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Prenatal diagnosis of cardiac rhabdomyoma associated with tuberous sclerosis: report of 3 cases

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Abstract

Cardiac rhabdomyoma is the most common cardiac tumor in fetal life, accounting for 60–86% of primary fetal cardiac tumors. It is primarily benign, originating form myocardial muscles and consisting of immature myocytes. About 50–60% of these tumors are associated with tuberous sclerosis. In this report, we present the clinical course and discuss the importance of prenatal diagnosis of cardiac tumors and their follow-up after birth.

CASE REPORT

INTRODUCTION

Cardiac rhabdomyomas are the most common cardiac tumors in childhood (Allan *et al.* 2000). They are benign tumors from the muscle of myocardium, but they can be life-threatening, because of heart chamber obstruction by their infiltrative growth (Freedom *et al.* 2000; Thomas-de-Montpréville *et al.* 2007). Most of the cases of cardiac rhabdomyomas are asymptomatic, but they can cause arrhythmias, murmurs and sudden cardiac death (Freedom *et al.* 2000). They are very often associated with tuberous sclerosis (Thomas-de-Montpréville *et al.* 2007). The diagnosis of rhabdomyoma is made by two-dimensional echocardiography and magnetic resonance imaging. Most patients with primary cardiac tumors are diagnosed by fetal echocardiography performed during the perinatal period. In postnatal life cardiac rhabdomyoma can be detected through the symptoms including arrhythmia, murmur, respiratory distress, and cyanosis. Most of the rhabdomyomas have tendency for spontaneous regression (Black *et al.* 1998; Piazza *et al.* 2004; Thomas-de-Montpréville *et al.* 2007).

CLINICAL REPORTS

We performed a retrospective review of the medical records of three children diagnosed with primary cardiac tumors, who have been followed at our centre during 5 years (Table 1). The diagnosis

Tab. 1. Clinical presentation.

Case number	Age	Sex	Time of diagnosis	Symptoms	Tuberous sclerosis	Regression of rhabdomyoma
1	9 years	F	prenatal	epilepsy	+	+
2	8 months	M	prenatal	epilepsy	+	+
3	5 months	M	prenatal	WPW syndrome	+	+

of rhabdomyoma was made by two-dimensional echocardiography and tuberous sclerosis by magnetic resonance imaging.

First child was a 9-year-old girl, in whom rhabdomyoma was diagnosed in fetal life by ultrasound (Figure 1). After birth, echocardiography and magnetic resonance imaging showed association of rhabdomyoma with tuberous sclerosis (Figures 2 and 3). She had mental retardation and epilepsy resistent to treatment. Because of progressive neurological deterioration a frontal lobectomy was done. After operation, the neurological status stabilized. In this case spontaneous regression of rhabdomyoma was confirmed by follow-up echocardiography.

Second child was an 8-month-old boy, in whom rhabdomyoma was also diagnosed during fetal period by ultrasound investigation. After birth, he had epilepsy as well and magnetic resonance imaging showed association of cardiac rhabdomyoma with tuberous sclerosis. Tuberous sclerosis was confirmed by MLPA analysis detecting a mutation of TSC1 gene. Follow-up echocardiography confirmed spontaneous regression of this tumor.

Third child was a 5-month-old boy, in whom rhabdomyoma was diagnosed by prenatal ultrasound. The diagnosis of concomitant tuberous sclerosis in this child was established by magnetic resonance of the brain after episode of seizures and confirmed by MLPA analysis of TSC2 gene. In this case, a diagnosis of Wolf-Parkinson-White syndrome was established by electrocardiography. Rhabdomyoma disappeared by spontaneous regression.

Localization of rhabdomyoma was in the left ventricle, especially in the interventricular septum, in all three cases. None of these patients had any complications such as arrhythmia, thromboembolism or ventricular dysfunction during the follow-up.

DISCUSSION

Cardiac tumors are very rare in childhood. Incidence of pediatric cardiac tumors is about 0.17% (Etuwewe *et al.* 2009). Most of them are benign, only 10 % are malignant (Uzun *et al.* 2007).

Rhabdomyoma is the most common cardiac tumor in children. The tumor is benign, arising from myocardial muscles, but can be life-threatening because of its infiltrative growth throughout the heart chambers (Allan *et al.* 2000; Thomas-de-Montpréville *et al.* 2007). Most of the cases are associated with autosomal dominant neurocutaneus syndrome called tuberous sclerosis (Takehiro *et al.* 2000). Cardiac rhabdomyoma is often asymptomatic, but it can be accompanied by symptoms such as murmurs, arrhythmias, respiratory distress and cyanosis. The affected conductive system of the heart and intracardiac blood flow obstruction are mainly responsible for the occurrence of these symptoms (Piazza *et al.* 2004; Thomas-de-Montpréville *et al.* 2007). Moreover, epilepsy and mental retardation in early childhood as symptoms of tuberous sclerosis, can

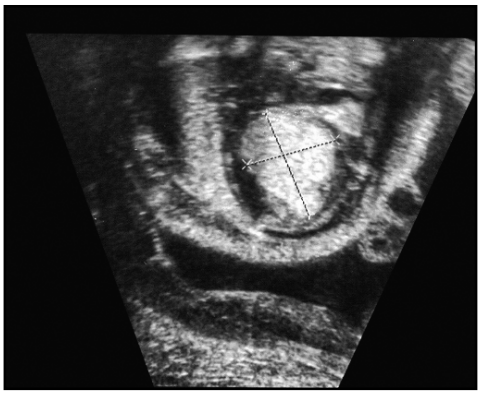

Fig. 1. Fetal echocardiography showing the rhabdomyoma in the interventricular septum.

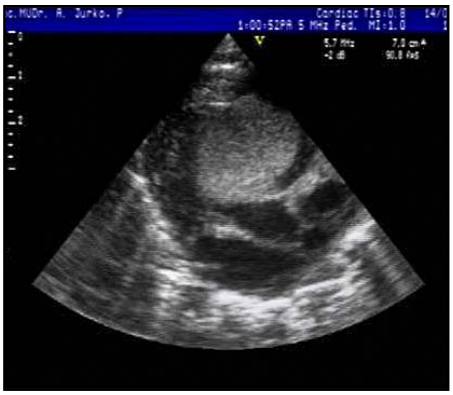

Fig. 2. Echocardiography after birth confirming rhabdomyoma.

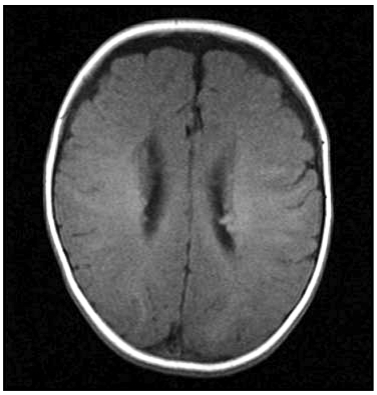

Fig. 3. Magnetic resonance imaging showing tuberous sclerosis (typical calcified subependymal nodules).

also be a warning for the presence of cardiac rhabdomyoma (Takehiro *et al.* 2000).

It has been reported in the literature, that more than half of the cardiac rhabdomyomas are diagnosed during prenatal period (Thomas-de-Montpréville *et al.* 2007). Rhabdomyomas in all our cases were diagnosed by prenatal ultrasonography. They were localizated in the left ventricle without causing ventricular dysfunction.

In two cases a mutation of TSC1 or TSC2 genes was confirmed, which is the cause of tuberous sclerosis. In the third child, this mutation was not detected, but magnetic resonance imaging showed degeneration of brain tissue typical for tuberous sclerosis. None of our patients had positive family history for this neurocutaneus syndrome. Infants with tuberous sclerosis are at risk of epilepsy or mental retardation (Takehiro *et al.* 2000). In our study, two children had epilepsy and one of these children had mental retardation as well. Cardiac rhabdomyoma usually has a tendency for spontaneous regression (Black *et al.* 1998). In the follow-up echocardiographic studies, we observed partial spontaneous regression of rhabdomyoma in all three our patients. The most dangerous feature of cardiac rhabdomyoma is the fact, that it can cause malignant arrhytmias leading to sudden cardiac death. Miyake *et al.* reported, that about 16% of primary cardiac rhabdomyomas cause significant arrhythmias (Miyake *et al.* 2011). In our three cases, none of the children had malignant arrhythmia, but in one child, Wolff-Parkinson-White syndrome was diagnosed by electrocardiography.

The diagnosis of rhabdomyoma is made by two-dimensional echocardiography and magnetic resonance imaging. Chest radiography is helpful to show cardiomegaly and electrocardiography is important for detection of arrhythmias (Allan *et al.* 2000).

Echocardiography should be performed systematically in all children with rhabdomyoma and tuberous sclerosis and is also recommended for members of their families. Histological proof of the diagnosis of rhabdomyoma is not necessary in the presence of characteristic echocardiographic findings

In this study, none of our patients experienced any complications such as arrhythmia, thromboembolism or ventricular dysfunction during follow-up.

CONCLUSION

Cardiac rhabdomyoma is a rare tumor, which is usually possible to diagnose by ultrasonography during prenatal period. In our study, all three rhabdomyomas were detected in prenatal life and they were all associated with tuberous sclerosis. From the diagnostic standpoint, it seems reasonable, that after confirmed diagnosis of cardiac rhabdomyoma it is necessary to do magnetic resonance imaging of brain to exclude tuberous sclerosis and conversely, after confirmed diagnosis of tuberous sclerosis it is necessary to do echocardiography to exclude cardiac rhabdomyoma.

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