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CARDIO-ONCOLOGY

CASE REPORT: CLINICAL CASE

# An Unusual Case of Anthracycline-Induced Ventricular Tachycardia in Pregnancy

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## ABSTRACT

A 34-year-old woman at 18 weeks' gestation experienced shortness of breath and palpitations after receiving her first dose of doxorubicin for right-sided invasive ductal breast carcinoma. Telemetry monitoring found frequent runs of nonsustained ventricular tachycardia that was treated with metoprolol tartrate. No further arrhythmias occurred with subsequent doses of chemotherapy. (JACC Case Rep. 2024;29:102532) © 2024 The Authors. Published by Elsevier on behalf of the American College of Cardiology Foundation. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

## HISTORY OF PRESENTATION

A 34-year-old woman currently at 18 weeks' gestation presented directly from the outpatient clinic after receiving her first cycle of doxorubicin and cyclophosphamide with weakness, dyspnea, and a productive cough. On examination, the patient was in mild distress while sitting. She was tachypneic with respiration rate of 20 breaths/min with diminished lung sounds in the lower bases. Blood pressure was 144/91 mm Hg, and body temperature was normal at 97.5 °F. She was tachycardiac at 140 beats/min with a regular rhythm. No murmurs, gallops, or pitting edema was noted. A 12-lead electrocardiogram showed sinus tachycardia with QTc (Bazett) values of 368 milliseconds (**Figure 1**). Initial laboratory test results were significant for white blood cells 18.2 K/mcL, neutrophils 76.4%, sodium 134 mmol/L, potassium 3.6 mmol/L, serum creatinine 0.34 mg/dL, and magnesium 1.7 mg/dL. Troponin I was negative. All other electrolytes were within normal limits. Chest radiograph on admission showed new areas of opacification within the right greater than left lung bases. The patient was started on oxygen and ceftriaxone for presumed pneumonia. In the afternoon of the next day, she had worsening shortness of breath and palpitations. At this time, all laboratory tests were stable from the day before except for a positive troponin I of 0.074 ng/mL. Electrocardiogram on this day showed premature ventricular contractions and runs of nonsustained ventricular tachycardia (NSVT) with fusion beats (**Figure 2**).

### TAKE-HOME MESSAGES

- This case highlights that anthracycline-induced ventricular tachycardia can be medically managed with only beta blockers because this patient's arrhythmia was significantly attenuated with subsequent anthracycline doses.
- This rare adverse effect should not be considered a contraindication to continuation of anthracycline therapy.

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**ABBREVIATIONS AND ACRONYMS**

**NSVT** = nonsustained ventricular tachycardia

## PAST MEDICAL HISTORY

The patient was recently diagnosed with right-sided invasive ductal breast carcinoma with metastases to multiple bone sites and axillary lymph node and underwent her first cycle of doxorubicin and cyclophosphamide the day prior. She is currently at 18 weeks' gestation.

## DIFFERENTIAL DIAGNOSIS

Our list of initial differential diagnoses of the etiology of the patient's symptomatic NSVT includes chemotherapy-induced cardiotoxicity, ischemic heart disease, and peripartum cardiomyopathy.

## INVESTIGATIONS

Echocardiogram showed normal left ventricular ejection fraction of 58.6% with no evidence of structural heart disease. Telemetry monitoring showed further runs of NSVT for the next few hours (Figure 3). Given the patient's gestational status, poor prognosis, and normal echocardiogram findings, cardiac angiogram and other cardiac testing were deferred.

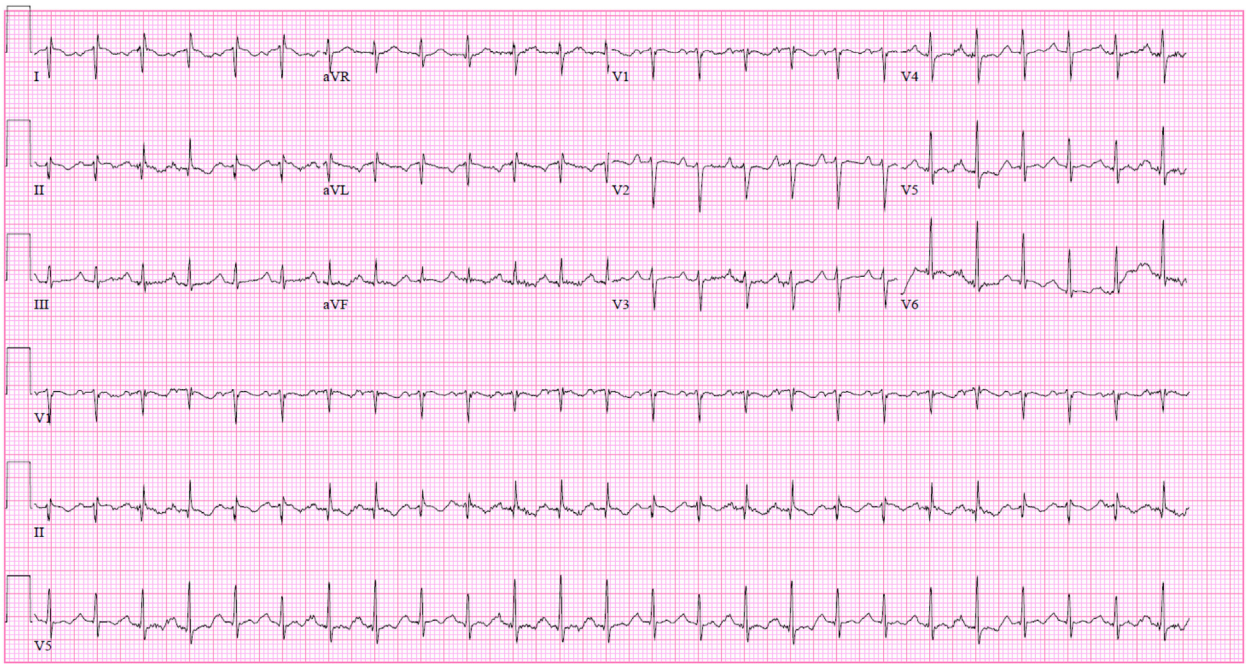
## MANAGEMENT

Although the patient had frequent runs of NSVT, there was no sustained ventricular tachycardia amenable to electrical cardioversion. The patient was started on metoprolol tartrate 5 mg IV every 4 hours which was transitioned to metoprolol tartrate 12.5 mg orally every 12 hours the next day and titrated up to 75 mg 3 times daily over the next week. Over the next couple of days, the patient remained in sinus tachycardia, but no further NSVT was observed.

## OUTCOME AND FOLLOW-UP

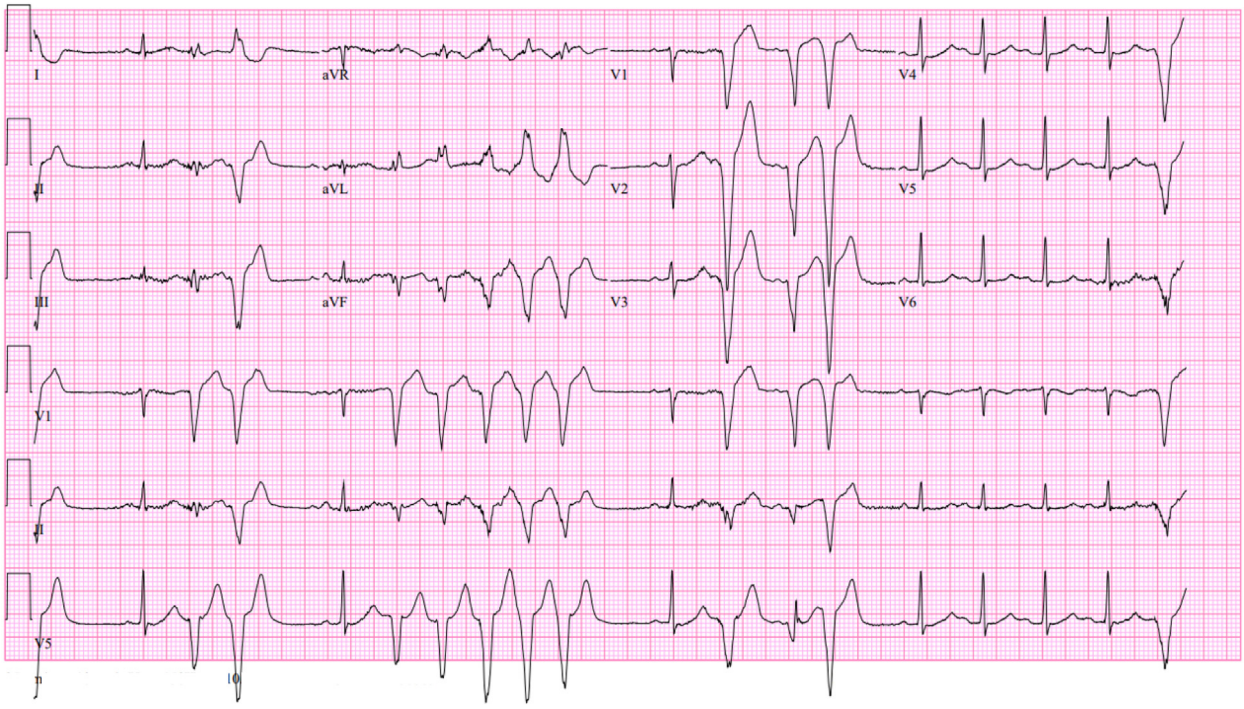
The patient was still admitted in the hospital 3 weeks later when her second round of chemotherapy was due. The patient's care goal was to prioritize the health of her baby and increase the chances of a safe delivery at 28 weeks' gestation; therefore, a second round of doxorubicin 100 mg and cyclophosphamide 1,000 mg was administered intravenously. Metoprolol tartrate 75 mg orally 3 times a day was continued, and over the next 72 hours, the patient only had 4 beats of NSVT (Figure 4). The patient continued to receive chemotherapy every 3 weeks without any further NSVT.

**FIGURE 1 Electrocardiogram 1**




Sinus tachycardia on hospital admission.

**FIGURE 2** **Electrocardiogram 2**




Nonsustained ventricular tachycardia on day 1 of admission.

During gestational week 27, the patient required an emergent cesarian section due to new-onset fetal growth restriction, intermittent absence end-diastolic flow on umbilical artery Doppler, and fetal heart deceleration. Fetal birth weight was in 17th percentile at 0.71 kg, and fetal glucoses during the initial 48 hours after birth ranged from 39 to 100 mg/dL. The patient remained on metoprolol with no further NSVT postoperatively or during the rest of her admission. She was discharged on postoperative day 11 and metoprolol was discontinued.

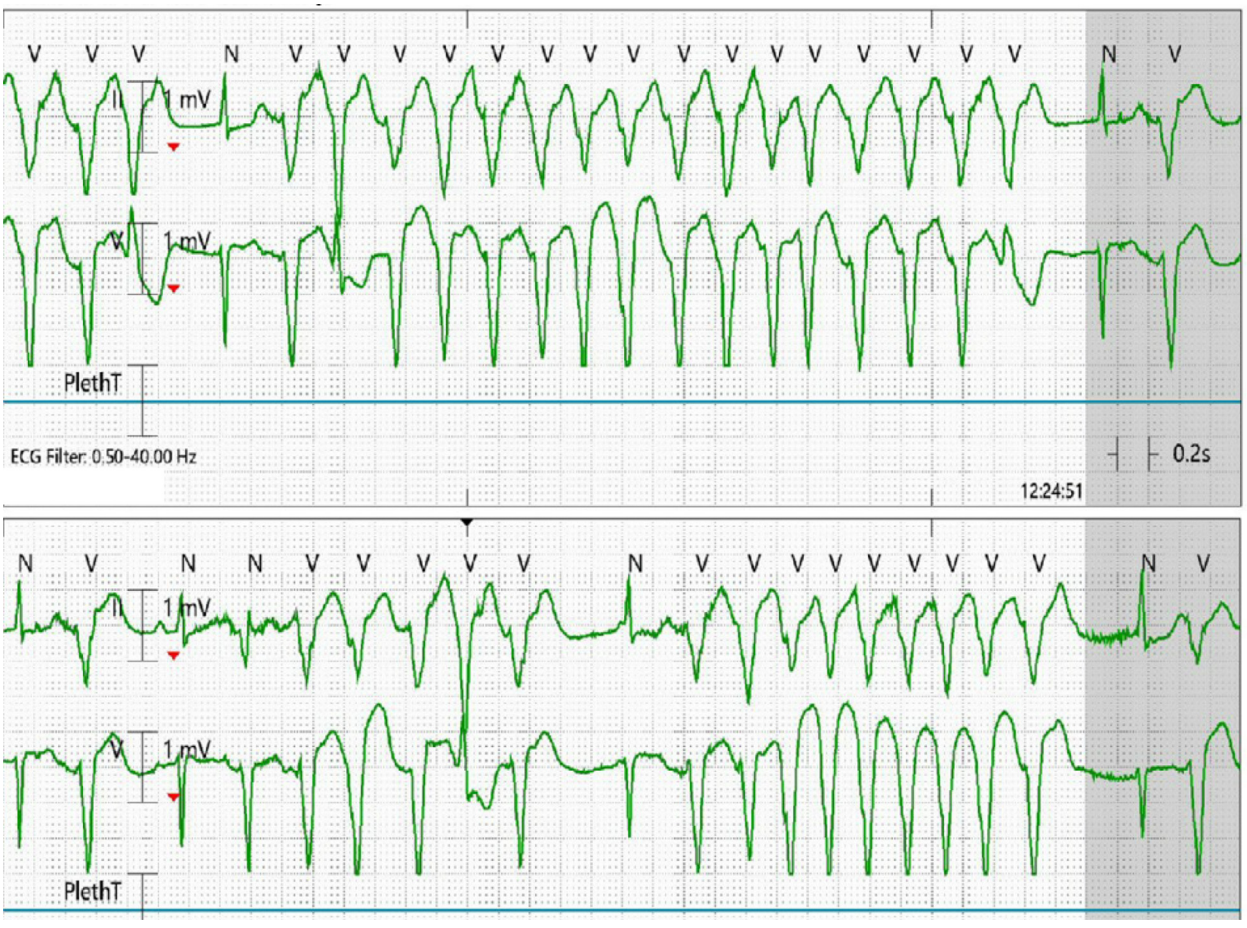
## DISCUSSION

Anthracyclines are the most well-known chemotherapeutic agents associated with cardiotoxicity. However, cardiomyopathy is the most common cardiac toxicity, whereas ventricular tachycardia is rare.[1] NSVT is the most common anthracycline-related arrhythmia with an incidence of 73.9%; however, this incidence is over an average of 5 years and no different when compared with non-cancer-associated ischemic heart disease or dilated cardiomyopathy.[2] Since the 1970s, anthracycline-induced cardiotoxicity has been recognized as a dose-dependent adverse effect[3]; however, rhythm abnormalities can arise both acutely and from long-term exposure of anthracycline.[4]

The present case of anthracycline-induced ventricular tachycardia is unique because this patient had no cardiac history and the arrhythmia occurred after receiving her first dose. Although anthracycline-induced cardiotoxicity is well known to be dose-dependent, this patient only had 4 beats of NSVT during her second round of chemotherapy. One hypothesized mechanism of anthracycline-induced ventricular tachycardia is through direct myocyte necrosis and can be seen within the first 24 hours of administration.[1,5] Although our investigation of other etiologies of her NSVT were limited due to the patient's gestational status and prognosis, the etiology is most likely anthracycline-induced given its temporal pattern to doxorubicin administration and positive troponin I on hospital admission. Cyclophosphamide has also been associated with supraventricular arrythmias, including atrial fibrillation, and less likely to be the offending agent with this patient.[1,6]

When drug-induced ventricular tachycardia is suspected, the offending agent should be

**FIGURE 3** Telemetry Strip



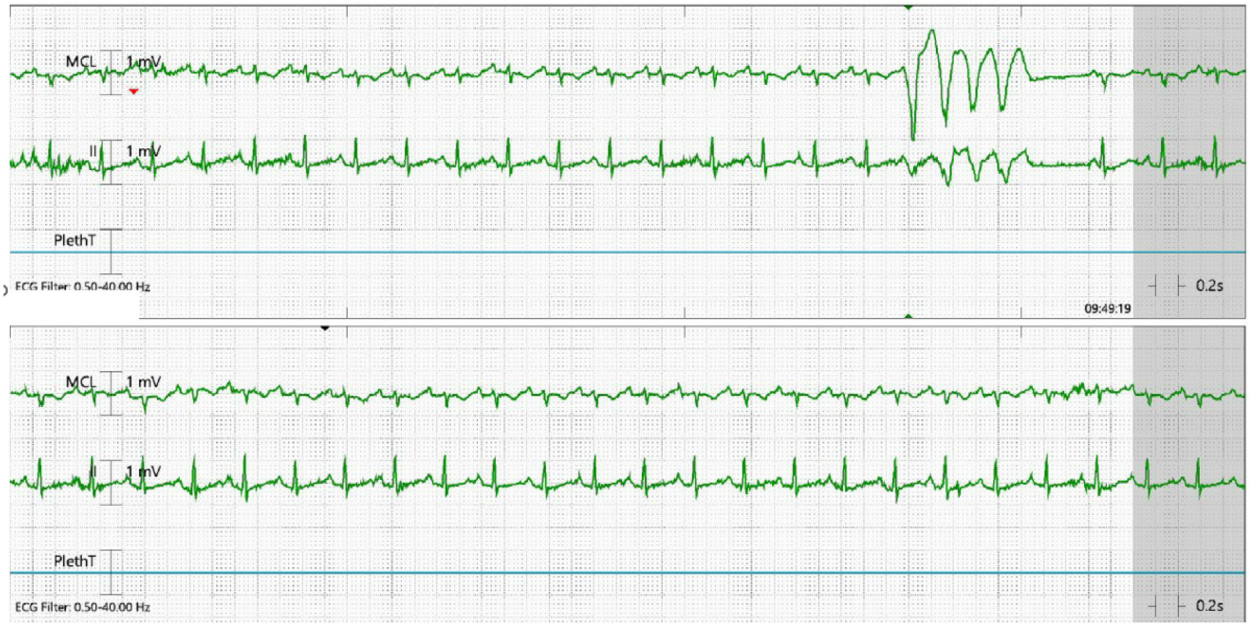

Continued nonsustained ventricular tachycardia on day 1 of admission.

withdrawn.[7] Although doxorubicin was the most likely offending agent, withholding further administration of doxorubicin was not an option given the patient's goals of care. Management of ventricular tachycardia in pregnancy requires careful selection between chemotherapeutics that are effective yet safe in pregnancy.[8] Because this patient's NSVT was not amenable to synchronized cardioversion, this was not an option. Guideline recommendations for acute management of ventricular arrhythmias in pregnancy include intravenous beta blockers, sotalol, flecainide, procainamide, or overdrive pacing.[9] Metoprolol tartrate was chosen over other antiarrhythmics initially to manage the patient because the patient was hemodynamically stable and because of its known safety in pregnancy. If the patient was to decompensate from her arrhythmia, could not be managed with beta blockers, or continued to have an arrhythmia not amenable to synchronized cardioversion, our plan was to select intravenous antiarrhythmics based on known safety in pregnancy. Previous Food and Drug Administration pregnancy categories for lidocaine and procainamide were B and C, respectively.[8] Avoidance of amiodarone was important given previous categorization as D.

## CONCLUSIONS

Anthracycline-induced ventricular tachycardia is a rare adverse effect. Although it is usually a dose-dependent effect and more likely in patients with preexisting cardiovascular disease, it can also occur acutely on administration of an initial dose. From our experience with this patient, beta blockers appear to be sufficient to medically manage anthracycline-induced ventricular tachycardia because no further NSVT occurred with subsequent doses of doxorubicin.

**FIGURE 4** **Electrocardiogram 3**




Nonsustained ventricular tachycardia after second round of doxorubicin with metoprolol.

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**KEY WORDS** **anthracycline, doxorubicin, pregnancy, ventricular tachycardia**