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Pseudo–Ventricular Tachycardia Mimicking Malignant Arrhythmia in a Patient with Rapid Atrial Fibrillation

By Walid Barake, MD, MBBCh, Adrian Baranchuk, MD, FRCPC, and Arnold Pinter, MD

Abstract Artifacts can simulate arrhythmias such as atrial flutter, atrial fibrillation, and ventricular tachycardia. A case of pseudo-ventricular tachycardia is outlined in a patient with newly diagnosed atrial fibrillation, which made the diagnosis a special challenge. Characteristic signs of pseudo–ventricular tachycardia are described. This case reinforces the importance of recognizing artifacts to avoid unnecessary interventions, especially in the telemetry and critical care units. (*American Journal of Critical Care.* 2014;23:270-272)

A 51-year-old man with a history of mitral valve endocarditis, mitral valve prolapse and regurgitation, hypertension, type 2 diabetes mellitus, and alcohol abuse came to the emergency department with nausea, vomiting, and vague abdominal pain after a binge of alcohol the preceding night. Vital signs included a heart rate of 132 beats/min, blood pressure of 125/96 mm Hg, respiratory rate of 18/min, and body temperature of 36.7°C. Physical examination was significant for irregular heart sounds with pansystolic murmur best heard at the apex with radiation to the left axilla. His abdomen was tender with absent peritoneal signs. Electrocardiography showed atrial fibrillation with rapid ventricular response (130/min). The patient was admitted to the general internal medicine service for telemetry monitoring and management of his newly diagnosed atrial fibrillation.

While being assessed by the medicine team in the emergency department, the patient had an 11-second run of an apparent irregular wide-complex tachycardia at 250/min with variable morphology (Figure, part A). The patient was asymptomatic and his blood pressure remained stable. The electrophysiology service was consulted urgently.

Does this patient have ventricular tachycardia?

Clinical Course

The patient started treatment with bisoprolol 5 mg daily for rate control of atrial fibrillation and rivaroxaban 20 mg daily for stroke prophylaxis. After a close look at the tracings, the consulting

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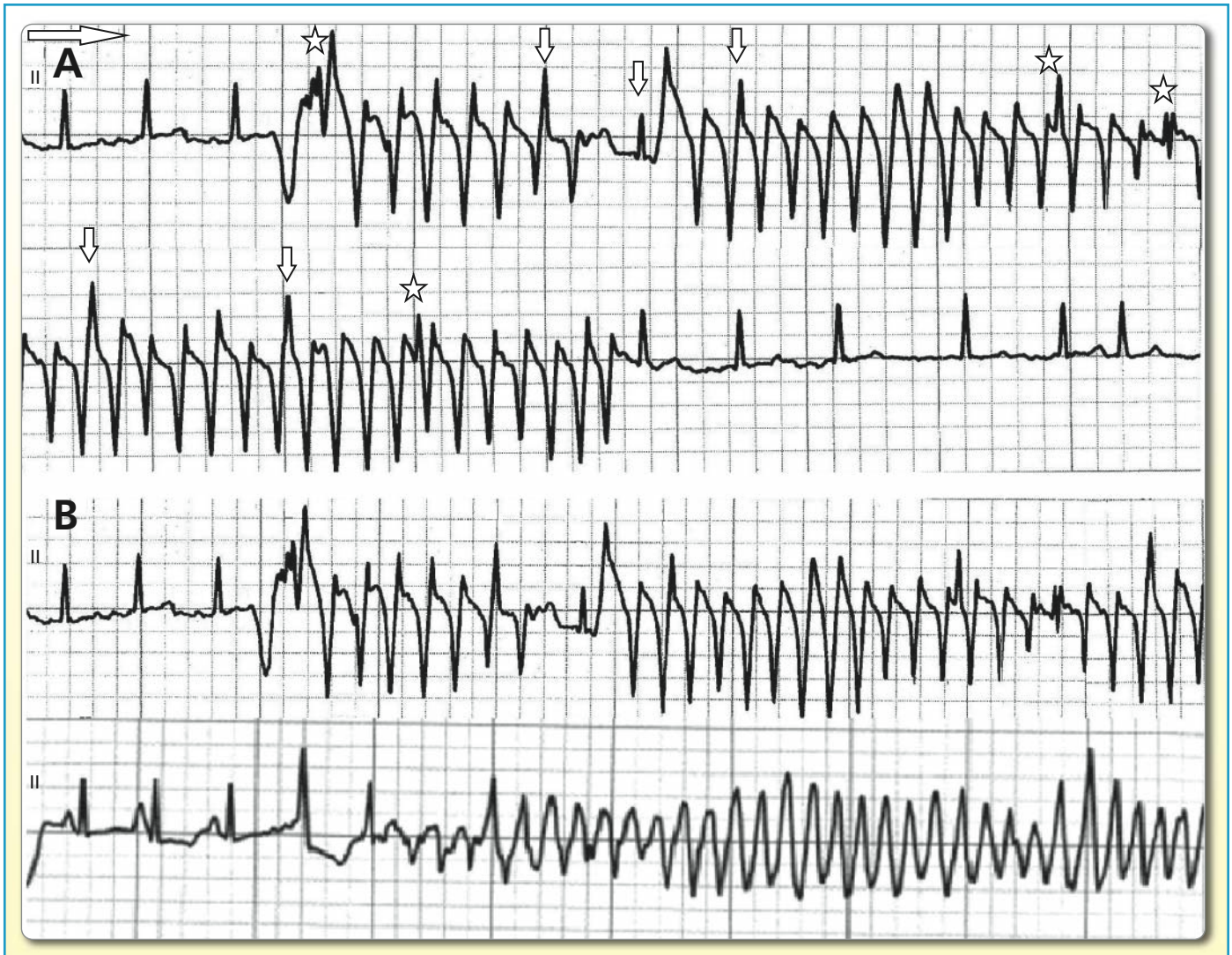

Figure Telemetry recording. Lead II (1 mV/10 mm, 25 mm/s speed). A, Arrows and stars indicate the spikes and notches, respectively, representing the true QRS complexes marching through the artifact. B, Upper panel shows the pseudo–ventricular tachycardia with sharp slopes versus a true ventricular tachycardia in the lower panel with moderate slopes.

electrophysiologist diagnosed it as pseudo–ventricular tachycardia (artifact mimicking ventricular tachycardia) on the basis of the presence of spikes and notches that can be seen among the wide QRS-like complexes and the sometimes physiologically impossibly short R-R intervals between 2 consecutive signals that were presumed QRS complexes. Detection of the QRS complexes marching through the artifact was more challenging because of the presence of underlying atrial fibrillation and, consequently, irregular R-R intervals. The electrocardiographic diagnosis of artifact was also suggested by the complete lack of symptoms, as it would be highly unlikely for such a rapid polymorphic ventricular tachycardia not to have any impact on hemodynamics.

The patient's in-hospital stay was uneventful; echocardiography was performed and revealed normal left ventricular size and function and mitral valve prolapse with associated severe regurgitation, similar to his previous examination. A computed tomography scan of his abdomen revealed tip appendicitis, which was assessed by a general surgeon, who decided that no intervention was required. The patient remained asymptomatic and his abdominal pain resolved conservatively. He was discharged home in 2 days.

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Discussion

Artifacts are commonly encountered in patients who require electrocardiographic monitoring and should always be part of the differential diagnosis. Artifacts are defined as electrocardiographic signals that are due to sources other than the electrical activity of the heart. Failure to correctly distinguish between a true arrhythmia and an artifact can result in misdiagnosis and unnecessary therapeutic interventions.[1,2] Artifacts can mimic arrhythmias such as atrial flutter, atrial fibrillation, and ventricular tachycardia.[3]

ECG artifacts that mimic ventricular tachycardia are common, usually due to poor electrode contact or movement of the patient.

Electrocardiographic artifacts mimicking ventricular tachycardia are not rare, especially in an intensive care unit monitoring setting. Such artifacts are usually caused by poor electrode contact or movement of the patient and are not associated with hemodynamic compromise.[4] Stable blood pressure in an asymptomatic patient at the time of the apparent ventricular tachycardia (pseudo–ventricular tachycardia) confirms the diagnosis.[1,4]

Three helpful characteristic signs of pseudo–ventricular tachycardia have been described[1,5]:

1. Notch sign: notches can be observed in the wide QRS-like complex artifact that time out with preceding real R-R intervals.

2. Spike sign: tiny spikes can be seen among the pseudo–ventricular tachycardia complexes, indicating the presence of real QRS complexes.

3. Sinus sign: one of the frontal leads (I, II, or III) shows normal P waves, QRS complexes, and T waves if one of the upper limbs is free of tremor or movement.

The morphology of the apparent QRS complexes is also helpful in distinguishing true ventricular tachycardia from pseudo–ventricular tachycardia. The slopes of the true ventricular tachycardia are relatively moderate in contrast to the slopes of the terminal components of the pseudo–ventricular tachycardia, which are sharp (Figure, part B).

The presented case was a special diagnostic challenge given that atrial fibrillation is the underlying rhythm, which made tracking the R-R interval among the pseudo–ventricular tachycardia signals more challenging. This case reinforces the importance of recognizing artifacts to avoid unnecessary interventions.

FINANCIAL DISCLOSURES
None reported.

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REFERENCES

1. Baranchuk A, Shaw C, Alanazi H, et al. Electrocardiography pitfalls and artifacts: the 10 commandments. *Crit Care Nurse.* 2009;29(1):67-73.
2. Chase C, Brady WJ. Artifactual electrocardiographic change mimicking clinical abnormality on the ECG. *Am J Emerg Med.* 2000;18(3):312-316.
3. Srikureja W, Darbar D, Reeder GS. Tremor-induced ECG artifact mimicking ventricular tachycardia. *Circulation.* 2000;102(11):1337-1338.
4. Pinter A, Sklar L, Dorian P. Factitious ventricular tachyarrhythmia outbreak. *Arch Intern Med.* 2011;171(3):191-193.
5. Huang CY, Shan DE, Lai CH, et al. An accurate electrocardiographic algorithm for differentiation of tremor-induced pseudo ventricular tachycardia and true ventricular tachycardia. *Int J Cardiol.* 2006;111(1):163-165.