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Clinical presentation of atrial myxomas does it differ in left or right sided tumor?

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ABSTRACT

Objective: This paper reports a 20 years' experience in the management of atrial myxomas at our institution. Apart from presenting our experience of their clinical presentation, surgical management, post-operative complication, and long-term follow-up we investigated any correlation between left and right sided tumor with their symptom of presentation.

Materials and Methods: The data were retrospectively collected for patients between the period 1995 and 2015 from the hospital database. The follow-up was conducted by questionnaire received from the patients describing their current status.

Results: Fifty four consecutive patients underwent surgical resection for atrial myxomas. The mean age was 62 years (standard deviation [SD]: ±14 years) with a larger number of female (55.5%) patients. The most common location for the tumor was the left atrium (70.3%) with the atrial septum being the most common (63%) site of attachment. The tumors presented in a variety of ways, namely, as shortness of breath (37.03%), transient ischemic attack (24.07%), and chest pains (22.2%) being the more common modes of presentation. Left heart tumors presented 6 years earlier with more severe shortness of breath as compared to right-sided tumors. Post-operative atrial fibrillation occurred in 22.2% of patients. Concomitant surgical procedures were required in 26% of patient. The median length of post-operative hospital stay was 6 days (IQR: 5; 9). There were 2 (3.7%) in-hospital mortalities and 4 (7.4%) later deaths at 2, 3, 7, and 15 years, respectively. Long-term follow-up actuarial Kaplan-Meire survival for the whole group was 92.6 ± 3.6% at 20 years with a significant reduction in the severity of shortness of breath.

Conclusion: Cardiac myxoma is the most common form of the cardiac tumor with a slight female preponderance. Left-sided tumors present earlier than right-sided tumors with more severe shortness of breath. Excellent long-term results can be achieved with surgical intervention for cardiac myxomas, including any concomitant interventions. In particular, a sustained reduction in shortness of breath is observed.

Keywords: Tumor, cardiac, myxomas

Introduction

Primary tumor of the heart is uncommon but not rare. The incidence of primary cardiac neoplasm ranges between 0.02% and 0.2% from various autopsy series.[1] In the literature, atrial myxomas have been reported as the most common cardiac tumor accounting for about 40–90% of all primary cardiac tumors.[2-4] Myxomas can be sporadic or can present as complex syndromes such as Carney complex which manifests as cardiac endocrine and neural neoplasm along with pigmented skin lesions.[5] Among cardiac myxoma up to 7% of myxoma present as Carney complex.[6] Myxomas can affect all age group but are commonly seen between the third and sixth decade of life with a female predominance.[7,8] The most common site of attachment is on the left atrial side of the fossa ovale. However, they can be found attached to the valves, in the ventricles or anywhere in the right or left atrium as well.[9,10] As they are connective tissue tumors of mesenchymal origin, they are also seen in other parts of the body including skin, bone, skeletal muscle, nasal sinuses, the gastrointestinal, genitourinary systems, and conjunctiva.[11,12] They are found incidentally or sometimes present with life-threatening emergencies. Most common symptoms include dyspnea, chest pain, syncopal episode or a triad of symptoms from intracardiac obstruction, cerebral, or peripheral embolisms. Valvular obstruction may cause heart failure, pulmonary edema, arrhythmias, or sudden

death.[13,14] Surgical resection has shown good long-term outcome. The tumor can be resected by a right or left atrial approach or by a biatrial approach which some authors suggest as their preferable approach.[15] In our cohort, we used either of these approaches depending on the location of the tumor. We share our 20 years follow-up experience from King's College Hospital, London, and report on the correlations between left and right sided tumor with their symptoms of presentation.

Materials and Methods

This institute treats only adult cardiac patients. All patient demographic, operative and outcome information is prospectively entered into a patient database. The database was retrospectively analyzed over a 20 years period from 1995 to 2015 and patients with cardiac myxomas identified. All patients, whether with a recurrence of cardiac myxoma or involving other concomitant cardiac surgical intervention, were included in the study. Patient operative and post-operative complications were obtained from the database, and the patient's current mortality status was ascertained from the Office of National Statistic. Patients still alive were approached to establish their current symptom status by questionnaire. Our institution is a center of academic excellence wherein anonymized patient information is ethically approved for research use.

The operative approach for all cases was through a median sternotomy and bicaval cannulation for establishing cardiopulmonary bypass. The myxomas were resected with full thickness excision of the septum with 0.5–1 cm margin around the stalk. The heart was inspected for other myxomas and defects. Where the tumor involved the atrial wall, or the mitral valve chordal apparatus both were excised, that from the LA wall by endocardial clearance and that from the MV by "shaving" the chordae.

Statistical analysis was undertaken on STATA11. Mean and SDs were used to summarize continuous variables and counts, and percentages were given for categorical variables. Where comparisons were made student's *t*-test was used for continuous variable and χ^2-test for categorical variables. Long-term survival was summarized and analyzed by Kaplan-Meire actuarial curves. $P < 0.05$ was accepted as a significant difference.

Results

The mean age of the cohort was 62 years (SD: ±14 years). 44 patients underwent surgical resection of their atrial myxomas over the period of 1995–2015 of which 55.5% were females and 44.5% males. One patient was a recurrence of the myxoma 8 years after the initial resection. The patients presented in a variety of ways with shortness of breath (37.03%), transient ischemic attack (24.07%) and chest pain (22.2%) being the most common modes, and the tumor is being an incidental finding in 9% of cases [Table 1]. Interestingly 28% of patients also had associated constitutional symptoms such as myalgia, arthralgia, fever, sweats, and weight loss.

The tumors were more commonly seen in the left atrium [Figure 1] (70.3% vs. 22.2%) as compared to the right atrium, where the most common location for attachment was the interatrial septum. However, 8 (14.8%) tumors were found attached to the roof of the left atrium, 1 (1.85%) tumor was attached to the free wall of the left atrium, while one arose from the secondary chordae attached to the edge of the anterior mitral leaflet [Figure 2]. In the right atrium 2 (3.7%) were attached near to the superior vena cava and inferior vena cava, respectively, one myxoma was found to be attached to the septal leaflet of the tricuspid valve. Three patients presented with tumors in both the atria [Table 1].

The average bypasses and cross-clamp times were 87 ± 21 min and 43 ± 18 minutes, respectively. Access to both atria through the right atrium was used in 32 (59.3%) patients while only the right atrium was accessed in 12 (22.2%) patients and the left atrium in 10 (18.5 %) patients. In 4 (7.4%) cases there was

Table 1: Pre-operative data

Symptoms	Number total *n*=54 (%)
Dyspnea (whole group)	20 (37.03)
Mean age	62 years (SD: ±14 years)
Sex	
Female	30 (55.5)
Male	24 (44.5)
Severe dyspnea NYHA III/IV	
Left tumor n=	9 (23.7)–16.7
Right tumor n=	2 (14.3)
TIA/CVA (whole group)	13/14 (24.07)
Left tumor=*n*	10 (26.3)
Right tumor=*n*	4 (28)
Chest pain	12 (22.2)
Asymptomatic	5 (9.2)
Syncopal episodes	4 (7.4)
Location	
Left side	38 (70.3)
Roof of left atrium	8 (14.8)
Free wall	1 (1.85)
Left atrium + mitral valve	1 (1.85)
Right side	12 (22.2)
SVC and IVC	2 (3.7)
Right atrium+	
Right ventricle	1 (1.85)
Bilateral	
Right+left atrium	3 (5.55)

All percentages given in this table are not correct and are incomplete. SVC: Superior vena cava, IVC: Inferior vena cava, SD: Standard deviation

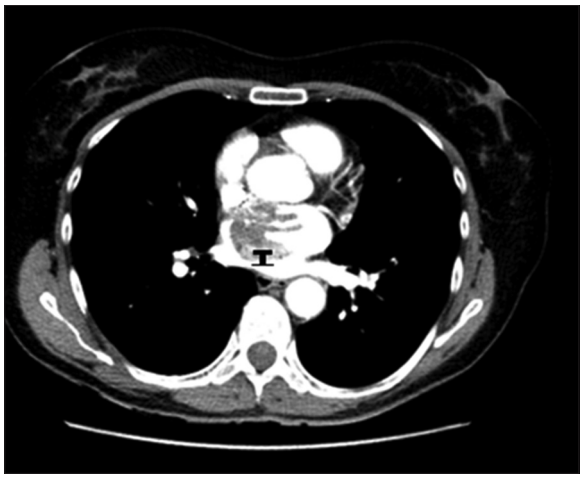

Figure 1: Computed tomography scan showing the myxoma in the left atrium

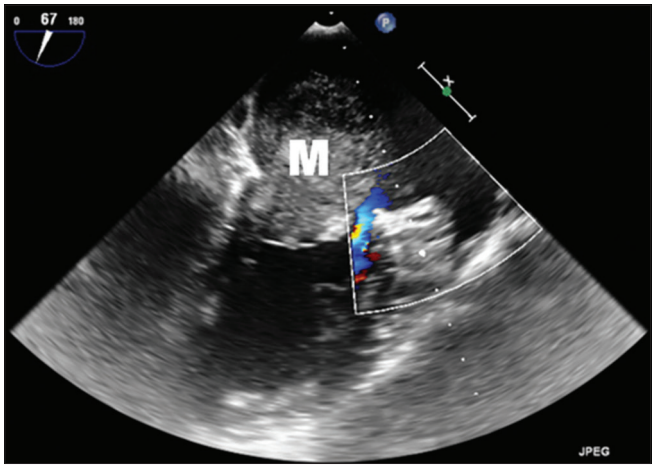

Figure 2: Transesophageal echocardiogram showing myxoma in the left atrium

an associated atrial septal defect, and in 2 (3.7%) there was a patent foramen ovale [Table 2]. The septum was repaired with primary suture closure in 21 (38.8%) cases while the rest was either reconstructed using bovine pericardium in 27 (50%) patients or autologous pericardium in 6 (11.1%). Eight patients required concomitant procedures unrelated to the tumor surgery, namely, five requiring coronary artery bypass grafting, two mitral valve surgery, and one aortic valve replacement, respectively.

The tumors varied in size with the smallest being around 1.5 cm to the largest measuring 12 cm in size. Typically the myxomas were fragile, gelatinous, pedunculated masses with a narrow base and stalk. However, there were other histological descriptions as some were described as being multiloculated 1 (1.85%), others as psuedo encapsulated 2 (3.7%) and hard and yet others were described as being hemorrhagic 1 (1.85%) [Figure 3] Thus, 51.8% in the left atria and 16.6% in the right were described as deformable with jelly-like consistency (Total 68.4%). In contrast, 18.5% in the left atrial and 5.5%

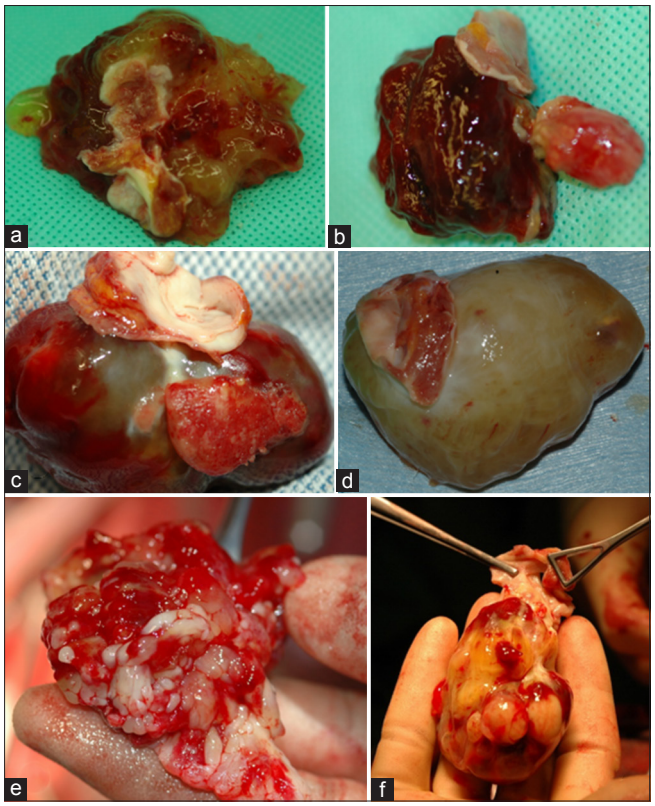

Figure 3: (a and b) Gelatinous myxoma 37 (68.4%), (c) hard pedunculated myxoma 13 (24%), (d) large pseudo capsulated myxoma 2 (3.7%), (e) hemorrhagic myxoma 1 (1.85%), (f) multiloculated myxoma 1 (1.85%). This figure does not give number and percentage of different myxomas of the study

Table 2: Intraoperative data

Total number	*n*=54
Surgical approach (%)	
Biatrial	32 (59.3)
Right	12 (22.2)
Left	10 (18.5)
CPB time (minutes)	86.5 86.5±21
Concomitant procedures	
CABG	5 (9.2)
ASD	4 (7.4)
Mitral valve replacement	2 (3.7)
Patent foramen ovale	2 (3.7)
Aortic valve replacement	1 (1.85)

Underline percentage is not correct. ASD: Atrial septal defect, CPB: Cardiopulmonary bypass

in the right were described as firm in appearance (total 24%) [Figure 3] with the remaining myxomas being intermediate inconsistency (total 7.6%). Given these differences in tumor size, location and consistency we investigated if there was any significant correlation between tumor size, location and consistency with the patient's symptoms at presentation or with their age. Namely, we found that cerebral events were not more likely a mode of a presentation given the tumor location in the left or right side of the heart (26.3% vs.

28%). There was a trend with tumors on the left side being associated with more severe dyspnea (NYHA III or IV) at the time of presentation, however, this did not reach statistical significance (23.7% vs. 14.3%). Patients with left-sided tumors were on average 6 years younger at the time presentation as compared to those with right-sided tumors though this was not a significant difference.

All patients spent < 24 hours in ICU postoperatively. Arrhythmias were the most common morbidity with atrial fibrillation and flutter being reported in 12 (22.2%) patients. The length of post-operative hospital stay ranged from 4 to 9 days with a median stay of 6 days. Thus, 93% of patients went home within 5 post-operative days in our cohort. Complete follow-up was available for 47 patients with 7 (54) patient being lost to follow-up, thus giving a mean follow-up of 60 months. There were 2 (3.7%) 30 days mortalities and 4 (7.4%) later deaths, namely, these patients died 2, 3, 7, and 15 years, respectively, after their surgery [Table 3]. The Kaplan-Meire survival for the whole group was 93±4% at 20 years resulting in a median survival for the cohort of 96 months. At follow-up, the patient's shortness of breath was significantly ($P < 0.01$) less in severity as compared to pre-operative symptoms with no patients at follow-up describing their shortness of breath as NYHA class 2 or more as compared to 20% of patients before their operation.

Table 3: Post-operative complication

Complication	Number (total *n*=54) (%)
Atrial fibrillation	12 (22.2)
Chest infection	3 (5.5)
Pleural effusion	3 (5.5)
Renal failure	2 (3.7)
Stroke	2 (3.7)
Recurrence	1 (1.85)
Perioperative and 30-day mortality	2 (3.7)
Late death	4 (7.4)
Post-operative stays (days)	Median 6 (range: 4-9)
Total follow-up (months)	60 months

Discussion

This paper describes a 20 years follow-up experience a large cohort of cardiac myxomas managed at our institution. In keeping with the published literature, most of our patients were female, and the left atrium was the most common site[7,8] for the tumor. There has been a variety of presentations reported in the literature for cardiac myxomas which in left heart myxomas can present as an emergency with left ventricle outflow obstruction,[16] sudden cardiac death[17] or as subacute bacterial endocarditis.[18] In keeping with this patient with right heart myxomas can also present acutely with pulmonary embolism.[19] In this study, a comparison between patients with left and right-sided heart tumors showed those with left-sided tumors to be on average 6 years younger in age at the time of presentation. Shortness of breath was the most common presentation in our cohort, and it was interesting that patients with left heart myxomas were more likely to present with more severe dyspnea. Thus, the symptom of shortness of breath is more likely to suggest an underlying element of pulmonary congestion from a left-sided myxoma rather than be the result of embolic events to the lung from a right-sided myxoma. The authors were surprised to find that cerebral embolic events in left heart myxomas showed no trend (26.3% vs. 28%) towards being a more likely mode of presentation as compared to right heart tumors. This was despite the fact that more tumors on the left side were described as being gelatinous and deformable. It raises an interesting question as to whether a myxoma embolus has a predilection to emboli to alternative destination sites in the body.

Echocardiography is now the principal method for the diagnosis of cardiac tumors and for follow-up[20] [Figure 2]. Real-time 2D echocardiography or transesophageal echocardiogram has allowed more comprehensive visualization of cardiac anatomy and pathological features of cardiac tumors.[21,22] In cases where the diagnosis is not well established cardiovascular magnetic resonance (CMR) can play a pivotal role. It has shown to help in confirming the presence or absence of mass. In addition, in the presence of a mass, CMR can provide accurate differentiation of pseudomasses, benign and malignant masses.[23] In this cohort of patients, all the important tumor anatomy and associated cardiac defects were established preoperatively with no new findings in theater. There was no tumor-related surgery required on the mitral valve in this series, however, there were two concomitant mitral valve replacements. This is in comparison to Selkane *et al*. who reported six mitral valve replacements in their series of 40 patient[24] and Kabbani *et al*. who reported four mitral valve replacements in a series of 24 tumor resections.[25] It should be expected that given the age of some patients a number of patients will also have concomitant ischemic heart disease thus in this series five patients required concomitant coronary artery bypass grafting. Therefore, pre-operative workup of such cardiac tumor patients and surgical planning is crucial especially as there is an increasing endeavor to resect such tumors via a minimally invasive approach.[26,27] The excision of a myxoma via a right mini-thoracotomy has shown satisfactory results in terms of post-operative complication and length of stay and thus holds the promise of becoming more commonly used technique.[28]

Recurrence of cardiac myxomas has been reported in the literature occurring within a few months to several years after the initial surgical excision with most occurring in the first 4 years.[29-31] However, the real mechanism for this is unclear with possible explanations for such recurrences including incomplete resection, intraoperative displacement, embolization, and multifocal genesis.[29] In our series, we observed a single case of recurrence which occurred 8 years after the excision of the tumor thus suggesting that recurrence of cardiac tumors remains low.

The post-operative recovery of our cohort, which included patients with other concomitant procedures, was comparable to that of isolated cardiac operation with atrial fibrillation occurring in 22.2% of patients and an average post-operative stay of 6 days. Our cohort demonstrated excellent long-term survival outcome at 20 years with a maintained reduction in the severity of their shortness of breath.

Conclusion

Cardiac myxomas are the most common cardiac tumors with the more female patient and left-sided tumor predominance. The data suggest that the group with left-sided heart tumors present earlier and have more severe shortness of breath than those with right-sided tumors. Tumor recurrence is rare and excellent long-term results in terms of symptoms and mortality can be achieved with open surgical resection.

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