

HINTS to Diagnose Stroke in the Acute Vestibular Syndrome

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Acute Vestibular Syndrome (AVS, sudden-onset vertigo, N/V, and gait unsteadiness) is often due to an acute peripheral vestibulopathy (AVP), though brainstem and cerebellar strokes often mimic AVP. In the acute setting, CT imaging has low sensitivity for infarcts of the posterior fossa and even available MRI imaging may be (-) early in an acute vertebrobasilar infarct, so bedside maneuvers are often used to differentiate between peripheral and central causes of AVS. At the time of this study, horizontal head impulse test (h-HIT) of vestibulo-ocular reflex (VOR) function and features of nystagmus were the two bedside maneuvers that were used most often¹, though vertical skew deviation was felt to be more predictive of posterior fossa pathology. As such, the goal of this study was to assess the predictive value of skew deviation, beyond that of the h-HIT and nystagmus alone, in identifying central pathology in AVS. The study also sought to identify the sensitivity of a three-step bedside exam (Head-Impulse—Nystagmus—Test of Skew, or HINTS) in identifying central vs. peripheral causes for AVS.

Experimental Design and Statistics: Data used in this study were a part of a larger, prospective and cross-sectional study of patients with AVS, conducted at a single center. Included patients were those presenting to the ED with core features of AVS (rapid-onset vertigo, N/V, gait unsteadiness) and at least 1 stroke risk factor²; excluded patients were those with a h/o recurrent vertigo. At the time of study entry, all patients underwent a neurological and vestibular exam by the single study Neuro-Ophthalmologist. All patients with suspected skew had confirmatory testing via ocular counterroll by fundus photography. Caloric testing was offered to confirm APV where appropriate. All patients were admitted for observation and serial exams, and all patients underwent neuroimaging to assess for an ischemic stroke. APV was defined as the absence of an infarct on MRI and a lack of neurological signs on follow up exams. Statistically, the proportions of patients with skew deviation in peripheral vs. central cases were compared, stratified by h-HIT findings. Each patient's HINTS exam was also categorized as benign (abnormal h-HIT, direction-fixed nystagmus, (-) skew) or dangerous (normal h-HIT, direction-changing nystagmus, (+) skew), and the sensitivity and specificity of these binarized scores were analyzed in terms of their predictive value for identifying central pathology.

Results: Data from 101 patients were used here. Most patients had ≥ 2 stroke risk factors, 75% were evaluated within 24hrs of symptom onset, most (70%) obtained MRI imaging within 6hrs of study examination, and almost all completed imaging within 72hrs of symptom onset. A total of 25 patients had APV, while 76 had a central lesion³. Symptomatically, all patients were unsteady, but severe truncal ataxia was only seen with central lesions (**Table 1**). In terms of the primary outcomes, skew was present in only 4% of patients with APV, but was seen in 30% with brainstem lesions and in 4% with pure cerebellar infarcts ($p = 0.003$, Chi Square; skew most often occurred in lateral medullary or lateral pontine infarcts). When combined with the h-HIT and features of nystagmus, all three maneuvers (i.e., the HINTS exam) achieved 100% sensitivity and 96% specificity for identifying central pathology. The HINTS exam was also more sensitive than the presence of general neurological or oculomotor signs for identifying central pathology. Further, acute ($<3d$) MRI imaging was (-) in 8 patients with eventual ischemic strokes, mostly in lateral medullary/pontine infarcts, meaning the sensitivity of bedside maneuvers for these patients was higher than that of these early, (-) MRI scans.

¹ A normal VOR by h-HIT and a vertical, torsional, or direction-changing nystagmus reflects central dysfunction; an abnormal VOR with unidirectional horizontal nystagmus reflects peripheral dysfunction.

² Smoking, HTN, HLD, DM, Afib, prior MI, hypercoagulable state, eclampsia, prior cervical trauma

³ 69 ischemic infarcts, 4 hemorrhagic infarcts, 2 demyelinating lesions, 1 anti-convulsant toxicity

Conclusions: Overall, this study showed that the presence of skew deviation is a strong predictor of at least brainstem pathology in patients presenting with AVS. When combined with the h-HIT and features of nystagmus, all three maneuvers as the HINTS exam are more sensitive than the presence of other neurological findings in identifying a central pathology in AVS. A benign HINTs exam also seems to generally rule out central lesions in AVS, at times more so than a (-) early MRI. There were inherent limitations to the study that may have altered the sensitivity/specificity data, including the use of only one non-masked examiner, follow up MRIs only in select patients, and restricted patient enrollment (high risk stroke, no prior vertigo history). However, given the general ease and speed with which a bedside HINTS exam can be performed, this initial data supported its routine use in AVS, at least to help reduce the risk of misdiagnosis.

Summary created by Elaine Sinclair, D.O.