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Case Report

Diastolic murmur in mid-ventricular obstructive hypertrophic cardiomyopathy: A case report

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ABSTRACT

A diastolic murmur is informative in the diagnosis of valvular heart disease, such as mitral stenosis and aortic regurgitation. Patients with hypertrophic cardiomyopathy (HCM) could have diastolic murmurs, although this is not widely recognized. We describe an illustrative case of HCM which was found to have a diastolic murmur associated with mid-left ventricular obstruction. An asymptomatic 65-year-old male was referred because of an abnormal electrocardiogram. Cardiac auscultation showed a soft fourth heart sound, a systolic ejection murmur, and a third heart sound followed by a diastolic murmur at the apex. On phonocardiography, the mid-diastolic murmur was predominantly low-pitched with an onset of about 200 ms after the second heart sound and a duration of approximately 150 ms. The timing of the diastolic murmur was consistent with an increased blood inflow during diastole in the mid-ventricular obstruction (2.0 m/s), which was produced by narrowing between the hypertrophied ventricular septum and the protrusion of the anterior papillary muscle.

<**Learning objective:** A diastolic murmur is common in valvular heart diseases, such as mitral stenosis and aortic regurgitation, and can also be heard in hypertrophic cardiomyopathy although not widely recognized. We report an illustrative case of hypertrophic cardiomyopathy with a diastolic murmur related to mid-left ventricular obstruction, findings that would highlight the importance of auscultation regarding not only the differential diagnosis but also risk stratification, given the possible association of diastolic murmurs with adverse outcomes, even in the era of advanced imaging techniques.>

Introduction

A diastolic murmur is characteristic of valvular heart diseases, such as mitral stenosis and aortic regurgitation, and is valuable in the differential diagnosis [1,2]. Diastolic murmurs can also be heard in patients with hypertrophic cardiomyopathy (HCM) [3–7], although this is not widely recognized. Herein, we report an illustrative case with HCM, in whom a diastolic murmur was detected in association with mid-ventricular obstruction.

Case report

An asymptomatic 65-year-old male was referred to Matsushita Memorial Hospital because of an abnormal electrocardiogram. The patient had a history of dyslipidemia, hyperuricemia, and no family history of heart disease or premature sudden death. On examination, the blood pressure was 136/82 mmHg and the pulse was 75 beats per minute. Cardiac auscultation showed a soft fourth heart sound (S4), a systolic ejection murmur, and a third heart sound (S3). Of note, a diastolic murmur was clearly heard at the apex after the S3 (Data Supplement Sound). The reminder of the examination was normal. Medications included bezafibrate, allopurinol, and benzbromarone. An electrocardiogram showed normal sinus rhythm with a rate of 60 beats per minute, left axis deviation, left ventricular hypertrophy, and abnormal Q waves in leads V_3 and V_4. A chest radiograph was unremarkable, as was

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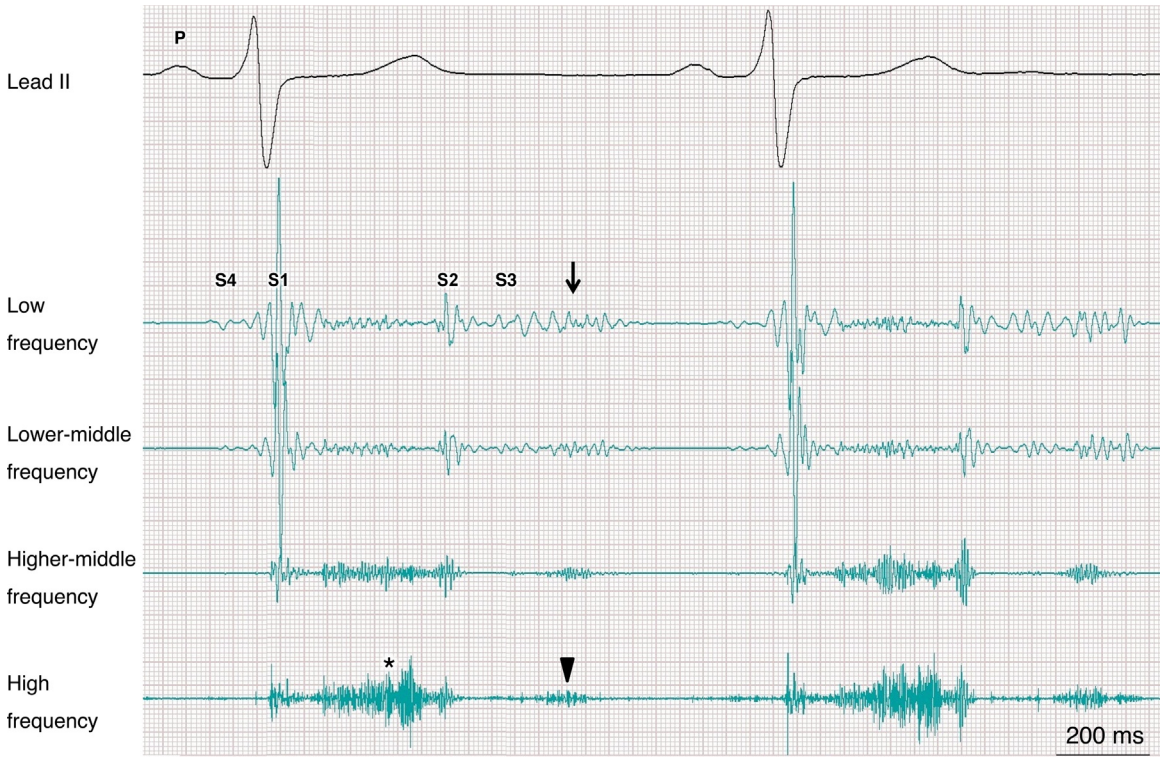

Fig. 1. Phonocardiography. A phonocardiogram obtained at the apex shows a fourth heart sound (S4) before the first heart sound (S1). A crescendo, mid-to-late systolic murmur is present (asterisk) predominantly in the high frequency and disappears before the second heart sound (S2). Note a diastolic murmur after the third heart sound (S3) in the low frequency (arrow). The middle part of the diastolic murmur has high-frequency components (arrowhead).

routine blood examination. The level of brain natriuretic peptide was 235.3 pg/ml.

A phonocardiogram, obtained at the apex in the left lateral decubitus position at a paper speed of 100 mm/s using a commercially available device (MES-1000, Fukuda-Denshi Co., Tokyo, Japan) [8,9], showed a small S4 before the first heart sound (S1), a high-pitched, mid-to-late systolic crescendo murmur, and an S3 followed by a diastolic murmur (Fig. 1). The mid-diastolic murmur was predominantly low-pitched, accompanied by high-frequency components in the middle part, with an onset of about 200 ms after the second heart sound (S2) and a duration of approximately 150 ms although the precise assessment was not easy because of its overlap with S3.

Transthoracic echocardiography revealed asymmetric septal hypertrophy with mid-ventricular systolic obstruction (Fig. 2). The systolic flow velocity in the mid-portion of the left ventricle was increased to 3.4 m/s, with no deterioration under the Valsalva maneuver. The mid-ventricular flow was also as high as 2.0 m/s even during diastole, findings consistent with the timing of the diastolic murmur as assessed by a simple phonocardiograph equipped in the echocardiograph. The mid-ventricular obstruction was likely to be produced by narrowing between the hypertrophied ventricular septum and the protrusion of the anterior papillary muscle. The apical wall motion was preserved without any thrombus, and a diastolic paradoxic jet flow from the apex toward the base of the left ventricle [10] was not detected. The transmitral E and A wave velocities as assessed by pulsed Doppler were 0.62 m/s and 0.47 m/s, respectively. Neither left ventricular outflow tract obstruction nor systolic anterior motion of the anterior mitral valve leaflet was found. Findings suggesting valvular heart disease, e.g. mitral stenosis or aortic regurgitation, and congenital heart disease, e.g. atrial septal defect or ventricular septal defect, were not detected. A diagnosis of mid-ventricular obstructive HCM was made.

Beta blocker, carvedilol, was administered to reduce the mid-ventricle obstruction and to prevent it from worsening in daily activities, although the patient had been asymptomatic and exercise stress echocardiography showed no deterioration in the mid-ventricular flow velocity. The mid-to-late systolic crescendo murmur has decreased, along with disappearance of the mid-diastolic murmur, after initiation of beta blocker therapy. The patient has been doing well without any cardiac events for more than 2 years.

Discussion

A mid-diastolic murmur is characteristic of mitral stenosis and tricuspid stenosis, although the latter is rare [1,2]. Diastolic murmurs can also be heard in the setting of severe mitral regurgitation (i.e. Carey-Coombs murmur) [11] or severe aortic regurgitation (i.e. Austin Flint murmur) [12]. These conditions, however, appear to be ruled out in our case, since there were no suggestive findings on echocardiography. Other causes associated with mid-diastolic murmurs include atrial myxoma, calcified vegetation, atrial or ventricular septal defect, and mitral valve replacement [1], none of which was seen in the present case. It is intuitive that the diastolic murmur in our case was associated with mid-ventricular obstruction during diastole, given the fact that the diastolic murmur coincided with an accelerated inflow in the mid-left ventricle regarding the timing.

Auscultation in HCM patients with left ventricular outflow obstruction is characterized by the presence of S4 and systolic ejection murmurs, less frequently accompanied by S3 [13], as seen in our case. It is also important to note that a diastolic murmur is not uncommon among HCM patients – the incidence varies from 2% to 15% [3–5,7]. The features of mid-diastolic murmurs related to HCM have been reported to be predominantly low-pitched and heard best or exclusively at the apex [5–7], findings consistent

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