Complete Heart Block Complicating the Head Impulse Test

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**Background:** Symptoms of acute vestibular syndrome include dizziness, nausea, vomiting, and postural instability. The cause may be a peripheral or central lesion. Distinguishing between these two causes is critical because the treatments differ completely. One bedside test to help make this distinction clinically is the head impulse test (HIT), sometimes called the head thrust test.

**Objective:** To describe a case of complete heart block associated with performance of the HIT.

**Design:** Case report.

**Setting:** Academic medical center.

**Patient:** A 52-year-old woman presented to the emergency department with sudden onset of dizziness.

**Intervention:** The HIT.

**Main Outcome Measure:** Use of the HIT to help distinguish between a peripheral or central lesion in a patient with dizziness.

**Results:** Complete heart block occurred immediately after performance of the HIT.

**Conclusions:** Physicians may perform this test in an office, emergency department, or inpatient setting and should be aware that occasionally patients may have a severe vagal reaction including complete heart block.

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**Symptoms of Acute Vestibular Syndrome (AVS) include dizziness, nausea, vomiting, and postural instability.** The cause may be a peripheral or central lesion. Distinguishing between these two causes is critical because the treatments differ completely. Patients with vestibular neuritis benefit from steroids, while those with cerebellar stroke need treatment of the underlying vascular lesion and close monitoring for posterior fossa swelling and brain stem compression.1,2 Pilot data suggest that misdiagnosis of cerebellar infarction may be associated with worse outcomes.3

One bedside test to help make this distinction clinically is the head impulse test (HIT), sometimes called the head thrust test. This test of the vestibular-ocular reflex was first described in 1988.4 The examiner stands in front of the patient, who is seated directly in front of and facing the examiner. The patient is instructed to fixate his or her gaze on the examiner’s nose and to allow the examiner to move the patient’s head freely (i.e., the patient must be completely passive). The examiner then rapidly rotates the patient’s head 15° to 20° while carefully watching the patient’s eyes. This is repeated several times in each direction.

The normal response (intact vestibular-ocular reflex, compatible with stroke) is for the patient’s eyes to remain focused on the examiner’s nose. The abnormal response, due to loss of vestibular input (deficient vestibular-ocular reflex, compatible with vestibular neuritis), is for the eyes to move with the head and then snap back to the target in 1 corrective saccade.

To our knowledge, there have been no reported complications reported from using this simple-to-perform bedside maneuver. We describe a patient who developed complete heart block immediately after the HIT was performed.

**Report of a Case**

A 52-year-old woman presented by ambulance to the emergency department with severe dizziness. She woke up to go to the bathroom and felt the sudden onset of a loud pounding in her left ear followed by dizziness. She reported multiple episodes of vomiting especially provoked by any movement. She denied any numb-
ness, weakness, chest pain, or shortness of breath. Her medical history was significant for similar episodes of vertigo, pituitary microadenoma, and vasovagal syncope. She was a social drinker and a nonsmoker. Approximately 10 days prior, she had been treated with azithromycin for an upper respiratory tract infection.

Her temperature was 36.7°C, her pulse was 71 beats/min, her blood pressure was 118/63 mm Hg, her respiratory rate was 12 breaths/min, and her oxygen saturation was 98% on room air. She preferred to lie on her left side with her eyes closed. Cardiac and pulmonary examination results were unremarkable. Cranial nerves II to XII were intact, and her strength was 5/5 in the bilateral upper and lower extremities. Sensory examination results were unremarkable. Deep tendon reflexes were 2+/H1 bilaterally throughout. Formal cerebellar testing results were normal, but the patient could not walk owing to her severe dizziness. She had unilateral horizontal nystagmus.

Results of a noncontrast head computed tomographic scan were negative. The patient was given lorazepam, 2 mg, with partial relief of symptoms. To help distinguish a central process from a peripheral process, we performed the HIT. When the patient’s head was rapidly rotated to her right, her eyes lost fixation on the examiner’s nose; within 1 to 2 seconds, her eyes snapped back to the examiner’s nose in a single corrective saccade. Within 5 to 10 seconds, the patient became diaphoretic and lost consciousness. The cardiac monitor (which initially showed sinus rhythm) now showed complete heart block, which resolved within another 30 seconds without any intervention (Figure).

We report the first complication of the HIT to our knowledge. This test is an important part of the bedside evaluation of patients with AVS. A positive test result (loss of fixation on the target followed by a corrective saccade of the eyes) indicates a loss of vestibular function on the side toward which the head is rotated and is highly predictive of a peripheral cause such as vestibular neuritis. A negative test result (normal fixation on the target and absence of a corrective saccade) suggests that a posterior circulation stroke is causing AVS. Physicians may perform this test in an office, emergency department, or inpatient setting and should be aware that occasionally patients may have a severe vagal reaction including complete heart block.

One possible explanation for our patient’s symptoms is a hypersensitive carotid sinus reflex; however, this was specifically tested for and not found at the electrophysiology study. Another theoretical concern that has been raised about the HIT is the possibility of causing an acute cervical artery dissection.5 Given our patient’s lack of neck or head pain, lack of neurological findings, and clinical course, it is also unlikely that arterial dissection caused her symptoms. We believe that the complete heart block was the result of vagal stimulation from her dizziness, abruptly increased by performing the HIT.

Recent studies have shown the HIT to be very useful in distinguishing vestibular neuritis (in which the HIT result is positive) from cerebellar and other brain stem strokes (in which the HIT result is typically negative).5-7 While a positive HIT result strongly suggests a peripheral cause, it should not be used in isolation. This is because occasionally patients with central vestibular lesions will have a positive HIT result secondary to lesions affecting the vestibular nerve root entry zone in the pons or at the level of its nucleus. In one small study,3 9% of patients with a central cause of their AVS had a positive HIT result.

![Figure](http://archneur.jamanetwork.com/content/67/10/1273/F1.large.jpg)

Figure. Cardiac monitor showing sinus rhythm on arrival (A) and complete heart block immediately after the head impulse test (B).
In these instances, however, other tests such as quality of the nystagmus, presence of skew deviation, other central findings on examination, and degree of ataxia will help to make this distinction between a peripheral cause of AVS and a central one. Specifically, patients with peripheral vestibular disease have horizontal direction–fixed nystagmus, whereas patients with vertigo from a central cause will often have nystagmus that is either vertical or horizontal direction changing. Skew deviation is rarely seen in peripheral vestibular disorders. Other central findings such as speech, motor, sensory, and visual deficits suggest a central cause. Severe ataxia in which the patient cannot walk or sit unassisted or unsupported also suggests a central cause. Therefore, in the presence of these other suspicious findings, even patients with a positive HIT result should be investigated for a central cause of AVS.

Accumulating evidence suggests that the HIT is a very useful clinical test, and we believe that it should be used in the evaluation of patients with AVS. The results of the HIT should be interpreted in the context of other findings such as other neurological examination findings, presence of vertical skew deviation, quality of nystagmus, and degree of gait instability. When performing the HIT, however, we do caution physicians to be aware of this complication especially in patients with slow underlying heart rates, receiving calcium- or β-blockers or other atrioventricular nodal blocking medications, or with known history of severe vagal sensitivity.

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