

# Tumors of the Right Atrium – A Review of cases operated in Department of Cardiac Surgery, Medical University of Lodz, between 2008 and 2015

Tomasz Skowroński<sup>1\*</sup>, Magdalena Redynk<sup>2</sup>, Cezary Lewandowski<sup>3</sup>, Sławomir Jander<sup>4</sup>, Stanisław Ostrowski<sup>5</sup>

<sup>1,4,5</sup>Department of Cardiac Surgery, Chair of Cardiology and Cardiac Surgery, Medical University of Lodz, Poland

<sup>2,3</sup>Medical student of the 6th year, Medical University of Lodz, Poland

\*Phone/Fax: +48 42 201 44 67, E-mail: tomek.skowronski@gmail.com

**Abstract**— Cardiac tumors, especially those of the right atrium (RA), are not prevalent. The most common tumor of RA is myxoma which must be differentiated with other neoplastic tumors and thrombi. The most important role in diagnostics plays echocardiography and histopathological examination of removed masses. Other diagnostic methods also deliver additional information useful in therapeutic process. Nine cases of tumors of RA operated through median sternotomy both electively and non-electively, between 2008 and 2015, were analyzed in the present study. The rate of myxomae and thrombi was higher than expected. Also operative outcome was found to be worse in non-elective patients. Although due to a small number of analyzed patients, further studies including multicenter trials are necessary. The fact that fast diagnostics enabling optimal timing and type of the surgery is essential for good therapeutic results is undeniable. One of the reasons which may delay a proper diagnosis is the fact that tumors of RA do not have specific clinical presentation and are quite rare.

**Keywords**— Cardiac surgery, Myxoma, Right atrium, Thrombus, Tumor.

## I. INTRODUCTION

### Background

Primary cardiac tumors are uncommon. They were found in 0,001-0,03% cases on autopsy. Lately, their prevalence is estimated for ca 0,02% [1,2,3,4,5,6]. On histopathological examination, cardiac tumors in 75% are benign lesions and 50% has a structure of myxoma [2,3]. In differential diagnostics primary malignancies, metastases and organized thrombi must be considered [12,19]. Myxoma which is most prevalent tumor usually is localized in the left atrium (75%) or RA (18%). Ventricular localization of myxoma is quite rare [2]. It is more common in women. The most important imaging technique in diagnostics of cardiac tumors is echocardiography, both transthoracic (TTE) and transesophageal (TEE). Magnetic resonance (MR) and positron emission tomography (PET) are also very valuable diagnostic methods because they have high specificity and sensitivity. Coronary angiography is also of large clinical importance providing some data on tumor's vascularization. On the basis of above mentioned imaging methods it is possible to state preliminary diagnosis of cardiac tumor including anatomical relations. Ultimate diagnosis is possible only on the basis of histopathological examination of a specimen of operatively removed lesion [13].

## II. CASE REPORTS

The present study is retrospective and concerns patients operated between 2008 and 2015 with diagnosis of tumor of RA. The study group consists of 9 patients; six men and three women. The patients' profile is shown in the Table 1. The patients were aged from 51 to 83 years. They all were burdened with cardio-vascular risk factors such as age, overweight, lack of physical activity, hyperlipidemia, smoking or arterial hypertension. Six patients were in functional class II, and one in class III according to NYHA. One patient had congestive cardiomyopathy with ejection fraction (EF) of 28% and one patient was admitted to the hospital with acute heart failure in the course of acute coronary syndrome. Five patients presented with atrial fibrillation (FA) which additionally predispose them to thromboembolism.

Six patients were operated on cardio-pulmonary bypass (CPB) with aorta cross-clamping, cardiac arrest and myocardial protection obtained by giving cold crystalloid cardioplegia. Three patients were also operated on CPB but without aorta cross-clamping on beating heart due to favorable anatomical conditions (pedunculated tumors). Mean CPB time was 38

minutes and mean aorta cross-clamping time in those operated on arrested heart was 28 min. Operative access in all patients was median sternotomy. Seven patients were operated electively and two urgently.

**TABLE 1**  
**PATIENTS' PROFILE**

	Sex	Age	Other procedures	Urgency	Complications	Histopathological result
1	M	60	tricuspid annuloplasty	elective	none	thrombus
2	M	83		elective	none	myxoma
3	F	58	closure of ASD II	elective	pneumothorax	thrombus
4	M	51		elective	none	thrombus
5	F	55		urgent	atrial fibrillation	thrombus
6	M	83	grafting of marginal branch	urgent	ARDS, cardiac shock, acute renal failure, death	anaplastic unclassified tumor
7	M	68		elective	bleeding, hypotension and cardiac resuscitation, twice rethoracotomy, reduction aortoplasty, massive transfusion of blood products, transient renal dysfunction, psychosis	myxoma
8	M	77	tricuspid annuloplasty	elective	none	myxoma
9	F	71		elective	low grade hydrothorax	myxoma

In four patients tumor removal was accompanied with some additional procedures affecting duration of the surgery. In two cases it was tricuspid annuloplasty, in one closure of atrial septum defect and in one grafting of marginal branch with saphenous vein.

Postoperative complications were observed in 3 patients operated electively and in both two patients operated urgently. In the first group complications comprised pneumothorax, pleural effusion and in the third patient excessive bleeding from the arterial cannulation site which needed two re-thoracotomies, massive blood transfusion and heart massage. During second re-thoracotomy aortic wrapping was necessary to control bleeding. Transient renal failure was observed in this patient in further postoperative course. One of the urgently operated patients had paroxysmal atrial fibrillation, pleural effusion and diarrhea with negative *C. difficile* cultures. Another urgently operated patient had respiratory insufficiency requiring prolonged ventilation, renal failure treated with continuous renal replacement therapy, cardiogenic shock with low cardiac output syndrome managed with catecholamine infusion and intra-aortic balloon pump assistance. This patient died on the third postoperative day. He was operated as emergency in acute coronary syndrome. In control transthoracic echocardiography mild to moderate mitral or tricuspid regurgitation was found and in 2 patients trivial aortic regurgitation was observed. Postoperative outcomes were affected by tumor diameters, its localization and mobility as well as by timing of diagnosis and co-morbidities. The patients who had atrial fibrillation in preoperative ECG continued with this arrhythmia after the operation. The patient who was operated in acute coronary syndrome left bundle branch block was observed postoperatively.

### III. DISCUSSION

In spite of a huge progress in medicine, classical surgery remains a basic method of treatment of cardiac tumors [13]. Other methods are of second choice in cases where surgical treatment is impossible or ineffective. So far less invasive methods are reported occasionally but it seems that with time that kind of operations will become more and more popular [10, 11].

Myxoma which is most prevalent primary tumor of the right atrium is more common in women [7]. When comparing our group with the meta-analysis of 66 cases published between 2008 and 2014 the biggest difference is the rate of thrombi (44% vs. 8% in the literature). However, due to small number of our patients we cannot draw any unequivocal conclusion from this fact. A proper diagnostics followed by early diagnosis is essential for perioperative course and outcomes of surgical treatment of cardiac tumors [1]. Some important pieces of information can be obtained when taking a history. Such clinical findings as arrhythmia especially atrial fibrillation, dyspnea or angina and positive family history may suggest a presence of cardiac tumor [1,2,6,14], however they are not very specific. A coincidence of right atrium tumor and previous surgical intervention within this heart chamber cannot be excluded [10]. If any nonspecific symptom may suggest a presence of tumor in the right atrium, the patient should be referred to echocardiography (TTE or TEE) which not only detects pathological masses but also enables to measure their diameters and to determine their accurate localization and a place of attachment [6,7,18]. If the symptoms intensity allows, the echocardiography should be performed in several time points to assess a dynamics of tumor's growth and to anticipate its nature [16].

The early diagnosis enables an optimal patient's preparation to the surgery. This is a very important issue because the results of urgent operations with a limited patient's preparation are significantly worse. This trend was observed both in our material and in the above mentioned meta-analysis. In case of malignant tumors the early diagnosis is even more important because it allows for radical surgical removal of the tumor which significantly affects the prognosis [5,18].

Other imaging techniques such as CT, MRI or PET should be always taken under the consideration because their results may strongly affect the treatment [3,6]. For example, the findings suggesting malignant nature of a tumor should accelerate the surgery. On the other hand, images that suggest that pathological masses are a fresh thrombus rather than a neoplasm may change the treatment from the operation to the intravenous heparin administration [9]. Additionally, PET enables to find other pathological foci in case of a malignant tumor which also may modify its management e.g. implement some oncological procedures [16,19].

In the reviewed literature, the perioperative mortality rate of the patients operated because of the right atrium tumor was 4,5%. In the analyzed group one death occurred (17%), however due to critical state of the patient before the operation and co-existing coronary artery disease requiring simultaneous grafting of the first marginal branch makes general concluding irrational.

A comparison of the outcomes of beating and arrested heart operations also requires further observation of bigger patients' groups. It seems that a choice of operation mode should mostly depend on the patient's clinical state and the tumor's size and localization. The need of additional simultaneous surgical procedures may also affect that choice [15,17].

### IV. CONCLUSION

1. Although possible, concluding on the basis of such a small patients' group allows only for signaling a scale of the problems connected with diagnosing and operating the right atrium tumors. However, further multicenter analysis would be of a greater clinical significance.
2. The proper and quick diagnostics is essential for an increase of surgical treatment effectiveness. The fact that urgent operations have much worse outcomes should be especially emphasized.
3. The classical operation through median sternotomy remains predominant therapy in the right atrium tumors. However, in the future the increase of less-invasive methods can be expected, especially in patients with much co-morbidity not requiring additional simultaneous cardiac procedures.
4. Echocardiography is the most important method in proper qualification to the surgery of the right atrium tumors. However, other imaging techniques such as CT, MRI or PET may be very helpful in more accurate diagnostics of the tumor and detecting of other potential foci.

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