

CASE REPORT

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The Violin Heart

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Abstract: Left ventricular false tendons are thin, fibromuscular structures which traverse the left ventricular cavity. They are thought to be intracavitary radiations of the bundle of His. Usually these tendons span between the interventricular septum and the lateral wall or a papillary muscle. They have been known to be a source of innocent and musical murmurs.

In this case report a peculiar left ventricular false tendon is shown—one extending between the two papillary muscles, giving the appearance of a musical note. During ventricular diastole the tendon is pulled taut between the two heads of the papillary muscles and during ventricular systole the tendon relaxes. The echocardiographic characteristics and possible long term implications are discussed.

Keywords: false tendon, papillary muscle

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Introduction

Left ventricular myocardial bands—also called false tendons—are anomalous fibromuscular structures which traverse the left ventricular cavity.¹ They originate in the interventricular septum and stretch across the left ventricular cavity, implanting in either the lateral wall or a papillary muscle.²

They may be associated with cardiac pathology or they may be an isolated finding.²

Echocardiographically these structures may mimic pathologic structures, such as intraventricular chorda rupture, vegetation or thrombus.³

These tendons may be a cause of murmurs—a musical murmur has been described when they are pulled taut by ventricular dilatation.⁴ A substudy from the Framingham Heart Study have confirmed the association of false tendons with innocent, precordial murmurs, but they were not associated with a risk of mortality.⁵

In this case report a peculiar left ventricular false tendon is shown—the tendon extends between the two papillary muscles, giving the papillary muscle-tendon complex the appearance of a musical note. During the cardiac cycle the tendon is continuously being pulled taut and relaxed during ventricular diastole and systole respectively, thus leading to the echocardiographical impression of the playing of a musical cord, thus the term the “violin heart”.

Case Report

A 23-year old, healthy Caucasian male was referred for an echocardiogram by his primary care physician who suspected the presence of a prolapsing mitral valve, based on his auscultation of a midsystolic click.

The patient never had any previous medical or surgical problems and he was completely asymptomatic. The midsystolic click was heard during an examination done during a bout of flu.

During the clinical examination of the patient the midsystolic click was not audible. No clinical abnormalities were detected and the electrocardiogram was normal.

Echocardiography revealed a peculiar left ventricular false tendon which was clearly visible on the parasternal, short-axis view between the two papillary



Figure 1. Parasternal, short-axis view during diastole.

Note: This is the parasternal, short-axis view during ventricular diastole. The ventricle is filled, thus pulling the tendon taut between the two papillary muscles. Note the appearance of the papillary muscle-tendon complex, resembling a musical note. The tendon is marked with +.

muscles (see Fig. 1- the tendon is marked with +). Also note the clear relaxation of tension on the tendon during left ventricular contraction (see Fig. 2- the tendon is marked with +).

Supplementary Figure 1 is a movie clip which clearly demonstrates the continuous and rhythmic cycle of the tendon being pulled taut and relaxing during ventricular diastole and systole respectively. Supplementary Figure 2 is a movie clip which clearly demonstrates a structurally normal mitral valve.



Figure 2. Parasternal, short-axis view during systole.

Note: This is the parasternal, short-axis view during ventricular systole. The ventricle is contracted, thus reducing the internal diameter and reducing the tension on the tendon as a result. During ventricular filling, the tendon will suddenly be pulled taut and consequently a ping will be audible.



Discussion

In this case report a peculiar echocardiographical entity is described—the “violin heart”. This picture is the result of a false tendon extending between the two heads of the papillary muscles.

The differential diagnosis of ventricular false tendons include the following:¹ isolated, left ventricular non-compaction, hypertrophic cardiomyopathy and levo-transposition of the great arteries.

The production of sound^{4,5} is not the only physiological action of tendons: Bhatt et al⁶ have demonstrated that patients with cardiomyopathy who have false tendons present in the left ventricular cavity have less severe mitral regurgitation. The mechanism for this reduction in functional mitral regurgitation is thought to be less severe mitral valve deformation when a false tendon is present.⁶ Long false tendons are also at risk for rupture and can then act as a nidus for infection or thrombus formation.^{1,7}

The embryologic basis of left ventricular false tendons is unknown, but may be due to the extension of the cardiac conduction system into the left ventricular cavity.^{1,8} False tendons can be associated with ventricular septal defects, a bicuspid aortic valve and coarctation of the aorta.^{1,9}

A substudy of the Framingham Heart Study⁵ have shown that these tendons are not associated with an increased mortality if no associated pathology is present and thus, the patient in this case report has a good prognosis.

Disclosure

This manuscript has been read and approved by the author. This paper is unique and is not under consideration by any other publication and has not been published elsewhere. The author and peer reviewers of this paper report no conflicts of interest. The author confirms that they have permission to reproduce any copyrighted material. Written consent was obtained from the patient or relative for publication of this study.

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