Review Article

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Atrial myxoma: a review

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ABSTRACT

A seemingly benign and rare condition atrial myxoma can present with a grim phenomenon if the presentation is late or the diagnosis and surgery is delayed. Females in 3rd to 5th decade of life are the common sufferers, but no age is exempt. Patients may present with dyspnea, palpitation, embolization, congestive heart failure, neurologic symptoms, systemic illness, pain chest/limbs, pyrexia or weight loss. Clinical examination may reveal accentuated apical first heart sound, systolic murmur, tumor plop, loud pulmonic component, anaemia, asthenia, hypertension, paresis or plegia of limbs, or sudden cardiac arrest. Symptomatology and clinical signs may be misleading and the diagnosis is made by transthoracic echocardiography. Transesophageal echocardiography though invasive is superior to transthoracic echocardiography. Patients presenting with peripheral embolization need doppler studies, computed tomography. Magnetic resonance imaging may be needed to differentiate atrial myxoma from other cardiac tumors. Early surgical intervention for atrial myxomas which is done on urgent basis mitigates morbidity and usually offers cure. Jugular cannulation is avoided, heart is approached by median sternotomy but right anterior thoracotomy is equally good. Cannulation is done gently and aorta cross clamped before cardioplegia, right atriotomy approach is sufficient to remove the whole tumor along with its base and adjacent septal wall. Thorough saline irrigation / suction of atrium and ventricle remove all the tumor emboli. The defect so created is repaired directly or with a patch. Recurrence may be there but the Long term results are excellent. If asymptomatic, high risk patients should be followed with echocardiographic examination.

Keywords: Left atrium, Myxoma

INTRODUCTION

The prevalence of primary tumors of the heart in autopsy series has been reported between 0.007, 0.35 to 0.3 percent. Though the first report of a cardiac tumor appeared in 1559, little headway had been made in the overall diagnosis and management of such a disease. It was only in 1931 that the first extensive review of the literature was made and a useful classification of the system designed. Three quarter of the tumors are benign and nearly half the benign tumors are myxomas.

Commonly observed tumors are myxomas which are globular in shape, have a soft, gelatinous consistency, exhibit a yellow-brown or greenish hue and often contain areas of hemorrhage and necrosis. They usually have short broad-based attachment but can be sessile. Papillary forms may have a fond-like surface that is friable making emboli more likely. Myxomas are exclusively intracavitarily and are rarely seen deeper then endocardium on histological sections.

Cardiac myxomas are found most commonly in adult females with a median age at presentation of 49 years,

but patients below 20 and above 90 years have also been diagnosed with these tumors. Left atrium is the most common site in about 86% of cardiac myxoma, and 90 percent of myxomas are solitary. These tumors usually occur without any predisposing genetic disorder, biatrial and multiple cardiac myxomas are also reported.

Symptomatology

It is related to hemodynamic effects of the tumor, embolism, or constitutional symptoms and may include dyspnea on exertion, palpitations, congestive heart failure, syncope, hemoptysis, embolic events, atypical chest pain, paroxysmal nocturnal dyspnea, fever, fatigue, weight loss, night sweats, severe dizziness, seizures, peripheral oedema, or sudden death. Dyspnea occurs when pulmonary venous blood entering the left heart is obstructed by the left atrial tumor, the obstruction is progressive, but when obstruction is intermittent, syncope, often related to postural change or sudden death may occur.8 Impairment of valve closure, either by obstruction or leaflet damage, may cause regurgitation. The symptoms of pulmonary hypertension result from chronic pulmonary artery occlusion by right heart myxomatous emboli and mitral valve obstruction by left atrial cardiac myxomas. The constitutional symptoms are produced by the hemorrhage and degeneration with in the tumor, production of active substances by the neoplasm, micro embolism of small tumor fragments, or a systemic autoimmune reaction to shed myxoma cells. The embolization of myxoma may present as acute arterial occlusion or may be fatal: embolization is common because of the friability of the tumor and intracavitory location. Finally the patient may be symptomatic from cardiac arrhythmias which improve after removal of the tumor.

Clinical signs

The clinical signs usually in a lean, thin, and anaemic patient may include fever, myalgia, arthralgia, mitral diastolic murmur, mitral systolic murmur, pulmonary hypertension, right heart failure, anaemia, tumor plop, clubbing, raynauds phenomenon, fibrillation, monoparesis, hemiparesis, monoplegia, hemiplegia, peripheral or pulmonary oedema and clubbing.

Diagnostic evaluation

Diagnosis of these patients is very important, to know the presence and type of a tumor. The laboratory investigations may reveal a raised erythrocyte sedimentation pulmonary emboli, rate, globulins, abnormal chest skiagram, polycythaemia, anaemia, pulmonary artery hypertension, mitral / tricuspid valve disease, in addition to an atrial mass. The investigation of choice is echocardiography (transthoracic {TTE}/transesophageal {TEE}), radionuclide imaging, computed tomography (CT), magnetic resonance imaging (MRI), and rarely angiocardiography may be needed in selected patients. Since the first North American application of ultrasound to visualize cardiac neoplasms in 1968, echocardiography has become the most important non-invasive modality to diagnose myxomas sensitivity of 100%. 10 Transthoracic echocardiography a non-invasive technique, widely available, is the initial investigation of choice (Figure 1), and in majority nothing further is required to confirm the diagnosis. It not only images the myocardium and cardiac chambers but also identifies the mass, provides information about any obstruction to the circulation and the likelihood that the tumor could be the source of embolization. TEE is more informative, the superior diagnostic utility of TEE is due to the proximity of esophagus to the heart, lack of intervening lung and bone. and the ability to use high-frequency imaging transducers that afford superior spatial resolution, and helps in planning surgical management. 11,12 CT scan is a useful diagnostic tools especially in patients where MRI is not available, but MRI is preferred which in addition to furnishing detailed anatomic images, the T1- and T2weighted sequences reflects the chemical microenvironment with in a tumor, thereby offering clues as to the type of tumor that is present, cardiac mural infiltration, pericardial involvement, and extra cardiac tumor extension. 10 Even positron emission tomography (PET) has been useful in identifying cardiac involvement in patients with metastatic tumor, atrial myxoma or lipomatous septal hypertrophy. Trans venous biopsy is one of the investigative modality, but the data is limited on the risk and benefits of trans venous biopsy of suspected cardiac tumors, also myxoma may embolize so this is not done if the appearance is typical on noninvasive imaging.

Surgical approach

Myxoma is operated by open heart surgery under cardiopulmonary bypass. Heart is approached by median sternotomy, but right anterior thoracotomy is equally good, in fact some cardiac surgeons advocate and that is a fact also, that right thoracotomy approach gets the surgeon directly into the area of interest that is the left atrium. A longitudinal incision in the left atrium, posterior to interatrial groove is first performed, and the tumor visualized, complete tumor resection without late recurrence is established.¹³ Many authors, however, contend that exposure of the tumor is facilitated by a simultaneous right atriotomy, with excision of a fullthickness portion of the interatrial septum (Figure 2), including the fossa ovalis. 14-19 The myxoma which is attached to the fossa ovalis, is removed through right atrial incision if small or through left atrial incision if large. The biatrial approach is particularly useful if the base of the left atrial myxoma is sessile.²⁰ The radical resection has no benefit over conservative policy of tumor excision, and patients with sporadic form of myxoma, who have excision of only a narrow rim of adjacent endocardium had no recurrence. 21,22 In patients with right atrial myxoma both cavae should be cannulated directly or venous drainage should be provided by superior vena cava and femoral vein cannulation. The pulmonary artery should be clamped and an oblique right atriotomy performed. Because of more broad base attachment of right atrial myxoma to the atrial septum, more extensive resection and reconstruction may be needed.²³



Figure 1: Transthoracic echocardiographic picture of left atrial myxoma.

Histopathology

Histopathology of these tumors which originate from the endocardial sensory nerve tissues may show a size of 1 to 15 centimetres, growth rate may be rapid, 75 to 85 percent of the tumors are pedunculated and 76 percent originate from fossa ovalis. ²⁴ Grossly the tumor may have gelatinous appearance or resemble a round firm mass. These tumors are either sessile or pedunculated with a distinct stalk which may be narrow or broad. In 90% of the cases the base of attachment is atrial septum, usually in the region of limbus of fossa ovalis. In 10% of the cases the point of origin is the posterior or anterior atrial wall or atrial appendage. Myxomas are composed of cells, primitive capillaries, and foci of extramedullary haematopoiesis with in a myxoid matrix of acid mucopolysaccharide. The stroma contains variable numbers of reticulocytes and elastin fibres, smooth muscle cells and collagen deposits. The diagnosis of myxoma is made by the observation of the characteristic patterns of cells called as lipidic cells, embedded in a myxoid stroma rich in glycosaminoglycan. One feature that distinguishes them from thrombi is that they are covered by endothelium and have endothelium lined crevices and clefts.²⁵ Microscopic foci of calcium and areas of metaplastic bone are found in 10% of myxomas.7,26

Recurrence after surgery

Local recurrence has been recorded in up to 3 to 4 % of patients and is seen in young patients. However, many large series have recorded no recurrence. The time interval between initial excision and reoperation has ranged from 6 months to 12 years with a mean of 2 years and 28% of the recurrences repeat. Myxoma may

recur despite radical excision, a recurrent myxoma may be clinically more aggressive than primary tumor. ^{28,30}

Differential diagnosis

The left atrial myxomas are confused with rheumatic mitral valve disease, pulmonary hypertension, intrinsic lung disease, endocarditis, rheumatic fever, myocarditis and vasculitis. Right atrial myxomas are to be differentiated from rheumatic tricuspid valve disease, atrial septal defect, pulmonary emboli, pulmonary hypertension and constrictive pericarditis.

Since majority of these tumors are benign and if operated/managed in time the long term results are excellent. It is therefore mandatory to evaluate and operate these patients on priority.



Figure 2: Excised myxoma along with its base.

DISCUSSION

The first report of a cardiac tumor appeared in 1559. 4 It was in 1800s that the tumor was distinguished from thrombus.³¹ The first presumptive diagnosis of primary cardiac tumors was made in 1934 and the clinical diagnosis of the cardiac myxoma was made by angiography in 1952. 32,33 Even at the turn of the century and the beginning of the new century only one to two cases are done at the busiest cardiac centre per year. Myxoma being more in females is well established. 34,35 Cardiac myxoma observed in pediatric age group has also been reported.³⁶ Symptomatology such as dyspnea on exertion, palpitations, congestive heart failure, syncope, hemoptysis, embolic events, atypical chest pain, paroxysmal nocturnal dyspnea, fever, fatigue, weight loss, night sweats, severe dizziness, seizures, peripheral oedema, or sudden death is well reported. 35,37-39 Left atrial (LA) myxoma with systemic embolization usually a fatal complication has been reported to occur in 25 to 50% of patients preoperatively. 15,40-42 Surgery is indicated in all patients diagnosed to have myxoma, and is considered urgent since the risk of hemodynamic decompensation and embolism are ever present. In some series there is between an 8 to 10% incidence of death from embolic complications during the interval between diagnosis and surgery. 22,43 That the clinical signs include mitral diastolic

murmur, mitral systolic murmur, pulmonary hypertension, right heart failure, anaemia, tumor plop, raynauds phenomenon, fibrillation, monoparesis, hemiparesis, monoplegia or hemiplegia, peripheral or pulmonary oedema is in accordance to other studies. 44-46 Two dimensional echocardiography the investigation of choice with a sensitivity of 100% is well established. 10,47 Transesophageal echocardiography being superior to transthoracic echocardiography for identifying shape, point of attachment and motion characteristics of the atrial myxoma has long been used and reported. 12,48-50 Interatrial septum is the common site of tumor origin.³⁷ Though there is no substitute to median sternotomy for approaching heart, right thoracotomy approach has been used with good results. Majority of the surgeons prefer biatrial approach but right atrial approach also gives excellent results. 34,35,38,37,51,52 It is well established that atrial myxomas constitute more than 90% of benign primary cardiac tumors, but the benign cardiac tumors being as low as 72% only has also been reported from a large series of 444 patients.⁵³ The low rate of myxoma cannot be taken as authentic nor certain because they had included all types of cardiac tumors in their study. Left atrium being the common site in 76 to 88% and isolated forms accounting for 90% of the patients has been reported from other studies also.⁵⁴ Giant atrial myxomas are nicely managed by surgical intervention.⁵⁵ If indicated, mitral / tricuspid valve surgery, and coronary artery bypass grafting is done at the time of myxoma resection. ^{34,56-58}

Right atrial myxoma was first removed through a right thoracotomy approach, using a short period of caval obstruction at normothermia successful excision of left atrial myxoma under cardiopulmonary bypass was reported in 1955, and successful removal of a right atrial myxoma was reported in 1958. 59,60 Intracavitory tumors of right atrium are rare, generally diagnosed as myxomas, once identified by echocardiography, right atrial lesions should be evaluated further by venacavagram, complete surgical excision including full thickness of normal surrounding margin should be the goal, and follow up should be up to at least 5 years. ³⁰ In a series of 54 patients with atrial myxoma, where 85% were in left atrium and 11% in right atrium, it was recommended that irrespective of the location, cardiac myxomas should be approached initially through intra-atrial septum, this route provides adequate exposure, allows radical excision, and is associated with low incidence of postoperative arrhythmias, excision of such tumors is curative and long term outcome is excellent.¹⁵ In 32 consecutive patients of atrial myxoma operated over a period of two decades, it was observed that mean age was 57 ± 11 years, all were located in left atrium, follow up after resection was excellent without recurrence and that recurrence is mainly confined to patients with familial presentations and or myxoma complex.⁶¹ At a follow up of 22 years (mean 6.5 years) where hospital mortality was 7.3%, long term mortality was 7%, it was observed that postoperative life expectancy of these patients seems similar to that of normal population, except in cases of recurrence and mitral valve replacement, further, recurrence is very low except in case of young patients, and recurrent, familial, multiple or complex myxomas. The multigrowth potential of the tumor seems more important than inadequate surgical resection.¹⁶ In a series of 63 patients with atrial myxoma operated over 40 years it was recommended that after uncomplicated resections frequency of postoperative echocardiography should be limited, except for patients with multiple, atypical, or familial myxomas. 62 Observations from a consecutive series of 112 patients of left atrial myxoma was, embolic event in young adults, in absence of sign or symptoms of endocarditis or arrhythmia must lead to a primary consideration of myxoma as embolic source. 63 Excellent results have been achieved at a follow up of 20 years with no recurrence, even with simple excision with or without normal atrial septum. 64,65 Of late not only thoracotomy but even less invasive techniques are being used for myxoma resection with excellent results. Three patients operated by right minithoracotomy approach for atrial myxoma, had neither any mortality nor morbidity.⁶⁶ Video assisted right mini-thoracotomy approach has been used in 10 patients, with shorter intensive care unit (ICU) stay, no post-operative complications/recurrence. 67 Postoperative hospital stay, morbidity, and mortality is less in patients in whom atrial myxomas have been resected through a robotic- assisted right minithoracotomy, compared to standard sternotomy.⁶⁸ Some studies have not found much difference in postoperative morbidity and mortality between right mini thoracotomy and sternotomy, except for shorter ICU and hospital stay.⁶⁹ Some studies have observed that there is no difference in transfusions requirements, ICU stay, hospital length of stay, in hospital mortality, and recurrence at 2 years between mini-thoracotomy and sternotomy group. 70 Postoperative strokes are less with mini-thoracotomy approach but aortic cross clamp and cardiopulmonary bypass time is longer in patients undergoing minimally invasive right mini-thoracotomy approach. 71,72 There are different observations from different centre's with some reporting, re exploration for bleeding, and strokes more in minithoracotomy group. ^{73,74} That the myxoma is well known in this part of the country and is managed with excellent results is already presented in various studies. In a series of thirty patients, mostly in 5th to 6th decade of life, with more females, where 56.6% were in functional class III, biatrial approach for resection of myxoma was used in 23.3%, only right atriotomy in 63.3% and only left atriotomy in 13.3% of the patients. 75,76 Though optimal operative approach to atrial myxoma lacks uniformity, the gold standard is surgical approach to atrial myxoma should allow minimal manipulation of the tumor/inspection of all the four chambers of the heart, provide adequate exposure for complete resection, minimize recurrence and above all be safe and efficacious. The details of thoracotomy approach for intracardiac procedures, its advantages disadvantages, have been discussed in detail in other studies. 77,78 In spite of functional class, approach, embolization, the overall mortality is less then 5%. 15,16,18,21,59

In conclusion atrial myxoma though rare, can present with a grim phenomenon, symptomatology and clinical features are not specific, diagnosis is made by transesophageal echocardiography, in case of doubt other modalities of investigation should be used, once a diagnosis of atrial myxoma is made, surgery should not be delayed, jugular cannulation should be avoided, heart should be approached by right anterior thoracotomy, cannulation should be done gently, cardioplegia should be started after aortic cross clamp, tumor should be approached through right atriotomy, should be excised along with its base, thorough irrigation, suction of all the chambers should be done, the defect so created should be closed by direct or patch repair.

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