The use and misuse of the Dix-Hallpike test in the emergency department

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Abstract

Objectives A simple bedside test, the Dix-Hallpike test (DHT), can reliably diagnose benign paroxysmal positional vertigo (BPPV) in patients with acute onset dizziness or vertigo. We evaluated patterns of DHT use by emergency physicians in patients presenting with dizziness and vertigo. Our objective was to assess the frequency and clinically appropriate use of the DHT in an emergency department.

Methods A health records review was performed using data from patients who presented to a tertiary care emergency department between September 2014 and March 2018 with a primary complaint of vertigo or dizziness. Patient records were reviewed for documentation of symptoms consistent with BPPV and DHT usage.

Results A total of 2309 patients met inclusion criteria. Of all dizzy patients who had complete documentation of signs and symptoms consistent with BPPV, 53% were assessed with a DHT. Of 469 patients who received a DHT, 134 (29%) of tests were done on patients who had documentation of at least one characteristic that was inconsistent with a diagnosis of BPPV. Eight patients who received a DHT were ultimately diagnosed with a central cause for their vertigo.

Conclusions The DHT is both underutilized and frequently applied to patients whose symptoms are not consistent with BPPV. This may result in prolonged patient discomfort and increased resource utilization, as well as increasing the risk of misdiagnosing central vertigo.

Keywords Vertigo · BPPV · Dix-Hallpike

Résumé

Objectifs Un simple test de chevet, le test de Dix-Hallpike (DHT), peut diagnostiquer de manière fiable le vertige positionnel paroxysmique bénin (VPPB) chez les patients présentant des étourdissements ou des vertiges d'apparition aiguë. Nous avons évalué les modèles d'utilisation de la DHT par les médecins d'urgence chez les patients présentant des étourdissements et

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des vertiges. Notre objectif était d'évaluer la fréquence et l'utilisation cliniquement appropriée du DHT dans un service d'urgence.

Méthodes Un examen des dossiers de santé a été réalisé à partir des données de patients qui se sont présentés à un service d'urgence de soins tertiaires entre septembre 2014 et mars 2018 avec une plainte principale de vertige ou d'étourdissements. Les dossiers des patients ont été examinés afin de documenter les symptômes correspondant à l'utilisation du VPPB et de la DHT.

Résultats Au total, 2 309 patients répondaient aux critères d'inclusion. Parmi tous les patients qui avaient des étourdissements et qui avaient une documentation complète des signes et des symptômes compatibles avec le VPPB, 53 % ont été évalués au moyen d'un DHT. Sur 469 patients qui ont reçu une DHT, 134 (29 %) des tests ont été effectués sur des patients qui avaient une documentation d'au moins une caractéristique incompatible avec un diagnostic de VPPB. Huit patients qui ont reçu une DHT ont finalement été diagnostiqués avec une cause centrale pour leur vertige.

Conclusions La DHT est à la fois sous-utilisée et fréquemment appliquée aux patients dont les symptômes ne correspondent pas au VPPB. Il peut en résulter une gêne prolongée pour le patient et une utilisation accrue des ressources, ainsi qu'un risque accru de diagnostic erroné du vertige central.

Clinician's capsule

What is known about the topic?

The Dix-Hallpike test can accurately identify benign paroxysmal positional vertigo (BPPV) in patients presenting to the ED with dizziness.

What did this study ask?

What was the frequency of use of the Dix-Hallpike test in patients with symptoms of vertigo consistent with BPPV?

What did this study find?

Only 53% of patients with symptoms consistent with BPPV received a Dix-Hallpike test, and many tests were performed on ineligible patients.

Why does the study matter to clinicians?

Underutilization and inappropriate use of the Dix-Hallpike test may result in prolonged symptoms or missed diagnoses of centrally caused vertigo.

The 2017 BPPV pathway provides evidence-based guidelines for physicians to properly diagnose and treat BPPV [3]. However, health care guidelines are only effective if they are successfully applied. Underutilization or inappropriate application of the Dix-Hallpike test may expose patients to protracted symptoms, unnecessary neuroimaging, and radiation, primary care or specialist consultation, and extended emergency department (ED) visits. Our objective was to assess the frequency and appropriateness of Dix-Hallpike test use in an ED.

Methods

Study setting and criteria

A health records review was performed for all patients presenting to a tertiary care ED in Ontario, Canada between September 2014 and March 2018 who received a triage diagnosis of dizziness, vertigo, light-headedness and/or unsteadiness. Patients were excluded from the study if they left without being seen, had dizziness > 14 days, recent trauma, a Glasgow Coma Scale score of less than 15, hypotension (SBP < 90), or reported syncope/loss of consciousness. The Health Sciences North Research Ethics Board approved this research.

Data analysis

Data was extracted from multiple sources, including electronic ED records and consultant notes, by five trained reviewers according to guidelines put forward by Jansen et al. [6]. A subset of 20 charts was coded by all reviewers to establish inter-rater reliability. Kappa was calculated with the data extraction form considered as a single variable, such that if any variable on the form varied between reviewers it was counted as a disagreement.

Introduction

Dizziness is one of the most common presenting complaints to Ontario emergency departments, accounting for 1.4% of all visits [1]. Benign paroxysmal positional vertigo (BPPV) is one of the most common benign causes of dizziness and is caused by the displacement of otolith fragments into the semicircular canals [2]. A simple bedside test, the Dix-Hallpike test, can be used to accurately diagnose this condition when the otolith is located in the posterior canal by provoking a characteristic torsional and vertical nystagmus (Supplemental File 1) [3, 4]. In those having a positive finding, the use of a canalith repositioning maneuver is indicated [3, 5].

Table 1 Characteristics of patients who received the Dix-Hallpike test

	Not appropriate for DHT	Appropriate for DHT
Cases	134 (28.6%)	335 (71.4%)
Symptom characteristics, <i>n</i> (%) ^a		
Not intermittent	63 (47.0)	
Duration > 2 min	72 (53.7)	
Not evoked by the change in position or head movement, or present when still	24 (17.9)	
Associated neurological symptoms, <i>n</i> (%)		
Diplopia	12 (9.0%)	
Dysphagia	1 (0.7%)	
Dysarthria	3 (2.2%)	
Dysmetria	4 (3.0%)	
Motor deficit on physical exam	6 (4.5%)	
Sensory deficit on physical exam	1 (0.7%)	
Truncal ataxia	0	

DHT Dix-Hallpike test

^aIf no documentation provided, criteria were assumed to have been met

Our primary outcome was the proportion of patients who received a Dix-Hallpike test whose symptoms were consistent with a diagnosis of BPPV. Secondary outcomes were (1) the number of patients assessed with a Dix-Hallpike test who were ultimately diagnosed with a central cause for their vertigo, and (2) the total number of dizzy patients who had symptoms consistent with BPPV and who also received a Dix-Hallpike test.

Appropriateness of Dix-Hallpike test use was determined according to the following symptom characteristics, which are consistent with a diagnosis of BPPV [3, 7]:

- Brief (lasting < 2 min).
- Intermittent.
- Evoked by a change in position or head movement/not present when still.
- Not accompanied by focal neurologic symptoms as listed in Table 1.

Only when there was explicit documentation of findings inconsistent with a diagnosis of BPPV was the test considered inappropriate. When documentation of one of the above characteristics was missing, it was assumed to be consistent with BPPV. The incidence of centrally caused dizziness was determined by the number of patients with stroke, transient ischemic attack (TIA), tumour or multiple sclerosis as diagnosed by computed tomography (CT), magnetic resonance imaging (MRI), or neurology consult.

A second analysis examined the number of all dizzy patients who had symptoms consistent with BPPV and who did or did not receive a Dix-Hallpike test. For this portion of the analysis, we only considered patients who had complete

documentation (symptom present or absent) for each of the criteria outlined above.

Results

We retrieved 3109 records, of which 2309 were included in the study (Supplemental File 2). Kappa for inter-rater reliability was calculated as 0.91 (0.87–0.93). Of these, 469 patients (43% male, mean age $55.4 \pm \text{SD } 18.4$ years) were documented as having received the Dix-Hallpike test. According to our criteria, it was clinically appropriate in 335 (71%) of these patients. The most common violations of guideline criteria were the use of the Dix-Hallpike test in patients having continuous vertigo, episodes lasting > 2 min, or accompanying focal neurological symptoms (Table 1).

Of all patients who received a Dix-Hallpike test, 8/469 (1.7%) were ultimately found to have a central cause for their dizziness, which was vascular (CVA or TIA) in all cases. Of these patients, five were documented as having either continuous vertigo or focal neurologic symptoms and were thus not appropriate candidates to receive the test. The remaining three lacked documentation regarding the duration of symptoms.

Overall, 70/132 (53.0%) dizzy patients with complete documentation and meeting all BPPV criteria received a Dix-Hallpike test.

Discussion

Our analysis showed that the Dix-Hallpike test was often not performed in patients who had symptoms consistent with BPPV and thus were an appropriate candidate to receive one. When it was performed, it was often on patients who did not meet the guideline criteria for receiving the test. An appropriate patient should have intermittent symptoms exacerbated by a change in position with no focal neurologic deficits.

Notably, eight patients who were ultimately diagnosed with a central cause of dizziness received a Dix-Hallpike test. All of these patients had symptoms that were inconsistent with BPPV or lacked documentation of symptom duration. Three of these patients were documented as having a positive Dix-Hallpike test despite their central pathology, which may be due to the nystagmus having been incorrectly interpreted. Our approach does not allow us to ascertain the characteristics of the nystagmus elicited, or to determine the accuracy of its interpretation by the clinician. Nevertheless, this result underscores the importance of applying the test to the appropriate patient population, since a Dix-Hallpike test interpreted as being positive might provide false reassurance to a provider when the dizziness is in fact attributable to a central cause.

Emergency physicians may benefit from additional training in the identification of candidates who are appropriate to undergo positional testing, and which findings correspond to a positive test [7]. A patient with spontaneous or gaze-evoked nystagmus is not a candidate for BPPV. A positive Dix-Hallpike test requires the observation of upward, rotatory nystagmus in the direction of the downward ear [8, 9]. The observation of horizontal or no nystagmus on the Dix-Hallpike test connotes a negative test and the absence of a posterior canal otolith. In those patients who meet criteria suggestive of BPPV, yet have a negative Dix-Hallpike test, the next step should be a test for horizontal canal BPPV [3, 9]. In a study where emergency physicians were trained to do so, 38% of the patients with BPPV had horizontal canal BPPV [10].

Limitations

When documentation of a given criterion (e.g. duration of symptoms) was absent for patients who received a Dix-Hallpike test, it was assumed to be consistent with a diagnosis of BPPV. Thus, incomplete charting may have caused us to overestimate the proportion of tests that were appropriately performed. Conversely, neurological symptoms that were incidental to the complaint of dizziness may have led to an underestimation of the number of clinically indicated Dix-Hallpike tests.

Conclusion

Our findings suggest that the Dix-Hallpike test is both underutilized and often misapplied. Underutilization of the test may delay the diagnosis and treatment of BPPV, while use of the Dix-Hallpike test on inappropriate patients may lead to false-positive tests if nystagmus is incorrectly interpreted. When performed on patients with intermittent, position-evoked vertigo without neurologic deficits, a Dix-Hallpike test showing the typical nystagmus can rule in BPPV, effectively ruling out other causes. Further study is needed to assess barriers to the appropriate use of the Dix-Hallpike test to identify effective intervention strategies.

Supplementary Information The online version contains supplementary material available at <https://doi.org/10.1007/s43678-021-00110-1>.

Compliance with ethical standard

Conflict of interest The authors declare that they have no conflict of interest.

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