

## Ventricular or Pseudo-Ventricular Tachycardia on Polysomnogram

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A 30-year-old man with past medical history of asthma presented for evaluation of nocturnal shortness of breath and daytime fatigue. His medications included an albuterol inhaler used as needed, fluticasone-salmeterol discus inhaler used daily, and cetirizine used daily. He smoked half a pack of cigarettes each day. Physical exam revealed an obese man with a body mass index of 33. Cardiac and respiratory exam were unremarkable.

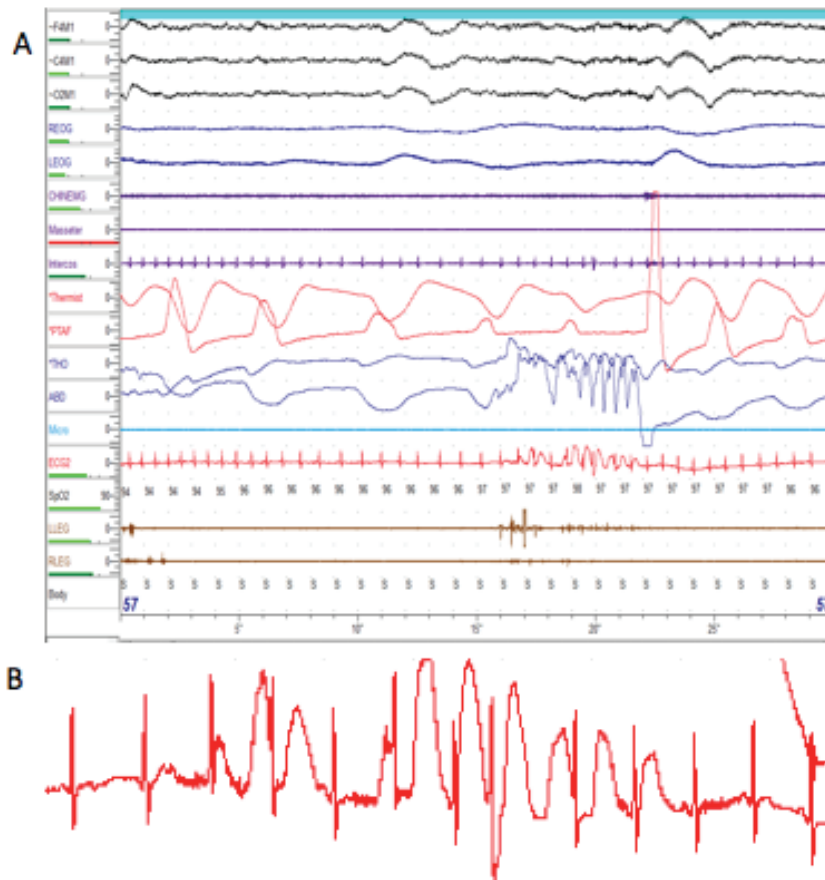
A split-night polysomnogram (PSG) was performed. During the diagnostic portion of the PSG, total sleep time (TST) was 173 min, sleep onset was 3

min, sleep efficiency was 90%, wake after sleep onset was 16 min, TST apnea hypopnea index (AHI) was 5.9, and REM AHI was 85.7. During the titration portion of the PSG, sleep disordered breathing resolved at continuous positive airway pressure of 11 cm.

PSG review revealed an electrocardiogram (ECG) finding shown in **Figure 1A**, with an enlarged view of the relevant ECG shown in **Figure 1B**.

**QUESTION:**  
What is the significance of this ECG finding?

Figure 1



(A) Electrocardiogram (ECG) finding on polysomnogram (PSG). (B) Enlarged view of the ECG2 channel from the PSG.

**ANSWER:**

**Pseudo-ventricular tachycardia due to nocturnal scratching of the precordial electrocardiogram electrodes (Figures 2, 3).**

**DISCUSSION**

Cardiac arrhythmias are the most common severe adverse effect encountered on nocturnal PSG.<sup>1</sup> The severity of the cardiac arrhythmia noted on PSG may correlate with the apnea severity, especially in men, and may be seen more frequently in those with comorbid cardiac disease.<sup>2</sup> It is critical for sleep technologists to recognize these events and take appropriate action.

The American Academy of Sleep Medicine (AASM) Manual for Scoring of Sleep and Associated Events (Scoring Manual) recommends the use of a modified Lead II (ECG2) for cardiac evaluation with two ECG electrodes: one on the right upper chest and another on the left lower chest.<sup>3</sup> In our sleep laboratory, we apply three ECG electrodes: on the right upper chest, the left upper chest, and the left lower chest. The software in our PSG system (Alice 5, Respironics, Inc., Murrysville, PA, USA) allows the display of six ECG channels—three bipolar channels and three augmented channels (**Figure 3**). The three bipolar channels are Lead I (ECG1) consisting of both upper chest electrodes; Lead II (ECG2) consisting of the right upper chest and the left lower chest electrodes; and Lead III (ECG3) consisting of the left

upper chest and left lower chest electrodes. The augmented leads are calculated post-acquisition and do not require the use of additional electrodes (**Table 1**). The use of multiple ECG channels allows the sleep physician the opportunity to more fully evaluate ECG rhythms and avoid electrodes contaminated by artifact.

Pseudo-ventricular tachycardia (VT) associated with tremor like movements has been previously reported.<sup>4</sup> Three signs are useful in the identifying tremor/movement induced pseudo-VT on ECG: the sinus sign, the spike sign, and the notch sign.<sup>5</sup>

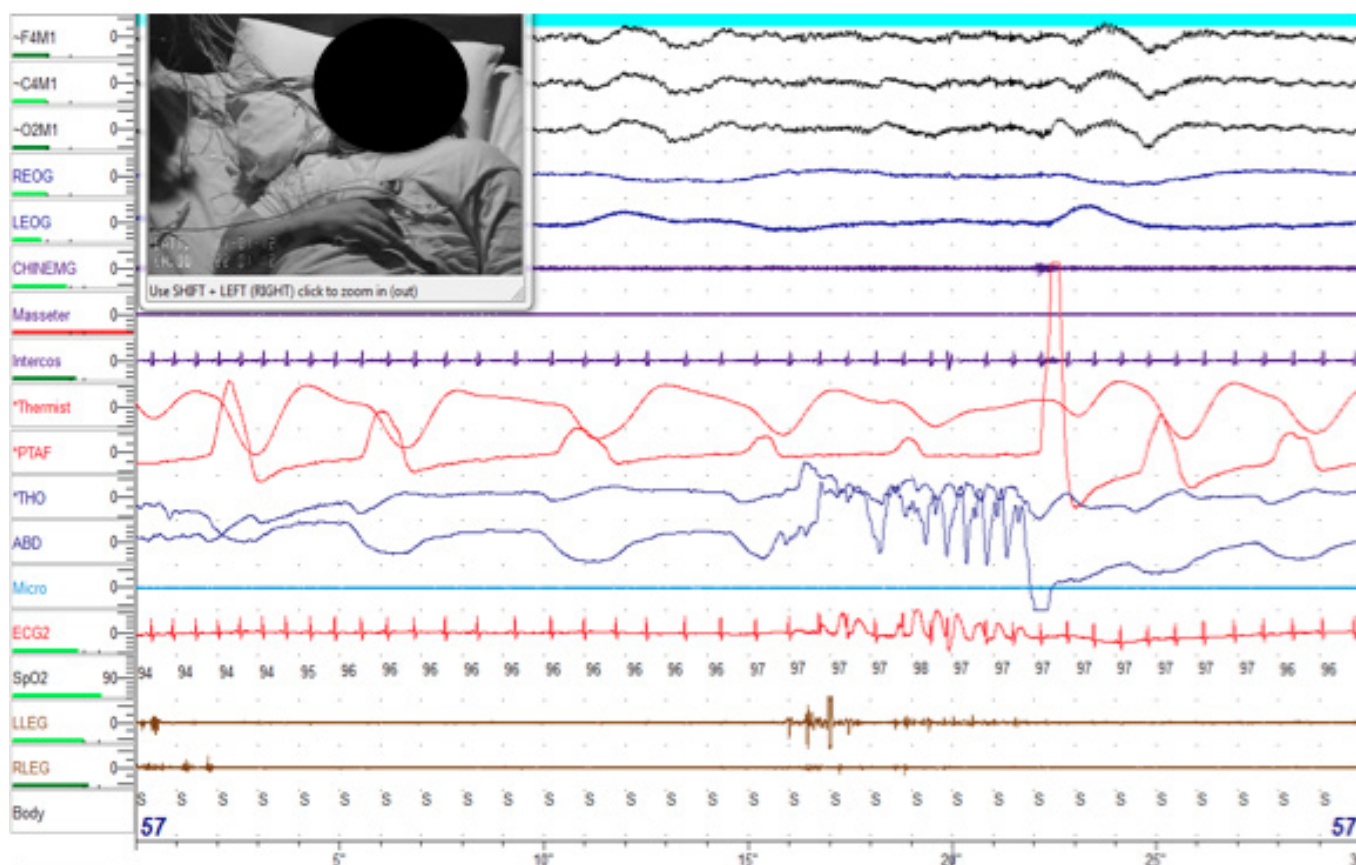
The sinus sign in pseudo-VT is the presence of a normal sinus rhythm with normal P, QRS, and T waves in either a bipolar lead or an augmented lead during an apparent episode of VT. This is due to the fact that one of the upper limb electrodes is free of movement artifact.

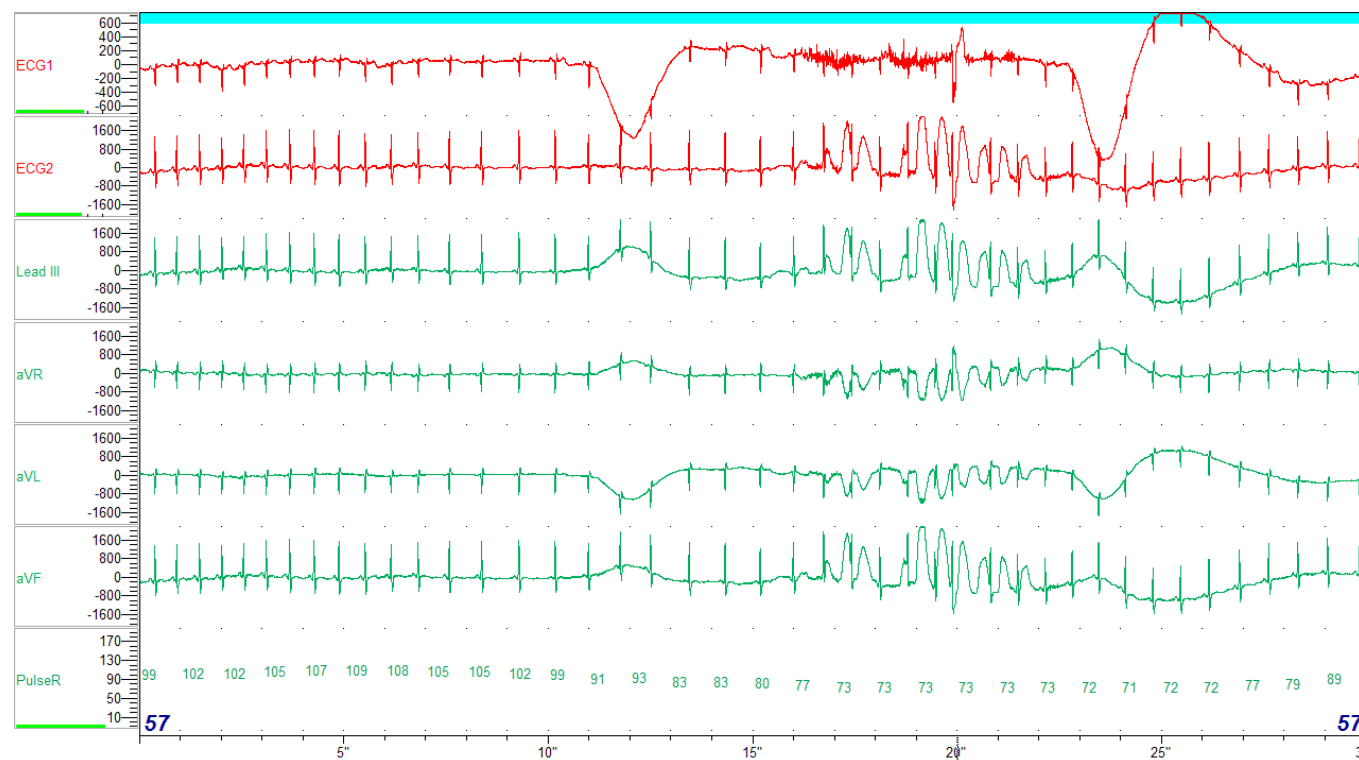
The spike sign in pseudo-VT is the presence of regular or irregular spikes among the wide-complex QRS artifact that represents the superimposition of a normal sinus rhythm QRS complex during the vent.

The notch sign in pseudo-VT is the presence of a superimposed notch on the wide-complex QRS artifact that also represents the superimposition of a normal sinus rhythm QRS complex during the event.

In **Figure 3** we can see the spike sign interspersed among the pseudo-VT wide-complex QRS artifact. In PSG interpretation, prompt evaluation of both the video recording and the patient's status is also recommended. Our patient was medically stable throughout the course of the recording.

**Figure 2—Scratching artifact on electrocardiogram channel**



**Figure 3**—Scratching artifact visualized on electrocardiogram using 6 channels: 3 bipolar leads and 3 augmented leads**Table 1**—Augmented electrocardiogram (ECG) leads in polysomnography

Augmented ECG leads	Positive electrode	Composite Negative Electrode Source	Post-Acquisition Formula in Augmented ECG lead calculation
Augmented voltage right arm (aVR)	Right arm electrode	Left arm electrode Left leg electrode	$-(\text{Lead I} + \text{Lead II}) / 2$
Augmented voltage left arm (aVL)	Left arm electrode	Right arm electrode Left leg electrode	$(\text{Lead I} - \text{Lead III}) / 2$
Augmented voltage left foot (aVF)	Left leg electrode	Left arm electrode Right arm electrode	$(\text{Lead II} + \text{Lead III}) / 2$

## CLINICAL PEARLS

1. Scratching can produce a pseudo-ventricular tachycardia artifact on electrocardiography (ECG) monitoring
2. The sinus sign, the spike sign, and the notch sign are useful in the identification of movement induced pseudo-ventricular tachycardia.
3. Evaluation of the PSG video recording for movement and assessment of patient clinical status are also recommended.
4. The use of an extended ECG montage composed of three bipolar channels and three augmented channels may allow more extensive visualization of ECG abnormalities when compared to single ECG channel.

## CITATION

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## REFERENCES

1. Mehra R, Strohl KP. Incidence of serious adverse events during nocturnal polysomnography. *Sleep* 2004;27:1379-83.
2. Szaboova E, Holoubek D, Tomori Z, Szabo P, Donic V, Stancak B. Severity of nocturnal cardiac arrhythmias correlates with intensity of sleep apnea in men. *Adv Exp Med Biol* 2013;755:155-68.
3. Iber C, Anconi-Israel S, Chesson A, Quan S. American Academy of Sleep Medicine. *The AASM manual for the scoring of sleep and associated events: rules, terminology, and technical specifications*. Westchester, IL: American Academy of Sleep Medicine; 2007.
4. Riaz A, Gardezi SK, O'Reilly M. Pseudo ventricular tachycardia: a case report. *Irish J Med Sci* 2010;179:295-6.
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: 163-5.

## SUBMISSION & CORRESPONDENCE INFORMATION

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## DISCLOSURE STATEMENT

This work was performed at the Louisiana State University School of Medicine in Shreveport, LA. The authors have no conflicts of interest, financial support, or off-label/investigational uses to disclose.