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A Retrospective Evaluation of the Patients with Rhabdomyoma

ORIGINAL INVESTIGATION

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ABSTRACT

Objective: To evaluate the location of rhabdomyomas in the heart, and the spontaneous regression, clinical and echocardiographic findings and association of rhabdomyomas with tuberous sclerosis.

Materials and Methods: The medical files of 12 rhabdomyoma cases diagnosed between 2005 and 2011 in the outpatient clinic of Paediatric Cardiology Department were retrospectively evaluated. Rhabdomyoma diagnosis was based on transthoracic echocardiography (TTE) and tuberous sclerosis was diagnosed according to clinical characteristics and imaging methods.

Results: The mean age at diagnosis of 12 cases, eight (66.6%) male, four (33.3%) female, male/female ratio 2, was 3.3+4.3 years (3 months-13 years). Seven cases (58.3%) were diagnosed to have definite tuberous sclerosis. Location of rhabdomyomas was as follows, seven cases (58.3%) in the left ventricle, two cases (16.6%) in the right ventricle, two cases (16.6%) in both ventricles and one case (8.3%) in the right atrium. The mass showed spontaneous regression in four of our cases (33.3%). Left ventricular size and systolic functions were normal in all cases. While the majority of the cases were asymptomatic, three cases had signs of congestive heart failure and one case had arrhythmia. The tumours of the cases with congestive heart failure were surgically excised.

Conclusion: Consistent with the literature, the frequency of definite tuberous sclerosis was 58.3%. While most of the rhabdomyomas were located in the left ventricle, 4 (33.3%) cases had spontaneous regression.

Key words: Echocardiography, rhabdomyoma, tuberous sclerosis

INTRODUCTION

Tuberous sclerosis complex (TSC) is an autosomal dominant genetic disorder, with an incidence ranging from 1/6000 to 1/30000. The disease is characterized by hamartomas in organs including brain, retina, skin, lungs, kidneys and heart. It frequently leads to cortical dysplasia, subependymal nodules, giant cell astrocytoma, retinal astrocytic hamartoma, facial angiofibroma, renal and lung angiomyolipoma and cardiac rhabdomyoma (1). Cardiac rhabdomyomas are generally associated with tuberous sclerosis. Rhabdomyomas are seen in approximately 43-60% of childhood tuberous sclerosis cases (2-4). Although primary cardiac tumours are rare, rhabdomyomas are common in infancy and childhood (2). While childhood rhabdomyomas can be asymptomatic, they may present with sudden death, fatigue, palpitations, chest pain, arrhythmia or congestive heart failure according to the number, location and size of the tumours. Echocardiography has an important place in the diagnosis and follow-up of rhabdomyomas (5-7). In this present article, we aimed to evaluate the location of rhabdomyomas in the heart, as well as the clinical and echocardiographic findings and the association with tuberous sclerosis.

MATERIAL and METHODS

The medical files of 12 rhabdomyoma cases diagnosed in the Paediatric Cardiology outpatient clinic between 2005 and 2011 were retrospectively evaluated. The written informed consents of the parents were obtained. The age at diagnosis, gender, neurological and systemic examination findings, transthoracic echocardiography (TTE), electrocardiography (EKG), electroencephalography, abdominal ultrasound, abdominal tomography, computed tomography (CT) of the brain), brain magnetic resonance imaging (MRI) and ocular findings of the cases were recorded. Rhabdomyoma diagnosis was based on echocardiographic examinations, and tuberous sclerosis was diagnosed based on clinical characteristics and imaging methods (Figure 1) (8).

Diagnostic criteria for tuberous sclerosis (8)

Primary characteristics

1. Cardiac rhabdomyoma (single or multiple)
2. Cortical tubers

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3. Facial angiofibromas or forehead plaque
4. Hypomelanotic macules (3 or more)
5. Lymphangioleiomyomatosis
6. Retinal nodular hamartomas (more than 1)
7. Non-traumatic ungula or periungual fibroma
8. Renal angiomyolipoma
9. Shagreen patch (connective tissue nevus)
10. Subependymal giant cell astrocytomas
11. Subependymal nodules

Secondary characteristics

1. Bone cysts
2. Cerebral white matter migration tracts
3. Confetti skin lesions
4. Gingival fibromas
5. Hamartomatous rectal polyps
6. Pitting of the dental enamel
7. Multiple renal cysts
8. Non-renal hamartoma
9. Retinal achromic patch

Definite tuberous sclerosis

2 primary or 1 primary+2 secondary characteristics

Probable TSC

1 primary +1 secondary characteristics

Possible TSC

1 primary characteristic or 2 or more secondary characteristics.

RESULTS

Of the twelve cases, eight were (66.6%) males, and four were (33.3%) females with a male to female ratio of 2. The mean age at diagnosis was 3.3±4.3 years (3 months-13 years), and eight (66.7%) of the cases were in the 0-3 years age group, and four (33.3%) of them was more than three years of age. One of the cases was diagnosed in the prenatal period by foetal TTE. According to the revised diagnostic criteria of tuberous sclerosis (8), seven cases (58.3%) were diagnosed as definite tuberous sclerosis. Apart from the three cases having dyspnoea, tachypnea, sinus tachycardia, or hepatomegaly, the physical examination findings of the cases were normal. A grade 3/6 systolic ejection murmur was present at the pulmonic area of a case (case 5) due to a mild obstruction in the right ventricular outlet that was caused by rhabdomyoma (Figure 2). Rhabdomyoma was located in the left ventricle in seven of the cases (58.3%) (Figure 3), in the right ventricle in two (25%) cases (Figure 4), in both ventricles in two (16.6%) cases (Figure 5) and in the right atrium in one (8.3%) case (Figure 6) (Table 1). Additionally, TTE showed one tumour mass in each seven cases (58.3%), two masses in each of the three cases (25%), five masses in one case (8.3%), and nine cardiac rhabdomyomas in one case (8.3%). Spontaneous regression of the mass was observed in four of our cases (33.3%). One of these cases, was the case with nine cardiac rhabdomyomas, while three of the tumours disappeared, there was a regression in the size of the biggest tumour. Left ven-

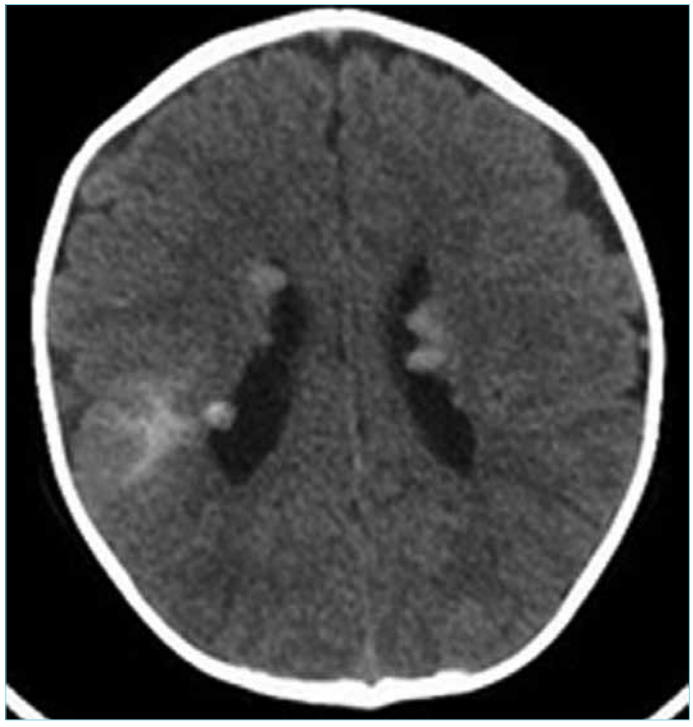

Figure 1. Brain CT scan of a case showing subependymal nodule, one of the primary characteristics of tuberous sclerosis

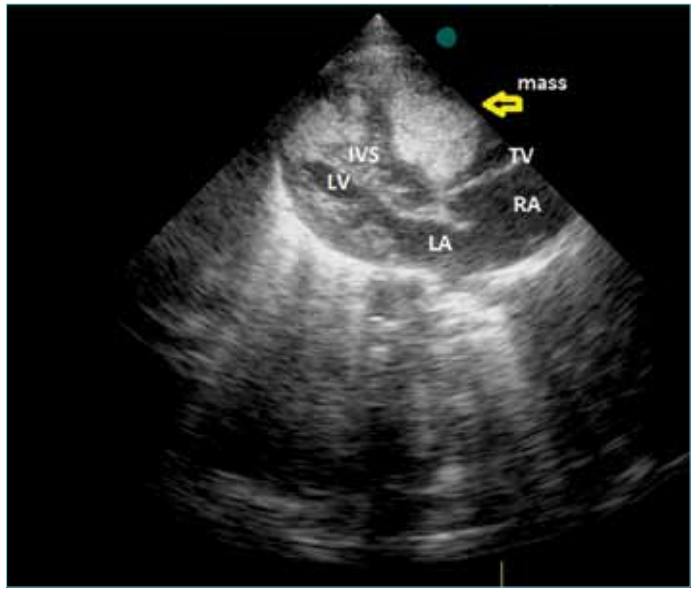

Figure 2. Echocardiographic image of case number 5

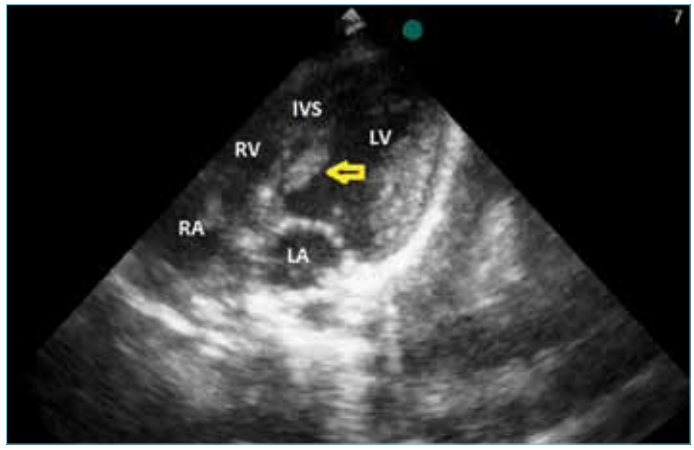

Figure 3. Echocardiographic image of case number 1

Figure 4. Echocardiographic image of case number 6

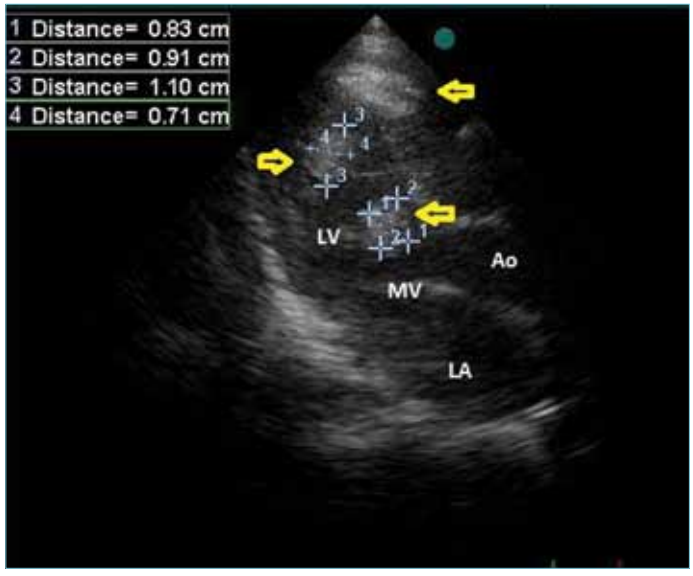

Figure 5. Echocardiographic image of case number 8

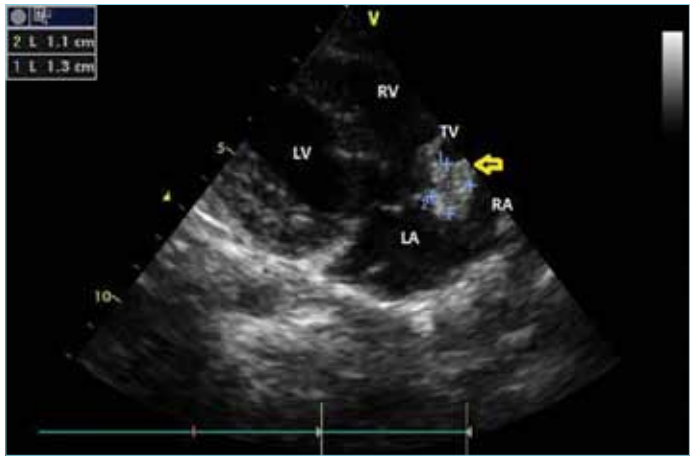

Figure 6. Echocardiographic image of case number 9

tricular size and systolic functions were normal in all cases. Holter monitoring showed a ventricular tachycardia attack (Figure 7) in the case (case 5) with mild obstruction in the right ventricular outlet (systolic pressure gradient 28 mmHg). The patient was started on beta blocker (propranolol, 3 mg/kg/day) therapy for arrhythmia. In 24-months follow-up, the mass reduced in size from 31x18mm to 15.6x9.4mm. Repeat Holter monitoring showed no ventricular tachycardia attacks, and the medical treatment of this asymptomatic case was discontinued. The tumours of the three cases were surgically excised as congestive heart failure developed. A 10 year-old tuberous sclerosis case with a rhabdomyoma located in the midseptal region of the left ventricle, additionally had an angiomyolipoma, approximately 20x10mm in size in the left kidney.

Statistical analysis

Frequencies, percentages and mean ± standard deviation values are given as descriptive statistics. SPSS for Windows version 11.5 software program was used for statistical analysis.

DISCUSSION

Rhabdomyomas are the most common benign cardiac tumours of the childhood (4, 7). Tuberous sclerosis complex is commonly associated with rhabdomyomas (9, 10). Rhabdomyomas observed in majority of the cases with tuberous sclerosis, are multiple, regular contoured, noncapsulated white or grey coloured benign intracavitary or intramural tumours that can be located in any part of the heart. The ventricles are involved in most cases. Histologically, it consists of large cells with glycogen-rich vacuoles. The size of the tumour varies between 1 mm and 10 cm. They generally originate from the left heart; left ventricle and interventricular septum (11-15). Atrial rhabdomyomas have also been reported, as seen in one of our cases (16). Spontaneous regression is among the important characteristics of rhabdomyomas.

Before transthoracic echocardiography was introduced for use, rhabdomyomas were generally diagnosed in autopsies. TTE has an important place in the diagnosis and follow-up of rhabdomyomas (17). Rhabdomyoma diagnosis can be made by foetal TTE in the prenatal period (5-7, 18). The frequency of rhabdomyomas in adult tuberous sclerosis cases decreasing to 20% also supports spontaneous regression (13, 14). After infancy, approximately more than 50% of the rhabdomyomas show a decrease in mass (17, 19-22). Spontaneous regression was observed in 4 (33.3%) of our cases. The prognosis is excellent in asymptomatic rhabdomyomas. Therefore, if life-threatening hemodynamic disturbances do not develop, regular clinical follow-up is recommended as is most of our cases.

Foetal echocardiography has an important place in the diagnosis of cases in the risk group in the prenatal period, and in the follow-up of the sizes and number of tumours in cases diagnosed. The evaluation of these cases with regards to tuberous sclerosis after birth leads to early diagnosis (9, 18, 21). In our case series, tuberous sclerosis was not identified in the postnatal examinations of the rhabdomyoma case diagnosed in the prenatal period.

Rhabdomyomas may lead to sudden cardiac death, or arrhythmias including ventricular tachycardia, supraventricular tachycardia and preexcitation syndrome, via compression of the cardiac conduction system. If these tumours lead to important clinical problems, surgical excision is recommended as the prognosis is bad (16, 17, 23-25). Miyake et al (24) determined a frequency of 6% for ventricular tachycardia and 10% for preexcitation syndrome in 106 rhabdo-

Table 1. Echocardiographic Findings of the rhabdomyomas

Case	Gender	Age	Echocardiographic findings	Duration of follow-up	Change in the size of the mass
Case 1	Male	4 years	A 11x4 mm mass in the LV, at the 1/3 superior aspect of the IVS (Figure 1)	2 years	Mass increased in size by 3x1 mm to 14x5 mm.
Case 2	Male	13 years	A 16x6 mm mass in the midventricular septum in the LV	2.5 years	Mass decreased in size to 11.5x3.5 mm.
Case 3	Male	6.5 years	A low density 35x31 mm mass adjacent to the posterior wall of the LV, 3 masses in the LV, the smallest being 5x5 mm (Figure 1)	6 months	Mass was surgically excised.
Case 4	Male	3 month	A 26x22 mm mass in the LV adjacent to the septum.	1 month	Mass was surgically excised
Case 5	Male	1 year	A large, regular contoured lobulated mass 31x18 mm in size, filling 2/3 of the RV cavity and leading to obstruction in the RVOT.	2 years	Mass 15.6x9.4 mm regressed in size.
Case 6	Female	1 year	An apical regular contoured homogenous mass, 22x20 mm in size attached to the free wall of the RV.	7 months	No changes in the size of the mass
Case 7	Male	1 year	A 14x12 mm apical mass in the LV, two masses 12x13 mm in size adjacent to the LVOT.	6.5 months	No changes in the size of the mass
Case 8	Male	7 months	A 11x7 mm apical mass in the LV, two masses 9x8 mm in size, adjacent to the mitral valve.	13 months	Apical mass was reduced to 4.5x 3.4 mm.
Case 9	Male	9 years	A hyperechogenic, regular contoured 13x11 mm mass adjacent to the anterior leaflet of the tricuspid valve in the RA.	8 months	No changes in the size of the mass
Case 10	Female	1 years	Nine regular contoured masses with homogenous density, mostly located in the apex of the RV, the largest being 13x7 mm.	9 months	The three small masses disappeared, the largest mass was reduced in size to 8x3 mm
Case 11	Male	10 years	Hyperechogenic image 12x5 mm in size in the midventricular septum.	2.5 years	No changes in the size of the mass
Case 12	Female	32 years	Foetal cardiac rhabdomyoma (Two masses leading to a reduction of LV and RV cavities, Grade 2 MF, mild aortic stenosis.	10 days	Mass was surgically excised

LV: left ventricle, LVOT: left ventricular outlet, MF: mitral failure, RV: right ventricle, RVOT: right ventricular outlet, IVS: interventricular septum

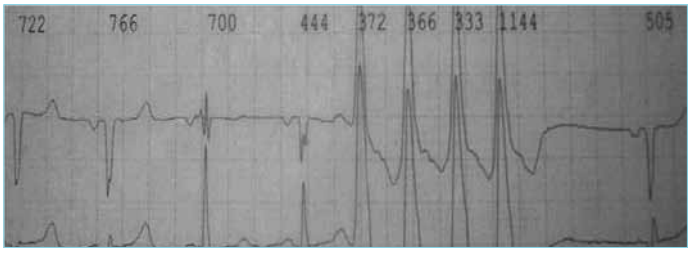

Figure 7. Short term ventricular tachycardia attack in the Holter ECG of case number 5

myoma cases. Di Liang et al (17) reported a mortality rate of 78% in symptomatic cases below one years of age. In our case series, ventricular extra-systoles and short term ventricular tachycardia attack due to compression of the cardiac conduction system was observed in a case with a tumour filling 2/3 of the right ventricular cavity. Arrhythmia was taken under control with medical treatment and regression of the tumour in time.

Rhabdomyomas may be surgically removed when they cause cardiac failure, obstruction and hemodynamic disturbances (26, 27). The tumours of the three cases were surgically excised as they caused congestive heart failure. In the post-operative follow-up, symptoms of congestive heart failure disappeared.

CONCLUSION

By multidisciplinary approach, we suggest that TTE, ECG and Holter monitoring have an important place in the follow-up and management of cardiac rhabdomyoma cases and complications in the follow-up period can be treated with appropriate and timely medical and surgical approaches.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Gaziantep University Clinical Research Ethics Committee.

Informed Consent: Written informed consent was obtained from patients' parents who participated in this study.

Peer-review: Externally peer-reviewed.

Authors' contributions: Conceived and designed the experiments or case: Aİ, OB, MK, MK. Performed the experiments or case: Aİ, DAŞ. Analyzed the data: OB, MK, KY. Wrote the paper: Aİ, SI. All authors have read and approved the final manuscript.

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