Clinical Medicine Insights: Cardiology



CASE REPORT

# Exercise Induced Non-Sustained Ventricular Tachycardia and Indication for Invasive Management

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**Abstract:** Diagnostic stress echo testing is commonly performed in patients with known or suspected cardiovascular disease. There has been considerable debate in management of exercise induced non-sustained ventricular tachycardia (NSVT). In this case report, we present our experience with a case of exercise induced NSVT, and subsequent angiographically significant left anterior descending (LAD) coronary artery lesion.

**Keywords:** tachycardia, angiography, LAD lesion

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## Introduction

Diagnostic stress echo testing is commonly performed in patients with known or suspected cardiovascular disease. The significance of an ischemic response, manifested as significant ST-segment depression, angina pectoris, wall motion abnormality, or combinations, is well established.[1] However, the diagnostic implications of exercise-induced non-sustained ventricular tachycardia (NSVT) are uncertain, especially as an isolated finding. VT can originate from left ventricle (LV).[2] Exercise-induced ventricular tachycardia has been considered to be associated with a poor prognosis although this has not been thoroughly studied.[3] There has been considerable debate in management of exercise induced NSVT. In this case report, we present our experience with a case of exercise induced NSVT, and subsequent angiographically significant left anterior descending (LAD) coronary artery lesion.

## Case Presentation

An asymptomatic 70 year old female was referred for a treadmill stress echocardiogram after an episode of paroxysmal supraventricular tachycardia with narrow QRS. She denied chest pain, dizziness, syncope, shortness of breath, or palpitation. 2 month earlier, patient had one episode of narrow QRS supraventricular arrhythmia with a rate of 150 beats/min, which happened during an emergency department visit for an allergic reaction. During that episode, the electrocardiogram (ECG) showed a normal sinus tachycardia rhythm with nonspecific ST-T changes in inferior and lateral leads. This episode lasted for about 1 min, during which patient felt nauseous, but denied chest pain, or shortness of breath. She had a history of treated hypertension. Patient used to smoke 1 pack per day for 20 years, and quit smoking 30 years ago. She had no family history of coronary artery disease.

## Office Visit

The physical examination revealed a resting BP of 120/70 mm Hg and a heart rate of 70 beats/min. On cardiovascular exam there was no murmur, gallop, or rub. Peripheral pulses were equal and symmetrical. There was no carotid bruit. Lung fields were clear, and the abdominal exam was unremarkable.

## Stress Echocardiogram

Patient was exercised to exhaustion or the development of symptoms on a treadmill using the Bruce protocols. Baseline ECG showed normal sinus rhythm, with no ST-T changes. The pre-test 12 lead ECG is shown in Figure 1. The resting echocardiogram is shown in Figure 2. During exercise, several episodes of NSVT developed (wide QRS morphology with duration of 160 ms); the longest run was during peak exercise with heart rate of 140 beats/min, and the blood pressure of 140/80 mm Hg, which lasted for 1 min (Fig. 3). The stress echocardiogram during VT episode showed left ventricular dilation (Fig. 4). Rest Echo Data: LVED (left ventricular end diastolic) volume: 69.40 ml, IVS (Inter-ventricular septum): 1.25 cm, LVIDd (left ventricular internal dimension at diastole): 3.99 cm, LVIDs (left ventricular internal dimension at systole): 2.64 cm, LVESV (left ventricular end systolic volume): 25.61, LVEF (left ventricular ejection fraction): 63.09%, SV: 43.78 ml. Exercise echo Data: LVIDd: 6.80 cm, LVED: 69.93 ml, LVIDs: 5.41 cm, LVESV: 29.35 ml, LVEF: 58.03%. The VT resolved spontaneously, and did not reappear at recovery. There has been no ST-T changes during exercise and echocardiogram part of the test. The recovery strip showed a normal sinus rhythm with a terminal heart rate of 76 beats/minute (Fig. 5). Patient had mild dyspnea during recovery. Patient was referred for an angiogram, which revealed 90% blockage on proximal LAD coronary artery (Fig. 6). A 2.5 mm × 18 mm Xience stent was inserted (Fig. 7). At 4 week follow-up visit, the patient denied any chest pain, shortness of breath, dizziness, or palpitation. At 8 week follow-up visit, the stress echo showed hyperkinetic, hyperdynamic wall motion at peak exercise. There were no ST/T segment changes or arrhythmia during exercise and recovery parts of the test. The patient consented to be enrolled in this study, and to reproduce the information and graphs.

## Discussion

Non-sustained ventricular tachycardia (NSVT) is one of the most common problems encountered in modern clinical cardiology. The term, defined as 3 or more consecutive beats arising below the atrioventricular node with a rate 120 beats/min and lasting less than 30 s.[4–6] In the study of Yang et al. Ventricular tachycardia

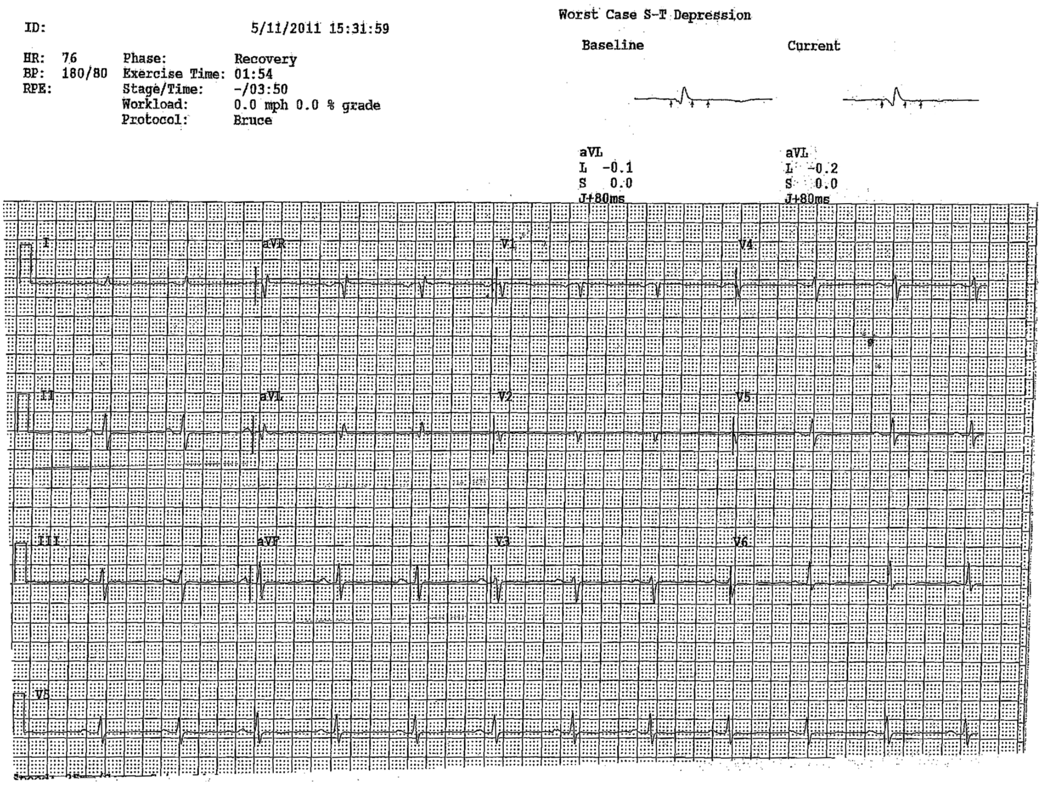


**Figure 1.** Pre-test 12 lead electrocardiogram.

during routine clinical exercise testing occurred rarely (prevalence of 1.5%) and was not associated with complications during testing. The total mortality in the exercise-induced ventricular tachycardia group (3.6%) was not significantly different from the mortality in the entire population (5.1%). Non-sustained ventricular tachycardia occurring during clinical exercise testing is not an independent marker of a poor prognosis.[7] The clinical relevance of asymptomatic exercise induced VT is a not well defined topic, and should

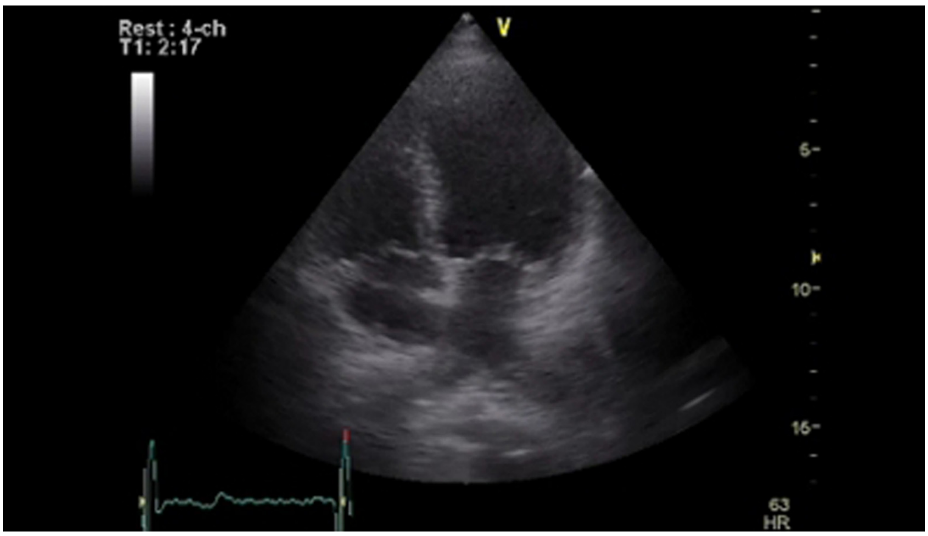


**Figure 2.** Resting echocardiogram, LVED volume: 69.40 ml, IVS: 1.25 cm, LVIDd (left ventricular internal dimension at diastole): 3.99 cm, LVIDs (left ventricular internal dimension at systole): 2.64 cm, ESV: 25.61, EF: 63.09%, SV: 43.78 ml.

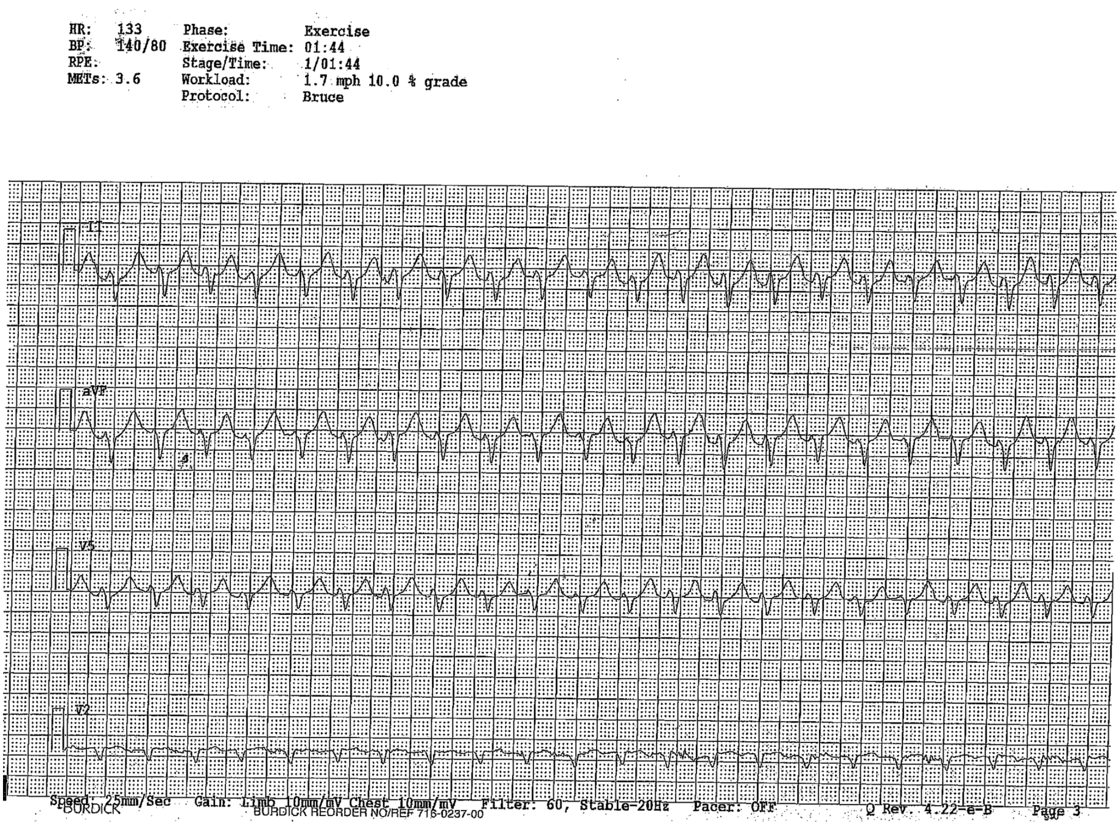


**Figure 3.** Exercise induced non-sustained ventricular tachycardia, wide QRS (duration: 160 ms).

always be considered within the particular clinical context in which the arrhythmia occurs. In the documented absence of heart disease, spontaneous NSVT does not carry any adverse prognostic significance.[8] Exercise-induced NSVT may predict increased cardiac mortality. Reports from the Analysis of the Multicenter Un-Sustained Tachycardia Trial (MUSTT) sub-studies have provided valuable information regarding the prevalence and prognostic significance of NSVT in the context of different clinical settings. It seems that not only the frequency of NSVT but the circumstances under which it occurs are important. MUSTT data have shown prognostic differences in patients with in-hospital, as opposed to out-of-hospital, identified NSVT. Overall mortality rates at two and five years of follow-up were 24% and 48%, respectively, for inpatients and 18% and 38% for outpatients (adjusted ).[9,10] In ischaemic patients with a left ventricular ejection fraction (LVEF) 40%, NSVT has an adverse prognostic significance.[11] Prior studies report variable risk associated with exercise-induced VT.[12] In the absence of structural heart disease, NSVT carries a relatively low risk for sudden cardiac death.[13] How should one proceed when an asymptomatic exercised-induced NSVT with normal systolic function is identified? The importance of this question arises from the fact that NSVT may be associated with an increased risk of SCD

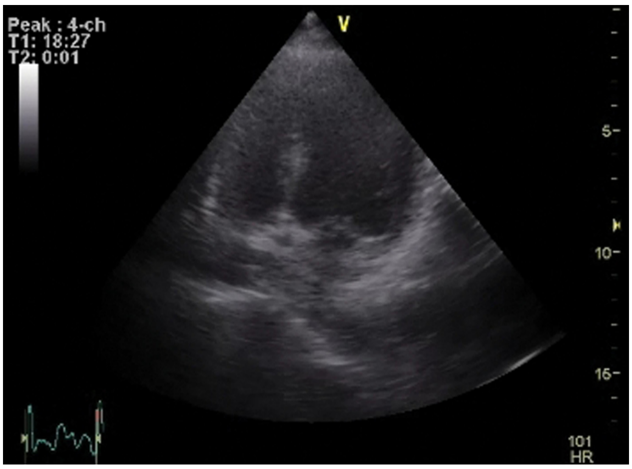


**Figure 4.** Stress echocardiogram during ventricular tachycardia, LVIDd: 6.80 cm, LVED: 69.93 ml, LVIDs: 5.41 cm, LVESV: 29.35 ml, LVEF: 58.03%.

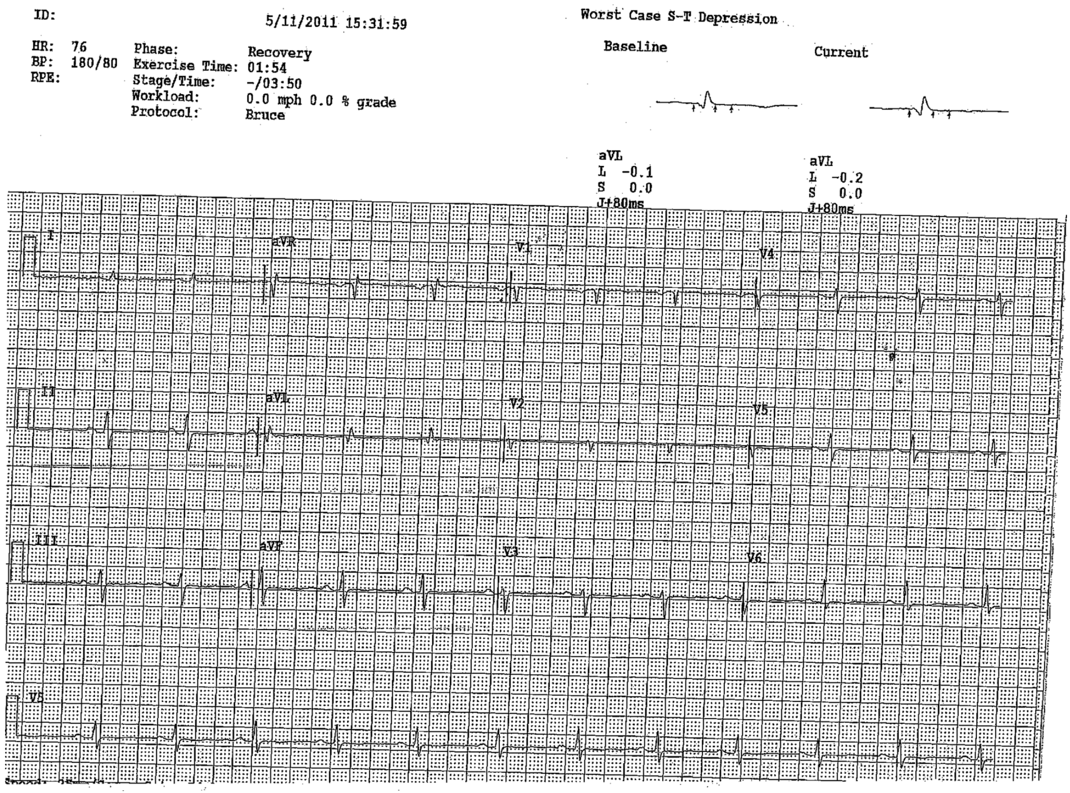


**Figure 5.** ECG strip during recovery.

(sudden cardiac death). The goal of further workup is to identify those patients at risk for SCD so that appropriate therapy can be initiated. The first objective should be to identify structural heart disease (LV dysfunction, valvular heart disease, and ventricular hypertrophy).

In the absence of structural heart disease, NSVT carries a relatively low risk of SCD.[14] NSVT in this setting is typically due to one of two things: ischemia or idiopathic VT. In the study of Fleg et al. NSVT was found in almost 1% of normal, healthy population with

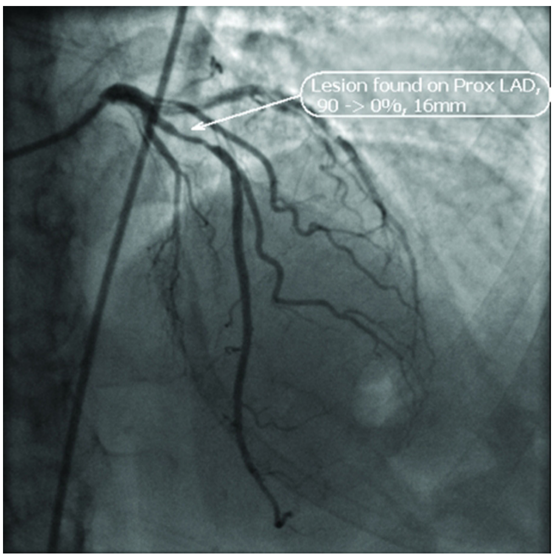


**Figure 6.** LAD coronary involvement during angiogram.

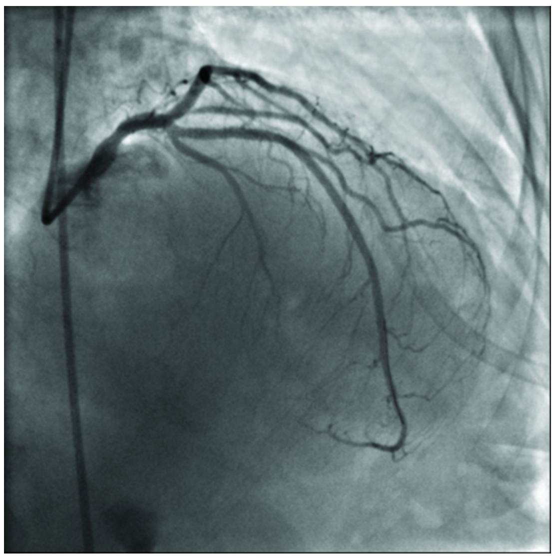

**Figure 7.** Stent placement during PCI.

no prediction of worse outcome at 2 years.[15] In patients with suspected CAD (coronary arterial disease), NSVT was associated with a slightly increased risk but was not as strong a predictor as wall motion abnormalities by echocardiography.[16] Only one study has reported on the prevalence of ventricular tachycardia during exercise, but this was unable to determine its prognostic significance.[17] This case report demonstrates aggressive management of asymptomatic NSVT developed during the stress echocardiogram.

## Conclusion

We concluded that, LV dilation in the setting of asymptomatic exercise induced NSVT should warrant further invasive investigations to reveal underlying CAD.

## Disclosures

Author(s) have provided signed confirmations to the publisher of their compliance with all applicable legal and ethical obligations in respect to declaration of conflicts of interest, funding, authorship and contributorship, and compliance with ethical requirements in respect to treatment of human and animal test subjects. If this article contains identifiable human subject(s) author(s) were required to supply signed patient consent prior to publication. Author(s) have confirmed that the published article is unique and not under consideration nor published by any other publication and that they have consent to reproduce any copyrighted material. The peer reviewers declared no conflicts of interest.

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