

Spike wave behind the QRS complex – how a little epsilon wave leads to non-compaction cardiomyopathy diagnosis

Kolec za zespołem QRS – jak mała fala epsilon doprowadziła do rozpoznania kardiomiopatii z niescalenia mięśnia sercowego

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ABSTRACT

The paper presents a case of a 26-year old patient, who admitted to allergology department for qualifications to specific immunotherapy.

Electrocardiogram (ECG) examination revealed spike waves behind the QRS complex in lead V1. Echocardiography examination showed characteristics of ventricular non-compaction cardiomyopathy. Diagnosis was confirmed by magnetic resonance imaging in the Cardiology Clinic.

Keywords: epsilon wave, non-compaction cardiomyopathy, ECG examination, echocardiography

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Introduction

Non-compaction cardiomyopathy is listed as an unclassified cardiomyopathy according to the European Society of Cardiology [1]. The disease is also referred to as spongiform cardiomyopathy. In most cases, the lesions are believed to involve the left ventricle. However, according to some authors, up to 50% of cases may present with right ventricular myocardial involvement [2]. A typical feature of myocardial non-compaction is excessive myocardial trabeculation. Layers of non-compacted and compacted left ventricular myocardium form a two-layered structure. Deep recesses exist between the trabeculae of the non-compacted myocardium into which blood penetrates [3]. Although the disease is genetic, its specific gene has not

been identified. It can be both familial and sporadic. Inheritance patterns vary, with autosomal dominant inheritance being the most common [4].

Spongiform cardiomyopathy can be asymptomatic for a very long time and detected in old age during the diagnosis of heart failure [5]. It is often detected in screening tests or incidentally – during echocardiography performed as part of the diagnosis of chest pain, syncope or palpitations. The clinical picture of spongiform cardiomyopathy presents with a triad of symptoms: signs of heart failure, arrhythmia and peripheral embolism [6]. The electrocardiogram (ECG) does not show signs typical of this disease entity. Some patients have a normal ECG. The most common abnormalities include signs of left ventricular hypertrophy, conduction abnormalities in the form of branch

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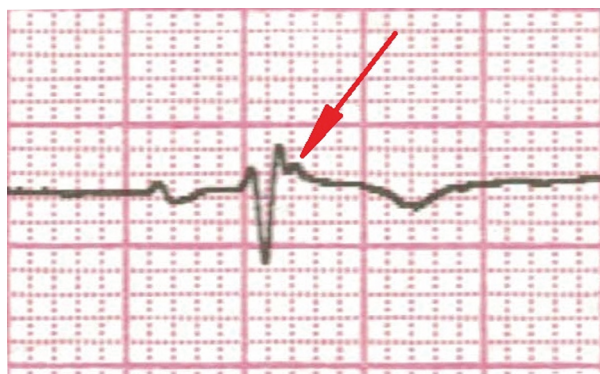


Figure 1. ECG on admission: just after the QRS complex in V1 lead – spike wave – small epsilon wave

blocks (most commonly left bundle branch block) or atrioventricular blocks, repolarisation abnormalities, arrhythmias, including atrial fibrillation or, less commonly, signs of WPWS [7, 8].

Transthoracic echocardiography plays a vital role in the diagnosis. The picture characteristically reveals a bilayered myocardium consisting of a non-compacted and compacted layer, with a ratio of the non-compacted to the compacted layer of more than 2:1. The lesions are primarily located in the left ventricular apex and progress to the middle segments. They may also involve the free wall of the right ventricle. Left ventricular enlargement and systolic and diastolic dysfunction are often found [9]. An magnetic resonance imaging (MRI) is performed where there is diagnostic doubt, especially when differentiation with hypertrophic cardiomyopathy and arrhythmogenic right ventricular cardiomyopathy is needed.

Case report

A 26-year-old man with no previous history of cardiovascular treatment, without an underlying family history of cardiovascular disease and having smoked cigarettes for ten years, was admitted to the Allergology Department for qualification for specific immunotherapy following an episode of generalised anaphylactic reaction to a bee sting. Physical examination on admission revealed no abnormalities. No abnormalities were found in the laboratory tests performed. Chest radiography findings revealed normal lung and heart images. Abdominal ultrasound showed signs of Grade 1 fatty liver.

Routine ECG showed normal cardiac axis, normal sinus rhythm with a heart rate of 54/min, incomplete right bundle branch block, abnormal Q wave in III, J point deviation

of 2 mm above isoelectric line with concave ST segment elevation in V2 and V3, QTc = 344 ms (Bazett correction).

Attention was drawn to a spike wave occurring just behind the QRS complex in the V1 lead, which was interpreted as a small epsilon wave (Figure 1). Accordingly, the patient underwent an echocardiogram, which showed an unenlarged left heart cavity, borderline right atrial dimension, and enlarged longitudinal dimension of the right ventricle (85.7 mm). In the vicinity of the intermediate bundle of the right ventricle, the structure of the free wall is abnormal – the wall is slightly convex, with increased trabeculation in this area (Figure 2A), normal systolic function of the right ventricular longitudinal fibres (TAPSE 23 mm). Abnormal left ventricular myocardial structure in the apical region was found – increased trabeculation with deep recesses (Figure 2B), left ventricular ejection fraction normal (60%), Grade 2 left ventricular diastolic dysfunction (pseudonormal mitral inflow pattern; Septal E/E': 10.2). Due to suspected non-compacted myocardium involving both ventricles, the patient was transferred to the 1st Department of Cardiology at the Swietokrzyskie Cardiology Centre on the same day to confirm the diagnosis. The MRI performed confirmed the diagnosis.

Discussion

The epsilon wave is a high-frequency narrowing located on the descending arm of the R wave or at the beginning of the ST segment just behind the QRS complex, usually recorded in the right ventricular leads of a standard ECG [10]. Its presence reflects delayed activation of the right ventricle. It was first described in patients with arrhythmogenic right ventricular cardiomyopathy. It is also observed in infarction of the lateral wall and right ventricle, sometimes in right ventricular hypertrophy, infiltrative disease and sarcoidosis [11]. In the discussed case, its presence was the main indication for an echocardiogram. The examination revealed abnormalities primarily affecting the left ventricle, but attention was also drawn to abnormalities affecting the right ventricle.

Electrocardiogram findings were more suggestive of arrhythmogenic right ventricular cardiomyopathy, while echocardiography was more suggestive of spongiform cardiomyopathy. An MRI scan is indicated in such cases to confirm the diagnosis.

The patient is currently asymptomatic and will require cardiac follow-up at least once every two years, with echocardiographic assessment and Holter ECG monitoring to exclude clinically silent arrhythmias [12].

It all started with a bee sting, and then a "spike" was found, which led to a diagnosis...

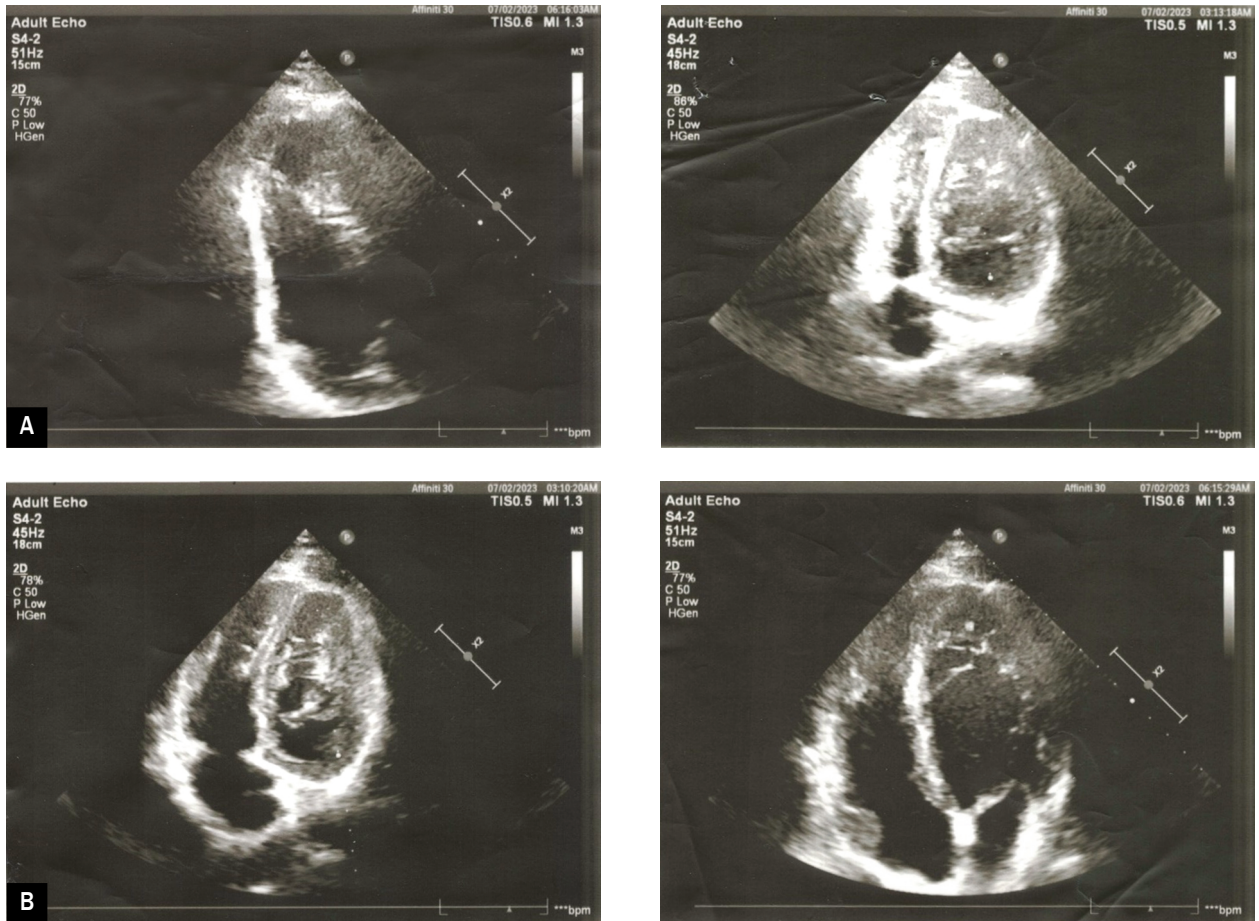


Figure 2. Echocardiography: **A.** Excessive trabeculation in the vicinity of the intermediate bundle of the right ventricle, increased longitudinal dimension of the right ventricle; **B.** Increased trabeculation with the presence of deep recesses in the region of the left ventricle apex; several false tendons

Article information and declarations

Ethics statement

None.

Author contributions

None.

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Conflict of interest

None declared.

Supplementary material

None.

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Streszczenie

W pracy przedstawiono przypadek bezobjawowego 26-letniego pacjenta, który został przyjęty na oddział alergologiczny w celu kwalifikacji do immunoterapii swoistej. W rutynowo wykonanym badaniu EKG stwierdzono obecność fali epsilon w odprowadzeniu V1. W związku z tym przeprowadzono badanie echokardiograficzne, na podstawie którego wysnuto podejrzenie kardiomiopatii z niescalenia mięśnia sercowego. Pacjenta skierowano do Kliniki Kardiologii w Świętokrzyskim Centrum Kardiologii w celu weryfikacji rozpoznania.

Słowa kluczowe: fala epsilon, kardiomiopatia z niescalenia mięśnia sercowego, badanie EKG, echokardiografia

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