

A 34-year-old man with non-obstructive apical hypertrophic cardiomyopathy (RCD code: III-2A.1)

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Abstract

Hypertrophic cardiomyopathy (HCM) is a primary disease of the myocardium that is defined by the presence of regional (more frequent) or global myocardial hypertrophy, which usually results in functional cardiac impairment. We present a case of a 34-year-old man with apical HCM who was admitted to the cardiology department due to cardiac hypertrophy in the echocardiogram. The management of HCM patients is directed at heart failure treatment and decreasing left ventricular outflow tract or intraventricular gradient, if present. According to the patient's calculated 5-year mortality risk, assessed using the HCM Risk-SCD Calculator, indications for implantation of an implantable cardioverter defibrillator were evaluated. JRC D 2017; 3 (5): 180–183

Key words: myocardial thickening, echocardiography, magnetic resonance imaging, electrocardiogram, rare disease

Background

Hypertrophic cardiomyopathy (HCM) is a primary disease of the myocardium that is defined by the presence of regional (more frequent) or global myocardial hypertrophy, which usually results in functional cardiac impairment. The prevalence of HCM is about 0.2% to 0.5% in the general population and affects equally men and women [2,3,4,5]. In the majority of patients of Caucasian descent, hypertrophy is local and usually confined to the basal septum. On the other hand, the morphology of cardiac hypertrophy can be variable. Although hypertrophy of apical segments is rare in Europe, it is more common in patients of east Asian descent [1]. The primary causes of this disease are hereditary or newly-created mutations of genes encoding contractile proteins of cardiac sarcomeres. These comprise over 90% of HCM cases [6]. At present there are over 600 identified mutations responsible for the disease, predominantly single-point missense mutations in the genes coding for beta-myosin heavy chain, myosin binding protein C, cardiac troponin T and tropomyosin [7]. HCM is a disease characterized by unexplained, asymmetric left ventricular (LV) hypertrophy, defined as a maximal wall thickness of

≥15 mm, without any dilatation in the absence of another disease capable of inducing wall thickening [8].

HCM is divided into obstructive and non-obstructive types, based on the blockage of blood flow out of the LV, which results in a substantial increase of the LV outflow tract (LVOT) gradient by more than 30 mm Hg [9]. LVOT obstruction is present in two-thirds of HCM patients – one-third with a resting gradient and one-third with an exercise-induced gradient [10]. In both types of HCM the thickened muscle reduces the volume of the LV, leading to diastolic heart failure. The clinical course of HCM is variable, progressing to non-specific cardiac symptoms such as: dyspnoea, exertional chest pain, palpitations, arrhythmias, fatigue, and syncope [11]. However, occasionally the disease can be asymptomatic – manifesting for the first time as sudden cardiac death (SCD). The annual rate of SCD is lower than 1%, but within the general population of HCM patients, there are subgroups with a much higher incidence [12].

Case presentation

We report a case of a 34-year old man with HCM who was referred to the Department of Cardiac and Vascular Diseases in

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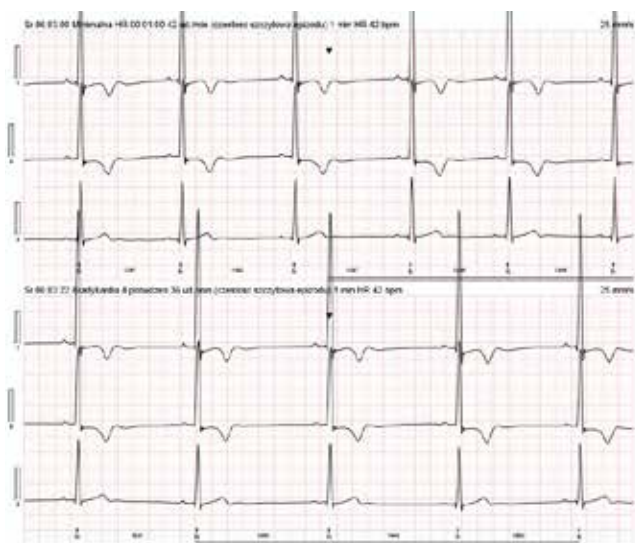


Figure 1. Holter ECG monitoring

John Paul II Hospital for further diagnostic evaluation and establishment of treatment. Because of abnormalities in the electrocardiogram (ECG) during employee health screening at work, he was hospitalised. There, he was diagnosed with HCM due to LV wall thickness, found on transthoracic echocardiogram (TEE). Cardiovascular risk factors were present in the medical history, such as stressful job (school director), unhealthy habits (cigarette smoking – 5-pack-years), and drinking two beers each day. Besides this, he was physically active, exercising at least three times per week, and his family history was unremarkable. His medical history was negative for chronic illnesses or surgical/medical interventions. On the day of admission the patient did not present any specific symptoms and physical examination was unremarkable – regular heart rate (HR) of about 80 bpm, blood pressure 140/80 mm Hg.

Basic biochemical parameters were as follows: blood morphology – within normal limits (WNL), electrolytes – WNL, elevated transaminases (Aspat – 46 U/L [N <40] Alat – 96 U/L [N <41]), elevated lipids (total cholesterol – 7.17 mmol/l [N 3.0–5.0], LDL cholesterol – 5.28 mmol/l [N <3.0], HDL cholesterol – 1.98 mmol/l [N >1.0]), and elevated glucose level (5.7 mmol/l [N 3.9–5.5]). Kidney function tests and C-reactive protein level were WNL. The 12-lead ECG revealed sinus rhythm 90/min, undetermined heart axis, duration of PR segment – 160 ms, duration of QRS complex – 80 ms. T-wave inversion in leads I, II, III, aVL, aVF and V2–V6. The 24-hour Holter-ECG registered sinus rhythm with maximal HR 110 bpm, minimal HR 42 bpm and average HR 61 bpm. There were 9 episodes of sinus bradycardia with minimal HR 36 bpm, 13 ventricular extrasystoles, and 3 supra-ventricular arrhythmias. The circadian twenty-four-hour cycle was present (Figure 1).

TTE showed abnormal thickness of the LV posterior wall (PW) and intraventricular septum (IVS) – diastolic diameter measured in the parasternal long axis view of PW was 19 mm and of IVS was 25 mm. The LV hypertrophy was especially noticeable at the apical lateral segment (maximal thickness – 18 mm), apical anterior segment, and apex (Figure 2). LV ejection fraction was 68% and there were no abnormalities in LV systolic and diastolic function. LVOT

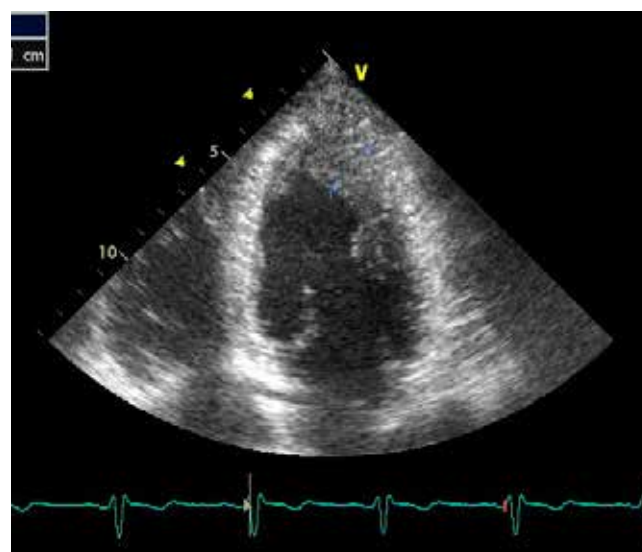


Figure 2. Transthoracic echocardiography. Hypertrophy of the left ventricular apex

obstruction was not observed (aortic velocity – 1.43 m/s, aortic valve gradient – 8 mmHg). The heart valves were unremarkable and pulmonary hypertension was absent (PASP – 35 mmHg).

In the cardiopulmonary exercise test, the patient demonstrated normal tolerance of physical activity (peak load – 13.1 METs) with a peak oxygen consumption of 40.5 ml/kg/min (107% of referenced values for age and gender). VE/VCO₂ ratio was 25.4. Anaerobic threshold was reached at an oxygen consumption level of 27.2 ml/kg/min (72% of maximal predicted value). During the exercise test, ST-depression of 2 mm in leads V4 – V5 was seen. No arrhythmia was observed.

Magnetic resonance imaging with contrast was performed with the following results: Left ventricular parameters: EF – 72%, end diastolic volume – 163 ml, end systolic volume – 45 ml, mass – 234g. Dimensions of all heart chambers were WNL. The hypertrophy of apical segments of all LV walls was present (Figures 3 and 4): IVS thickness – 25 mm, anterior wall thickness – 27 mm, lateral wall thickness – 17 mm, inferior wall thickness – 19 mm. T1-timing was WNL. Contrast administration revealed late gadolinium enhancement of the apex and apical segments of LV walls (Figure 5).

Review of literature

Based on the diagnostic criteria of HCM (asymmetric LV wall thickness of ≥ 15 mm in the absence of another cause), apical HCM (asymmetric apical hypertrophy with maximal apical wall thickness of ≥ 15 mm), and obstruction of LVOT (gradient ≥ 30 mm Hg), our patient was diagnosed with non-obstructive apical HCM (AHCM) [13]. AHCM are classified according to the absence or presence of IVS hypertrophy, as pure or mixed AHCM [13]. In pure AHCM there is isolated asymmetric apical hypertrophy, while in mixed AHCM it co-exists with IVS hypertrophy [13].

The mean age of presentation of AHCM is 41.4 ± 14.5 years and is mostly seen in males [13]. Because AHCM is commonly spo-

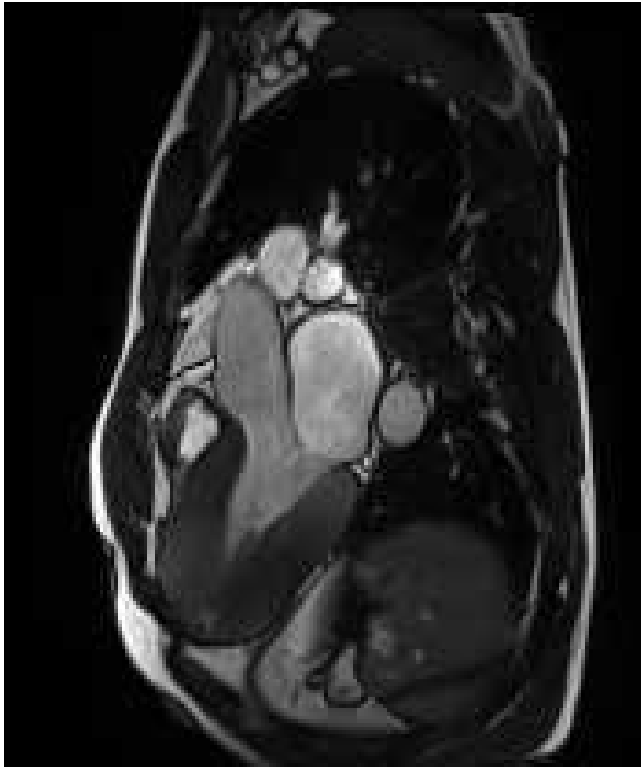


Figure 3. Magnetic resonance imaging. Hypertrophy of the apex



Figure 4. Magnetic resonance imaging. Hypertrophy of the apical parts of all left ventricular walls

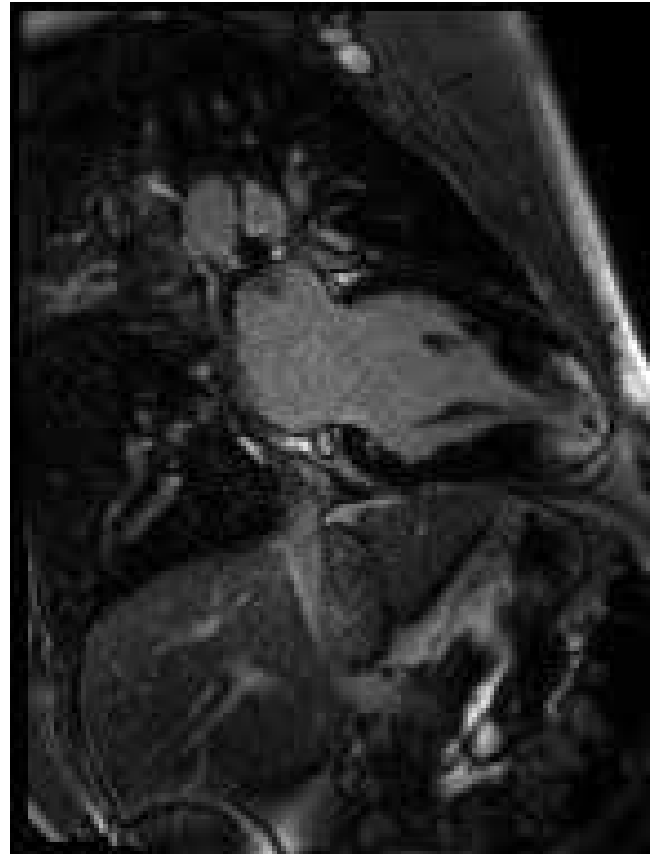


Figure 5. Magnetic resonance imaging with contrast agents. Late gadolinium enhancement of the apex and apical segments of left ventricular walls

radic and our patient had no family history of heart diseases, genetic tests were not performed for further assessment of AHCM aetiology [14]. However, there have been reports of several families with an autosomal dominant inheritance of the E101K mutation in the alpha-cardiac actin gene [14]. Our patient was asymptomatic and physical examination was unremarkable. About half of AHCM patients are asymptomatic, while the other half report some form of chest pain [10]. T-wave inversions are the most frequent ECG abnormalities in AHCM patients and they are usually present in the precordial leads [13].

Patient management

The prognosis of AHCM is relatively good, unlike in other types of HCM, with a cardiovascular mortality of 1.9% after a follow-up of 13.6 ± 8.3 years [13]. In symptomatic patients, verapamil, beta-blockers, and antiarrhythmic agents are usually used [13]. Taking into consideration an annual mortality rate of up to 1%, our patient's lack of symptoms, normal tolerance of physical activity, and no abnormalities in LV systolic function, appropriate treatment was introduced [15]. During hospitalisation, the patient was receiving a beta-blocker (bisoprolol) and statin (atorvastatin). However, due to presence of bradycardia in the Holter-ECG, the beta-blocker dose was decreased. Recommendations for im-

plantation of an implantable cardioverter defibrillator (ICD) suggest performing the procedure only in HCM patients with a high risk for 5-year mortality [16]. Because our patient's calculated risk for 5-year mortality, assessed using the new HCM Risk-SCD Calculator, was 2.3%, there was no indication for implantation of an ICD [16]. However, analysing indications for ICD implantation according to an earlier approach suggests that the treatment should be considered as primary prophylaxis due to presence of syncope in the medical history [11]. We have recently reported significant discrepancies between the "old" SCD risk assessment and the "new" approach using the HCM-SCD calculator [17].

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