Cardiology in the Young

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Asymptomatic cardiac tumour with premature ventricular contraction in an athlete: case report

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Brief Report

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Abstract

Cardiac fibromas are the second most common benign primary tumour of the heart in the children; the clinical features include chest pain, arrhythmia, low cardiac output due to outflow tract obstruction, and sudden cardiac death. Sports are associated with an increased risk for sudden death in athletes who are affected by cardiovascular conditions predisposing to life-threatening arrhythmias. We present a case report of 10-year-old asymptomatic boy who was referred to the paediatric cardiology department by his general practitioner for cardiac examination before participation in competitive sports. The electrocardiogram showed premature ventricular contractions originated from inferior of left ventricle. A mass was detected by 2D transthoracic echocardiography, and it was found to be compatible with fibroma on MRI. In some cases, cardiac tumours are asymptomatic as in our patient. Electrocardiogram abnormalities require detailed cardiac imaging with echocardiogram, and if necessary CT/MRI. In this article, we emphasise that detailed cardiac examination of individuals before participating in competitive sports is vital.

Cardiac fibromas are the second most common benign primary tumour of the heart following rhabdomyoma in the children.[1] However, a number of patients with cardiac fibroma are asymptomatic[1]; the clinical features depend on the size and location and include chest pain, arrhythmia, low cardiac output due to outflow tract obstruction, and sudden cardiac death.[1,2] Furthermore, it is known that sports are associated with an increased risk for sudden death in athletes who are affected by cardiovascular conditions predisposing to life-threatening arrhythmias.[3] We report an asymptomatic 10-year-old boy diagnosed with left ventricular fibroma, who was admitted to our clinic for cardiac examination for competitive sports.

Case report

A 10-year-old boy was referred to the paediatric cardiology department by his general practitioner for cardiac examination before participation in competitive sports. He was asymptomatic. There was no family history of syncope, cardiac arrest, sudden death, or cardiomyopathy. He was found to have extrasystoles with auscultation. There was no murmur and no thrill. No other abnormal physical examination findings were detected. His systemic blood pressure was 100/70 mmHg. X-ray radiography showed no cardiomegaly; pulmonary vascularity was normal. The electrocardiogram showed premature ventricular contractions originated from inferior of ventricle with deep S waves in the inferior leads DII, DIII, aVF (Fig 1). Complete blood count, blood urea, electrolytes, and thyroid functions were normal. Detailed two-dimensional transthoracic echocardiography examination demonstrated a 20 mm × 30 mm sized mass at the left ventricle apex myocardium (Fig 2a). The mass was immobile, invaded into myocardial tissue. It was observed that it protrudes slightly into the left ventricle. There was no valve involvement and wall motion defect. Systolic functions of left ventricle were normal. After that, three-dimensional transthoracic echocardiography was performed and confirmed that egg-shaped mass measuring 2.3 by 2.8 cm along the apical portion of lateral wall (Fig 2b). It was thought that premature ventricular contraction might be related to this apical located mass. To determine its features, cardiac MRI was performed. MRI showed a 31 × 29 × 28 mm sized tumour compatible with fibroma, located in the myocardium of left ventricle apex extending to lateral wall (Fig 3). Tumour was demonstrated low signal intensity on T1 and T2 sequences, late contrast enhancement was detected. On rhythm holter, the monitored premature ventricular contractions were 30% of total heart beat and 112 couplet premature ventricular contractions were seen at 166 bpm. There was no ventricular tachycardia detected on rhythm holter. In the exercise

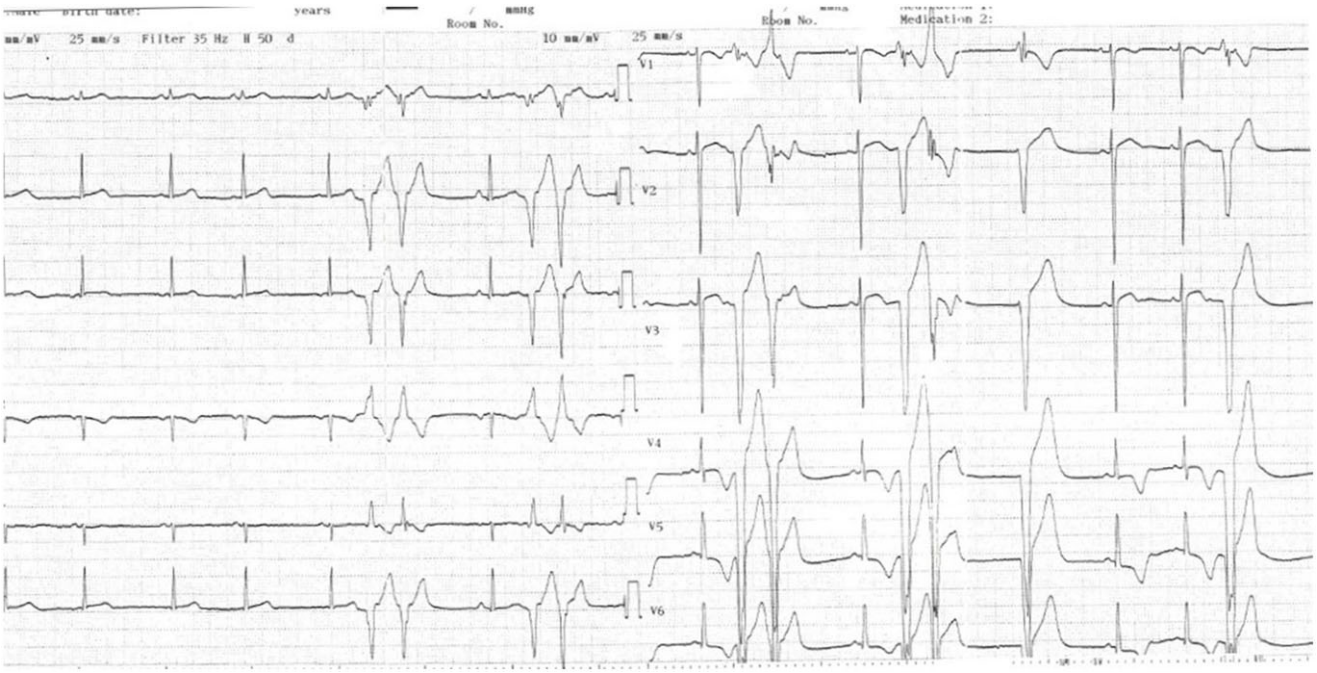

Figure 1. The electrocardiogram showed couplet premature ventricular contractions originated from inferior of ventricle.

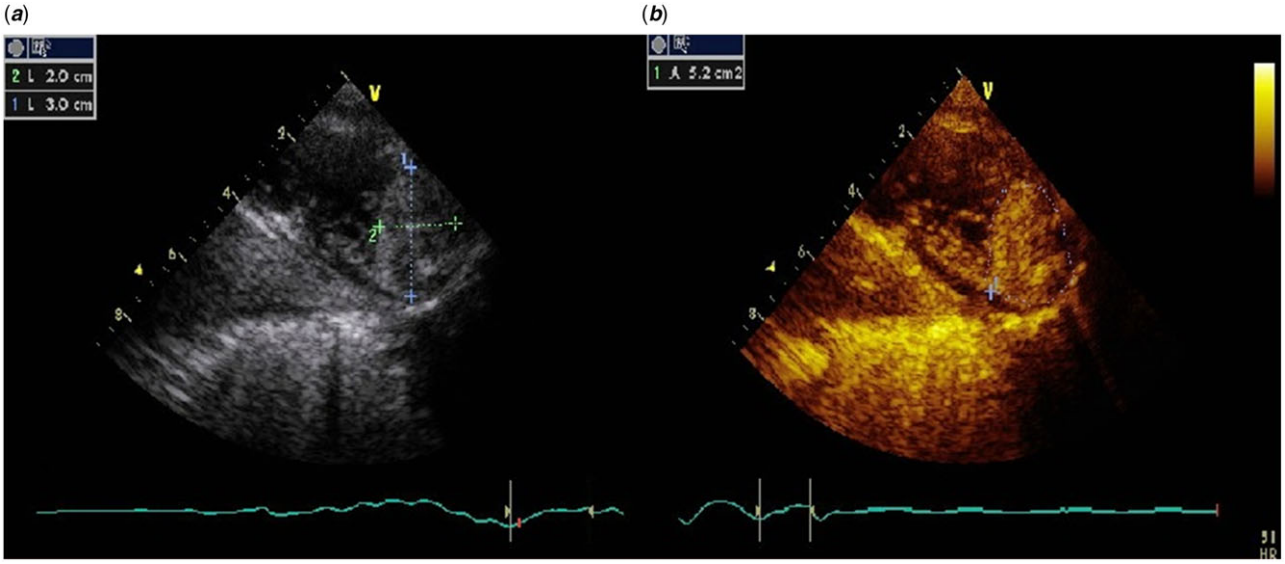

Figure 2. (***a***) 2D transthoracic echocardiographic examination demonstrated a 20 mm × 30 mm sized mass at the left ventricle apex myocardium. (***b***) Three-dimensional transthoracic echocardiography demonstrated that egg-shaped mass measuring 2.3 by 2.8 cm along the apical portion of lateral wall.

test, premature ventricular contractions were observed at above 160 beats/min. Because of frequent premature ventricular contractions seen in rhythm holter and detecting premature ventricular contraction at high heart rates, antiarrhythmic therapy was initiated. We were monitoring the patient by medical treatment with flecainide and propranolol. Flecainide was initiated 100 mg/m^2/day, propranolol was initiated 1 mg/kg/day, gradually increased to 2 mg/kg/day. Rare PVCs, not exceeding 5% of total beat, were detected in the rhythm holter performed after the medical treatment was started; couplet PVCs and ventricular tachycardia were not observed. The patient was recommended effort restriction and his arrhythmia is under control with medical treatment for following 2 years.

Discussion

Sports are associated with an increased risk for sudden death in athletes who are affected by cardiovascular conditions predisposing to life-threatening ventricular arrhythmia during exercise. Cardiac screening with non-invasive examinations is a very important tool for identification of possible pathology and for the characterisation of electrical instability. Rhythm and conduction

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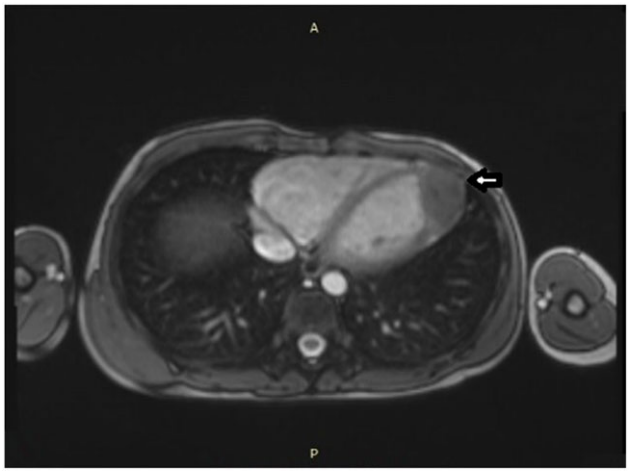

Figure 3. MRI demonstrated a 31 × 29 × 28 mm sized tumour located in the myocardium of left ventricle apex extending to lateral wall.

abnormalities are the first cardiovascular causes of sports disqualification.[3] Cardiac tumours are a rare cause of arrhythmias in clinical practice.[2]

The most common origins of PVC are the ventricular outflow tracts.[4] However, on cardiac screening for competitive sports, inferior originated PVC was detected in our patient. Like these atypical originated PVCs when detected, it should be kept in mind that there may be a structural anomaly like mass. In such cases, examination with echocardiography will be helpful in recognising structural anomalies and if necessary, advanced investigation methods such as CT or MRI can be used. Our patient's, who was detected mass with echocardiography, MRI results gave findings in favour to fibroma.

Primary cardiac tumours are rare. 75% of cardiac tumours are benign and have a reported incidence of 0.03–0.32%[5] Cardiac fibromas found in one quarter of cases, amongst tumours identified at postmortem in hearts of children between 1 and 15 years[6] Cardiac fibromas are the second most common benign cardiac tumours in the children[5] which arise from heart fibroblasts.[7] These tumours are mostly located in the left ventricular free wall or interventricular septum and less frequently in the right ventricle or atrial free wall.[8] In our patient, it appeared as a mass extending to the lateral wall of the left ventricle, which is the most common localisation for fibromas. Clinical symptoms and signs of the tumour are chest pain, cardiomegaly, arrhythmias, and even sudden mortality. In some cases, cardiac tumours are asymptomatic as in our patient. Due to the non-specific nature of symptoms, many are diagnosed following an echocardiographic finding,[1] as in the case presented.

Cardiac tumours are associated with wide variety of arrhythmias depending on the tumour type and the location of involvement. The arrhythmias resulting from cardiac tumours include atrial ectopics, atrial flutter, atrial fibrillation, Wolff–Parkinson–White syndrome, ventricular ectopics, ventricular tachycardia, torsades de pointes, atrioventricular blocks, and sudden death. The mechanism can be re-entry or triggered automaticity. In fibroma, clinically significant arrhythmias are more common than in any other cardiac tumours. Some form of cardiac arrhythmia is present in 64% of cases. Very frequent monomorphic PVCs and couplet PVCs were observed in our patient as well. Ventricular tachycardia and sudden death may occur in up to 30% of patients with cardiac fibroma.[9]

Two-dimensional transthoracic echocardiography provides information in terms of mass localisation and size. Two-dimensional transthoracic echocardiography may underestimate the size of cardiac masses; the accurate size is possible only if a plane chances to encompass the complete long axis of the mass, but that may not occur especially the mass is mobile. With 3D echocardiography, the whole extent of mass is contained in the data and that would provide more reliable measurements.[10] However, in our patient, there is no significant difference between two-dimensional transthoracic echocardiography and three-dimensional transthoracic echocardiography measurements. This may be due to immobility of the mass. In literature, 3D transoesophageal echocardiography was utilised to define the morphologic and spatial characteristics of cardiac and paracardial tumours in vivo, establish their relationships with adjacent structures, and assess the haemodynamic effects.[11]

Using advanced imaging techniques such as CT and MRI helps to determine the characteristics of the cardiac mass. Cardiac CT often demonstrates partial calcifications in fibromas.[12] We preferred MRI for further examination in our patient because of superior tissue contrast, versatility in image planes[11] , and radiation free. MRI is an important imaging technique in the evaluation of cardiac tumours. T1-weighted, T2-weighted, and gadolinium-enhanced sequences are used for anatomic definition and tissue characterisation. Because of their fibrous nature, the tumours are usually homogeneous and hypointense on T2-weighted MR and generally isointense or hypointense on T1-weighted images. Appearances after administration of gadolinium contrast material can demonstrate heterogeneous enhancement.[13] MRI findings of our patient were compatible with fibroma.

Different management strategies are suggested in the literature including surgical resection, single ventricle palliation, cardiac transplant, and conservative treatment with antiarrhythmic medications.[5] Cases showing the efficacy of amiodarone and/or beta-blockers in cardiac fibroma-associated arrhythmias have been reported in the literature.[5,14,15] Our presentation is original because it is a publication showing the efficacy of flecainide and beta-blocker in cardiac fibroma-associated PVCs. In cardiac tumours, the mechanism can be re-entry or triggered automaticity. Abnormal automaticity is thought to play a role in cases of elevated extracellular potassium, low intracellular pH, and catecholamine excess.[16] Flecainide blocks fast inwards sodium channels and slowly unbinds during diastole, prolonging the refractory period of the heart. Flecainide also prevents delayed rectifier potassium channels from opening, lengthening the action potential through ventricular and atrial muscle fibres.[17] Therefore, we started to our patient flecainide and beta-blocker combination treatment to minimise the risk of arrhythmia and symptoms. Our patient's tumour was not amenable to resection due to its extensive invasion of myocardial tissue. To avoid cardiac surgery complications, it was decided to follow up in our patient because the fibroma that invaded the left ventricular apicolateral myocardial tissue was asymptomatic, life-threatening ventricular tachycardia was not observed, and PVCs were controlled with antiarrhythmic therapy. And his arrhythmia is under control with medical treatment for 2 years.

Conclusion

In conclusion, applications before participation in sports should be carefully evaluated. Electrocardiogram assessment of all individuals should be done. Electrocardiogram can provide important

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clues for serious diseases. The patients with arrhythmia on electrocardiogram require further examination with echocardiography. In our patient, the diagnosis of cardiac mass was made by echocardiography. Evaluations by CT or MRI provide the identification, location, and surrounding structures of the tumour. Step-by-step cardiac examination and if necessary imaging are vital for diagnosing patient before participation in sports. Sports are essential for health, but sudden deaths are known to occur during sports. Detailed examinations are necessary for professional sports. In this case, the importance of detailed cardiac examination with electrocardiogram and imaging techniques in asymptomatic individuals before participating in sports was emphasised.

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Conflicts of interest. None.

Ethical standards. Informed consent was obtained from the patient's family for publication of this case report and any accompanying images.

References

1. Cordinhã C. Asymptomatic cardiac tumor in a child: an incidental diagnosis. Rev Port Cardiol 2011; 30: 795–797. DOI: 10.1016/S2174-2049(11)70028-9.
2. Shenthar J. Clinical presentations, diagnosis, and management of arrhythmias associated with cardiac tumors. J Arrhythmia 2018; 34: 384–393. DOI: 10.1002/joa3.12030.
3. Steriotis AK. Noninvasive cardiac screening in young athletes with ventricular arrhythmias. AmJ Cardiol 2013; 111: 557–562. DOI: 10.1016/j.amjcard.2012.10.044.
4. Oomen A, Dekker LRC, Meijer A. Catheter ablation of symptomatic idiopathic ventricular arrhythmias: A five-year single-centre experience. Neth Heart J 2018; 26: 210–216.
5. Rajput FA, Bishop MA, Limaiem F. CardiacFibroma. StatPearls. Treasure Island (FL): StatPearls Publishing, 2021.
6. Bédard E, Becker AE, Gatzoulis MA. CHAPTER 51 - CardiacTumours. In: Robert H. Anderson, Edward J. Baker, Daniel J. Penny, Andrew N. Redington, Michael L. Rigby (eds). GilWernovsky, GemmaPrice, PaediatricCardiology (Third Edition), Churchill Livingstone, 2010, 1055–1065. https://doi.org/10.1016/B978-0-7020-3064-2.00054-0.
7. Zheng XJ. Left ventricle primary cardiac fibroma in an adult: a case report. Oncol Lett 2018; 16: 5463–5465. DOI: 10.3892/ol.
8. Maleszewski JJ, Burke A. Cardiac tumors: overview and pathology, In: Clinical Cardio-Oncology. Elsevier Inc., 2016: 61–75.
9. Shentar J. Clinical presentations, diagnosis, and management of arrhythmias associated with cardiac tumors. J Arrhythmia 2018; 34: 384–393. DOI: 10.1002/joa3.12030.
10. Asch FM, Biegansky SP, Panza JA, Weissman NJ. Real-time 3-dimensional echocardiography evaluation of intracardiac masses. Echocardiography 2006; 23: 218–224. DOI: 10.1111/j.1540-8175.2006.00196.x.
11. Zavaleta NE, Morales GH, Vargas-Barro J, Keirns C, Fraustro AA. Three-dimensional transesophageal echocardiography in tumors of the heart. J Am Soc Echocardiogr 2002; 15: 972–979. DOI: 10.1067/mje.2002.121535.
12. Yılmaz R, Demir AA, Önur İ, Yılbazbayhan D, Dursun M. Cardiac calcified amorphous tumors: CT and MRI findings. Diagn Interv Radiol 2016; 22: 519–524. DOI: 10.5152/dir.2016.16075.
13. Sparrow PJ, Kurian JB, Jones TR, Sivananthan MU. MR imaging of cardiac tumors. RadioGraphics 2005; 25: 1255–1276. DOI: 10.1148/rg.255045721.
14. Miyake CY, Del Nido PJ, Alexander ME, et al. Cardiac tumors and associated arrhythmias in pediatric patients, with observations on surgical therapy for ventricular tachycardia. J Am Coll Cardiol 2011; 58: 1903–1909. DOI: 10.1016/j.jacc.2011.08.005.
15. Jones JP, Ramcharan T, Chaudhari M, et al. Ventricular fibromas in children, arrhythmia risk and outcomes: a multicentre study. Heart Rhythm 2018; 15: 1507–1512. DOI: 10.1016/j.hrthm.2018.06.018.
16. Gaztanaga L, Marchlinski FE, Betensky BP. Mechanisms of cardiac arrhythmias. Rev Esp Cardiol 2012; 65: 174–185. DOI: 10.1016/j.recesp.2011.09.018.
17. Andrikopoulos GK, Pastromas S, Tzeis S. Flecainide: current status and perspectives in arrhythmia management. World J Cardiol 2015; 7: 76–85. DOI: 10.4330/wjc.v7.i2.76.

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