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CARDIAC MYXOMA: THE INFLUENCE OF SURGICAL TECHNIQUE ON LONG-TERM PROGNOSIS

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Abstract. - The aim of our study was to analyze the influence of different surgical techniques (left atriotomy, right atriotomy, biatrial approach and tumor basis solving) on early and late outcomes of patients operated on for cardiac myxoma. We evaluated 74 patients operated on for cardiac myxoma from 1982 through 2011. Sixty-six patients (89.19%) had left atrial myxoma and 8 (10.81%) right atrial myxoma. Histopathologic examination confirmed the diagnosis of atrial myxoma in all patients. In analyzing different surgical techniques we found that they had no influence on the duration of extracorporeal circulation and aortic cross-clamp time. Mortality analysis revealed: no intraoperative mortality; early mortality in 2 patients; late mortality in 12 patients. Survival after 29 years was 81.08%. There were no myxoma recurrences. 83.78% of the patients had functional improvement. In our opinion the best approach for right atrial myxoma is through right atriotomy, for left atrial myxoma through left atriotomy, with a biatrial approach for large tumors of the left atrium or when exploration of all 4 chambers is necessary. Subendocardial excision or thermocauterization was used for small tumors with bases less than 5 mm. Myxoma with a wider basis, depending on the localization, were partially resected at the atrial septum in the whole thickness or subendocardial excision of the tumor basis.

Key words: Cardiac myxomas, surgical approach, tumor basis, long term prognosis

INTRODUCTION

Primary tumors of the heart are exceedingly rare, accounting for 0.002-0.03% of all tumors (Ipek, 2005). The vast majority of primary cardiac tumors are benign and the most common type in adults is myxoma with an estimated incidence of 0.5 per million of the population per year (MacGowan, 1993). Approximately 75% of all myxomas are located in the left atrium (Bhan 1998). Most of them arise from a short stalk in the atrial septum. The symptoms are atypical and diagnosis was difficult to establish until the development of two dimensional echocardiography. Although biologically benign, due to their localization myxomas are considered "functionally malignant" tumors. Diagnosis of cardiac myxoma is an indication for surgical treatment.

MATERIALS AND METHODS

From January 1982 to January 2011, 80 patients at the Clinic for Cardiac Surgery, Clinical Center of Serbia, Belgrade, were operated on for cardiac myxomas. Seventy four patients were included in the study, while 6 patients were lost for follow-up as they moved abroad or changed their address. Twenty-four patients (32.45%) were male and 50 (67.55%) female. The median age was 46.7±15.28

Table 1. Preoperative clinical manifestations in patients with cardiac myxomas

Clinical semiology	Number of patients	(%)
General symptoms and signs	68	91.89
fatigue	61	82.43
elevated sedimentation rate	32	43.24
anemia	10	13.51
fever	6	8.10
weight loss	5	6.76
Heart symptoms and signs	59	79.73
symptoms of valve obstruction	55	74.32
cardiomegaly	52	70.27
syncope	6	8.11
angina pectoris	4	5.41
NYHA classification		
NYHA I	3	4.1
NYHA II	26	35.1
NYHA III	31	41.9
NYHA IV	14	18.9
Heart rhythm		
sinus rhythm	67	90.54
atrial fibrillation	7	9.46
bundle branch block	5	6.76
Embolic events	15	20.27
cerebral	9	12.17
pulmonary	4	5.41
peripheral	2	2.7

*Symptoms of valve obstruction: pulmonary edema, congestive heart failure, or dyspnea

(range 4 to 75 years); 75% of the patients were in the age interval between 40 and 60. Sixty-six patients (89.19%) had left atrial myxoma and 8 patients (10.81%) had right atrial myxoma. None of them had a family history of myxoma, or multiple myxomas.

The clinical profile and symptoms of the patients are summarized in Table 1.

Symptoms were present 2 to 36 months (mean 13.60±7.52 months) before the operation. At the time of diagnosis, 3 patients (4.05%) were asymptomatic. In the NYHA class III and IV there were 45 patients (60.8%). The most common symptoms were fatigue in 61 patients (82.43%) and symptoms of valve obstructions in 55 patients (74.32%). Preoperative embolic events were present in 15 patients (9 cerebral, 4 pulmonary, 2 peripheral). Physical examination was suggestive for mitral stenosis in 42 patients (56.75%), mitral regurgitation in 13 patients (17.56%) and tricuspid stenosis in 3 patients (4.10%).

Preoperative diagnosis, after standard clinical examination, was established in all patients by transthoracic echocardiography. In 15 patients (20.27%) a transoesophageal echocardiography was also necessary (in 10 patients left atrial thrombosis was suspected and in 5 patients a better visualization of the localization of the tumor basis was needed). Selective coronary arteriography was performed in 4 patients (5.45%) with a history of chest pain.

The patients underwent operations soon after the diagnosis of myxoma (1-8 days, mean 3.14 ± 1.5 days). Two patients had urgent procedures due to severe symptoms.

The standard surgical procedure was used: medial sternotomy, total cardiopulmonary bypass, moderate hypothermia (32°C-34°C) and cardiac arrest using crystalloid cardioplegia. The mean time of extracorporeal circulation was 57.97 min, 61.60 min, and 64.60 min for left atriotomy, right atriotomy and biatrial approach, respectively. The mean aortic cross-clamp time was 42.85 min (41.90 min, 42.40 min and 46.00 min for left atriotomy, right atriotomy and biatrial approach, respectively). In 8 patients with right atrial myxoma we used right atriotomy (10.81%). In 66 patients with left atrial myxoma we used a left atrium approach in 53 (71.62%) and a biatrial approach in 13 patients (17.56%). According to the local finding of the tumor basis, in 34 patients (45.94%) the tumor was resected together with a partial resection of the atrial septum in the whole thickness 4-5 mm from the edge of the tumor basis. Sixteen of these patients had direct suture of the interatrial septum, and in 18 patients the interatrial septum was reconstructed using a patch (Dacron patch in 4 patients and pericardium in 14 patients). Sixteen patients (21.62%) underwent complete excision of the tumor with a subendocardial excision of the tumor and endocardial suture. In 24 patients (32.43%) we used thermocauterization of the tumor basis. Five patients had associated procedures: 2 patients needed coronary artery grafting (one to the left anterior descending coronary artery and the other to the right coronary artery); 1 patient underwent mitral valve replacement, and 2 patients mitral valvuloplasty. Histopathologic examination of the resected specimen confirmed the diagnosis of atrial myxoma in all the patients.

All the patients were followed up on an outpatient basis 1, 3, 6, 12 months after discharge and then at yearly intervals. The mean follow-up was (12.2 ± 1.6) years. Follow-up included clinical examination, electrocardiography and echocardiography.

Statistical analysis was performed using the χ^2 test, Fischer′s test, Wilcoxon's test and Spearman's test. Survival rates were calculated using the Kaplan-Meier method (Castells, 1993).

RESULTS

Two patients (2.7%) died postoperatively. The first died on the third day due to cerebral coma and the second on the seventh day due to hepatorenal insufficiency.

Analyzing the different surgical techniques, we found that they had no influence on the duration of extracorporeal circulation and aortic cross-clamp time ($p>0.05$). During the follow-up period 37 patients (51.39%) were in NYHA class I, 30 (41.67%) in NYHA class II and 5 (6.94%) in NYHA class III. Ten patients remained in the same NYHA class, and none of them had a worsening of functional class. 83.78% of the patients had functional improvement.

In the preoperative period, 12 patients had rhythm disturbances or conduction disorders (7 atrial fibrillation, 3 incomplete right bundle branch block, 1 complete left bundle branch block and 1 complete right bundle branch block). These patients had no changes in the perioperative and follow-up period, but 4 other patients (5.5%) had new arrhythmias: 3 of them developed atrial fibrillation, 1 patient had incomplete right bundle branch block. In 1 patient who developed complete atrioventricular block one year after the operation, implantation of a permanent pace maker was performed. Statistical analysis did not reveal an effect of the different surgical approaches in solving the tumor basis and on the development of heart arrhythmias ($p > 0.05$).

During late follow-up, 3 patients required additional cardiac surgical procedure after the extirpation of myxoma: 1 patient had mitral valve replacement after 4 years, in 1 patient mitral valvuloplasty was performed after 6 years, and 1 patient underwent aortic valve replacement 5 years after the first operation.

One patient had thromboembolic event, i.e. cerebral emboli with a transient ischemic attack 5 years after the operation. This patient had atrial fibrillation. A control echocardiography did not show any signs of myxoma.

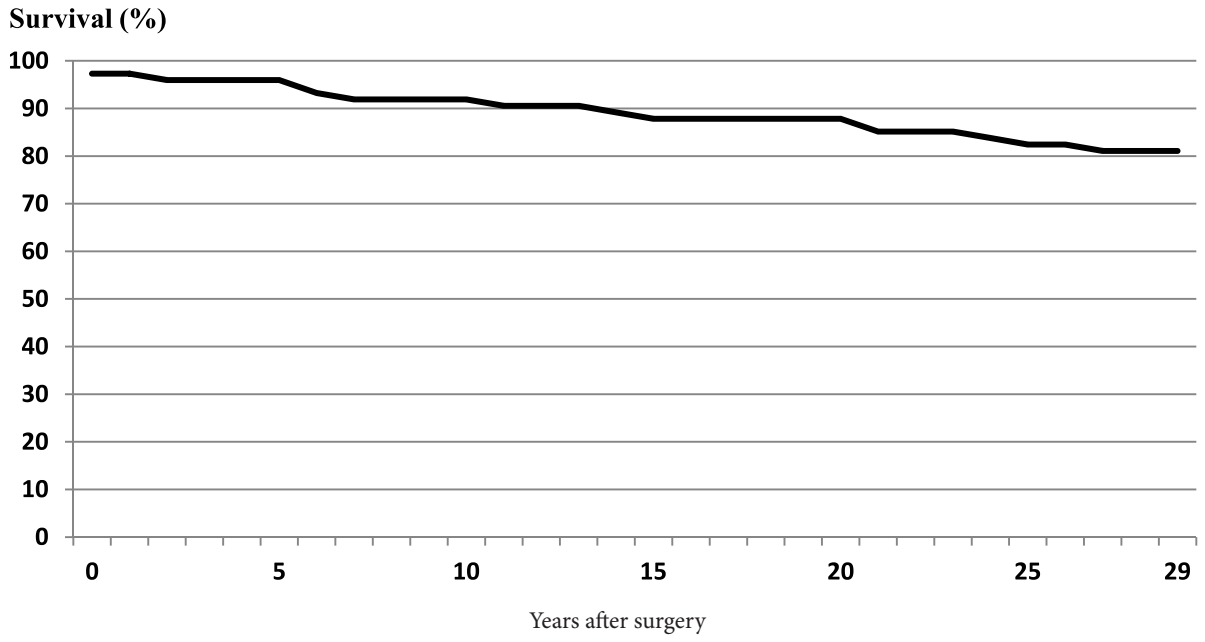

Fig. 1. Actuarial survival rate after excision of intracardiac myxoma

Mortality analysis revealed: a) no intraoperative mortality; b) early mortality in 2 patients (cerebral coma and hepatorenal insufficiency); c) late mortality in 12 patients. Survival after 29 years was 81.08%. (Fig. 1).

There were no myxoma recurrences in the operated patients.

DISCUSSION

Cardiac myxomas are the most frequent benign tumors of the heart which can be localized in any of the four cardiac chambers. Approximately 75% of all myxomas are located in the left atrium. Our study comprised 74 patients, predominantly females that were operated on for cardiac myxomas. The majority of patients (75%) were aged between 40 and 60 years. These demographic data are in concordance with the data from literature (Keeling, 2002, Karlof, 2006). Until now, large studies of patients with myxoma have been published by: Murphy et al. - 63 patients over a period of 25 years (Murphy, 1990), Miralles et al. - 58 patients for a period of 17 years (Miralles, 1991), Bortolotti et al. - 54 patients for a period of 20 years (Bortolotti, 1990) and Bjessmo et al. - 63 patients for a period of 40 years (Bjessmo, 1997).

Preoperative diagnosis was established by echocardiography in all patients. The development of echocardiography enabled earlier diagnosis, possibly before the symptoms became pronounced. Delaying the operation carries the risk of pulmonary or systemic embolization or local obstruction, as it is known that they grow fairly rapidly (Kusano, 2002; Malekzadeh, 1989). In our study we had 15 embolic events (20%). Bortollotti had a few more embolic events (25%). In his study an embolic event was the first symptom in 10 of 13 patients. This is why cardiac myxoma is an indication for urgent surgery, especially in patients with severe dyspnea or high risk of embolization (Reynen 2005).

There are some dilemmas in the literature about the local surgical approach to myxoma (Stevens, 2005). We used right atriotomy in order to approach myxomas located in the right atrium. In 66 patients

with left atrial myxomas, a left atriotomy approach was performed in 53 patients and a biatrial approach in 13 patients. Our opinion is that the best approach for right atrial myxoma is through right atriotomy, and for left atrial myxoma through left atriotomy. The biatrial approach was used for large tumors of the left atrium or when exploration of all 4 chambers was necessary.

Another important problem in the surgical treatment of atrial myxoma is solving the tumor basis in order to prevent tumor recurrence. Subendocardial excision or thermocauterization were used in patients who had small tumor basis, less than 5mm, attached to the endocardium. Numerous authors (Schaff, 2000; Selkane, 2003) prefer septum excision with reconstruction or sutura compared to thermal or laser coagulation of the tumor basis in myxomas attached to the interatrial septum. There is general agreement that the site of the attachment should be resected with a clear margin, even if this involves the artificial creation of an atrial septal defect that needs to be closed by a pericardial patch. Using different surgical techniques we found no difference in the duration of the operation and the development of new arrhythmias.

The vast majority of patients (83.78%) had functional improvement, and none had worsening after the operation. Our patients had early mortality and long-term survival similar to studies published in literature (Bjessmo, 1997; Bortolotti, 1990; Keeling, 2002; Miralles, 1991).

It has been estimated that cardiac myxomas recur with an approximate incidence of 7%. Inadequate primary excision, tumor seeding at the time of operation, and multiple foci of tumor have all been proposed as explanations for recurrence. Recurrence of sporadic cardiac myxomas after removal has been reported as well as in cases of multifocal tumors and in cases with a family history of the tumor. This is the reason for routine echocardiography control. In our series there were no recurrences during the follow-up period, indirectly suggesting that all surgical approaches were successful.

CONCLUSION

All patients in our series of 74 operated on for cardiac myxoma had improvement after the operation and there were no recurrences. Our opinion is that the best approach for right atrial myxoma is through right atriotomy, and for left atrial myxoma through left atriotomy. A biatrial approach was used in patients with large tumors of the left atrium or when exploration of all 4 chambers was necessary. Another important matter is solving the tumor basis in order to prevent tumor recurrence. Subendocardial excision or thermocauterization were used in patients who had a small tumor basis of less than 5mm, attached to the endocardium. In patients who had a wider tumor basis, the tumor was resected with partial resection of the atrial septum in the whole thickness, 4-5 mm from the edge of the tumor basis or by subendocardial excision of the basis. Our results are in agreement with those reported in literature, so we can recommend our approach as safe and beneficial.

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