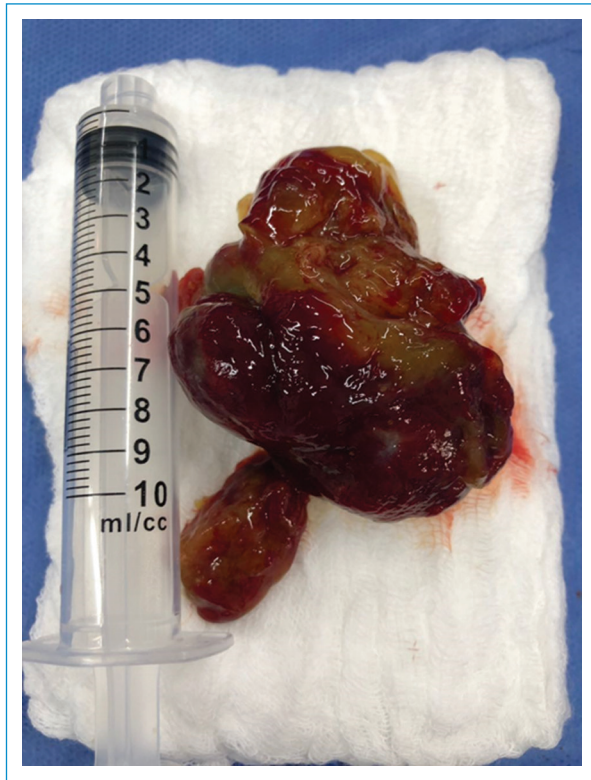


Figure 2. Resection of the intraoperative myxoma of patient 2.

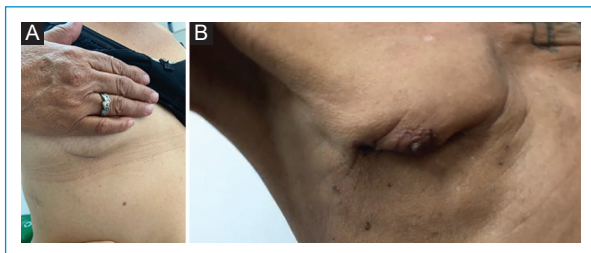


Figure 3. Scars of the right-lateral minimally invasive approach in the out-patient follow up. **A:** patient 1. **B:** patient 2.

reverted with one electrical discharge. In the out-patient follow-up, patients one and two had minimal scars post-surgically (Fig. 3). All interventions were performed successfully without any peri-operative complications or mortalities, with ICU stay Quality of life scale (SF-36) was applied 6 and 12 months postoperatively with scores above 90 %. Additionally, patient 1 had echocardiography immediately, 2 months and 28 months postoperatively; patient 2 had echocardiography at 1 month and 8 months postoperatively; patient 3 at 1 month and 16 months postoperatively; all reports

with a conserved ejection fraction and without any masses visible.

Discussion

Compared to other cases series in the literature, reports in our study were consistent in the average clinical course. Although a small sample size, all three were diagnosed via echocardiography and none reported any complications or mortality peri-operatively. We describe the most relevant findings (Table 1), while comparing worldwide similar case series reports ($n > 17$) albeit with a much larger sample size (Table 2). In this setting, our cases represent similar findings with respect to symptoms, bleeding, and peri-operative morbidity and mortality. Although other cases series usually do not report pump and clamp time, our time settings are within range of averages reported in other literature, as well as myxoma size and location³⁻⁵. Unfortunately given that in the three cases the in-hospital stay was very variable, we cannot ensure this as an advantage, a larger sample size is required.

These results emphasize evidence that a minimally invasive myxoma resection via the right lateral minithoracotomy can be the ideal approach in myxoma resection, specifically in Colombia where open surgery is often chosen based on lack of expertise or equipment/personnel available. We believe we can promote the use of this alternative surgical approach, especially in Colombia, given the promising results shown worldwide and locally.

Conclusions

Cardiac tumors are rare and often unrecognized until autopsies are performed, the most common type being the myxoma. Although the surgical approach is varied depending on the expertise, cost and equipment available, recently a minimally invasive myxoma resection via the right lateral minithoracotomy has been proposed as an ideal approach. We believe the case reports in this manuscript provide an idea for future surgical techniques as the patient outcomes are promising compared to open surgeries. We hope these excellent results promote further research in Colombia as well as increase education to ensure it becomes the norm.

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Conflict of interests

The authors declare they have no conflict of interests.

Ethical disclosures

Protection of human and animal subjects. The authors declare that no experiments were performed on humans or animals for this study.

Confidentiality of data. The authors declare that they have followed the protocols of their work center on the publication of patient data.

Right to privacy and informed consent. The authors have obtained the written informed consent of the patients or subjects mentioned in the article. The corresponding author is in possession of this document.

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