

# Otology & Neurotology

## Head Shaking During Dix -Hallpike Exam Increases the Diagnostic Yield of Posterior Semicircular Canal BPPV --Manuscript Draft--

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<b>Abstract:</b>	<p><b>Objectives:</b> To assess whether shaking the head during the Dix Hallpike maneuver (HSDH) improves the sensitivity of Dix- Hallpike (DH) maneuver for posterior semicircular canal BPPV (pBPPV).</p> <p><b>Study Design:</b> A prospective cohort clinical study.</p> <p><b>Setting:</b> A tertiary dizziness clinic and in two private clinics.</p> <p><b>Patients:</b> Consecutive patients diagnosed with pBPPV.</p> <p><b>Intervention:</b> Patients were seen by two experienced neurotologists and underwent a complete neurotology exam, including the Dix- Hallpike test (DH). Patients with a negative DH underwent a Dix- Hallpike test, while shaking the head (HSDH). Patients with a positive DH (group 1) or only with a positive HSDH (Group 2) underwent Epley maneuvers and were followed up until cured.</p> <p><b>Main outcome measures:</b> 1.The diagnostic yield of performing the HSDH in patients with a negative DH. 2. Comparison of the following variables: gender, age, the duration of symptoms until diagnosis, conversion to horizontal type BPPV and the number of visits required until cure between groups.</p> <p><b>Results:</b> Sixty nine patients were diagnosed with pBPPV (group 1). Twelve additional patients were negative on DH, but were found positive on HSDH (group 2). Accordingly, HSDH added 14.4% to our ability to diagnose pBPPV. The variables examined showed no statistically significant difference between the two groups.</p> <p><b>Conclusions:</b> The use of HSDH increases the diagnostic yield of BPPV and should, therefore, be used when DH is negative.</p>

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To the Editor of *Otology Neurotology*

Re: Submission of a manuscript

Dear Sir,

Please find, attached our manuscript *Head Shaking During Dix -Hallpike Exam  
Increases the Diagnostic Yield of Posterior Semicircular Canal BPPV.*

We hope you would consider it for publication in your esteemed journal.

As commented, we suggest that this study be seen as a preliminary report on a  
technique for increasing our diagnosis ability of BPPV,. Further, more  
epidemiologically oriented studies are needed in future.

Sincerely,

Daniel Kaplan MD

# **Head Shaking During Dix -Hallpike Exam Increases the Diagnostic Yield of Posterior Semicircular Canal BPPV**

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Key words: vertigo; benign paroxysmal positional vertigo; Epley maneuver; head shaking

Running title: Improving diagnostic yield of Dix–Hallpike exam

## **INTRODUCTION**

Benign positional paroxysmal vertigo (BPPV) is the most common cause of vertigo. Most cases of BPPV involve the posterior semicircular canal unilaterally (pBPPV) and diagnosis is established applying the Dix- Hallpike maneuver (DH). DH is considered positive when geotropic, torsional- up beating nystagmus appears in a head hanging position, lasting for seconds, with a latency of several seconds.

Typically, the nystagmus reverses when the patient is brought back up to the sitting position, and these findings are accompanied by symptoms of vertigo<sup>1,2</sup>.

It is not uncommon to examine a patient, either with or without the classic symptoms of "positional vertigo lasting for seconds", in which the DH is found to be normal. In this situation it becomes unclear whether BPPV is, indeed, the correct diagnosis or not.

Several studies have described an entity of BPPV without nystagmus<sup>3</sup>. Interestingly after treatment for BPPV, the duration until recovery- which in such cases means relief of vertigo, did not differ from that of patients with regular pBPPV.

Nevertheless, the situation of a patient suspected of suffering from BPPV with a negative DH, may be quite frustrating for both the patient and the physician, since the diagnosis is unclear.

In our practice we have noticed that some patients complaining of vertigo have a negative DH, however when shaking their head during this maneuver, the DH becomes positive.

The aim of the study was 1. Document the yield of diagnosis when performing head shaking during DH (HSDH) for patients with a negative DH. 2. Characterize the

group with a negative DH and positive HSDH compared to classical pBPPV with a positive DH.

## **SUBJECTS AND METHODS**

All patients referred to our tertiary dizziness clinic were assessed with a complete neurotological examination by one of two experienced neurotologists (DMK and MK). At the beginning of the study the first several patients were examined together, to assure that the exact same examination and treatment protocol were used. The examination was performed in a tertiary dizziness outpatient clinic in Soroka University Medical Center and in the private offices of the neurotologists. Positioning exams were performed in the final part of the neurotology examination and they included 3 parts:

1. Role test: Examined for horizontal BPPV. The patient was placed in the supine position and the head was rotated to both sides.
2. DH was performed on both sides. When the DH was positive on the first side, it was always completed contralaterally, in order to rule out bilateral disease. Patients with a positive DH were defined as group 1.
3. DSHS was performed in cases of a negative DH. The head was shaken from side to side in the head hanging position, for approximately 5 times. Patients with a positive HSDH (after having a negative DH) were defined as group 2.

The two groups of patients were compared for the following: gender, age, the duration of symptoms until diagnosis, the number of visits required until cure, conversion to horizontal type BPPV and recurrence rates between the two groups.

Treatment and follow up protocol: Epley maneuver (EM) was performed in modification from the procedure originally described by Epley<sup>4</sup>. Neither

premedication nor oscillation during the maneuver, were used. Patients with a positive DH or DSHS were treated with a modified Epley maneuver, with help of a nurse, when required. After this maneuver, patients were reexamined, applying DSHS. If the exam was positive, the Epley maneuver was repeated until it became negative. There were, however several exceptions to this protocol, dictated by the patient's condition; difficulty or refusal to undergo a repeated maneuver, elderly and morbidly obese patients.

Patients were instructed to sleep in a semi-sitting position for three nights. A neck collar was offered to patients to be worn during the day, and they were instructed not to engage in physical exercise. Patients were scheduled for a follow up visit at an interval of 2 weeks.

Inclusion criteria: Consecutive patients seen in the dizziness clinic diagnosed with a positive DH or positive DSHS exam.

Exclusion criteria:

1. Patients diagnosed with other types of BPPV: horizontal nystagmus on role test, corresponding with horizontal canal BPPV, torsional- down beating nystagmus on DH, corresponding with anterior canal BPPV and a positive, or any type of bilateral involvement.
2. Patients who did not complete follow-up visits.

The study was approved by the Ethics Committee of Soroka University Medical Center.

Data and statistics:

Patients' demographics and characteristics of their disease were plotted on an Excel file. The two patient groups; group 1 and group 2 were examined. The student t test and  $\chi^2$  test were applied. Significance was assumed at  $p < 0.05$ .



## **RESULTS**

Between December 2009 and December 2011 a total of 88 patients were diagnosed with BPPV. Three individuals were diagnosed with bilateral pBPPV and 2 with unilateral horizontal BPPV and were excluded. Two additional patients did not complete follow-up visits and were also excluded from the study. The study population, therefore, consisted of 81 patients.

Sixty nine patients had a positive DH (group 1). Twelve patients (group 2) showed a negative DH exam but were positive when the DSHS was performed. Accordingly, the DSHS added 14.4% to our ability to diagnose BPPV. Assuming that the addition of the DSHS in cases of a negative DH is set as the gold standard for diagnosing pBPPV, this new exam increased the sensitivity (true positive/( true positive + false negative) from 83% to 100%.

All patients in group 1 were symptomatic; experiencing vertigo with or without nausea during the DH. In group 2- two out of the 12 patients were symptomatic during DH, whereas, all patients were symptomatic during HSDH.

Table 1 lists the variables compared between patients in group 1 and in group 2. Age and gender distribution did not differ between groups. In group 2 the duration of symptoms was longer, and the patients required less visits until cure than in group 2 but this was not statistically significant.

## DISCUSSION:

It is important to establish the diagnosis of BPPV in a given vertiginous patient since this is a treatable disease. Although observation without treatment is an option for BPPV, a large meta- analysis study from 2004 has shown that particle repositioning maneuvers (PRM) have significantly improved symptom resolution when assessed at 1 month and beyond<sup>5</sup>. A patient with undiagnosed, and therefore untreated BPPV, might therefore, suffer from prolonged symptoms of vertigo, possibly accompanied by imbalance. For this reason, it is our duty, as clinicians, to improve our ability to diagnose BPPV, and therefore, minimize the group of patients with unknown etiology of vertigo.

We initially performed HSDH several years ago, assuming it may be beneficial in diagnosis of patients with a negative DH. Our results confirm this theory, increasing the rate of diagnosis by a 14.5%. This study is not epidemiologically designed, and was not aimed at describing the prevalence of patients with a positive DH (group 1) and those with negative SH but positive HSDH (group 2) out of a known population attending in a vertigo clinic. Like most studies reporting on the diagnosis and management of BPPV, whether retrospective or prospective, we focused on patients with a positive diagnosis and demonstrated that there is significant added diagnosis when performing the head shake, in cases of a negative DH.

We hypothesize that shaking the head mobilizes canaliths adhering to the pSCC, causing the classical presentation of pBPPV, when the head is lowered. The concept of otoconia becoming stuck in the SCC and their mobilization has been suggested by Epley<sup>4</sup> in his first description of the particle reposition maneuver. The author held a bone vibrator of 80Hz on the ipsilateral side of the head, while performing his particle

repositioning treatment. Epley reported that this procedure reactivated nystagmus in several cases, presumably due to the mobilization of adherent canaliths. We hypothesize that this is what happens when we shake the head, during the HSDH.

As with all medical examinations, it is our duty to consider the safety of the HSDH. Limitation in the movement of the cervical spine and neck muscles is considered a contraindication for performing the DH<sup>6</sup>. It should be noted, however, that during a thorough neurotologic exam the head is also moved and shaken during the head thrust test and when examining for post head shake nystagmus. The HSDH, in the study was not performed with force and was well tolerated by all patients in group 2.

Nevertheless, in the head hanging position, gravity would decrease the patient's control over the neck muscles, so caution is necessary.

In group 2 the duration between symptoms and diagnosis was longer, and the patients required less visits till cure, compared to group 1, but this was not statistically significant. This trend, however, is interesting, as it may suggest that patients only positive on HSDH have undergone a partial- spontaneous cure. A larger number of patients is required to confirm this theory. It would also be interesting to see whether the patients in group 2 require less EMs but we did not examine this factor since some of patients in our study could not tolerate repeated EMs due to objective and subjective difficulties (obesity, cervical pain, severe nausea)

Due to the finding of increased diagnostic yield of the HSDH, perhaps we should consider performing it alone, instead of the standard DH. This would, potentially, shorten the duration of the exam and the degree of discomfort to the patient. On the other hand, the HSDH may be more strenuous on the neck and perhaps, should only be reserved for cases of a negative DH.

There have been several studies on patients with BPPV diagnosed only on patient's symptoms (positional vertigo and or nausea associated with changes of head position) without nystagmus<sup>3</sup>. Results of 9 studies on this special situation show remission of symptoms in 50- 97% of patients. How do our findings relate to these results? All patients in group 2 of this study, actually, belong to this group of patients when examined only with the standard DH. Group 2 patients may represent a milder variant, with minimal calcium carbonate debris in the pSCC, or alternatively, a state approaching complete recovery. It is logical to assume that at least a part of the patients with a negative DH would test positive had the HSDH been used.

A shortcoming of this study is that it focuses on patients diagnosed with BPPV, so we do not know the rate of patients with symptoms of BPPV and a negative HSDH that prove negative on HSDH. However, we think the actual introduction of the HSDH and reporting on it's preliminary effect on diagnosis is significant. A future study assessing all patients with symptoms of vertigo and a negative DH, with the HSDH would be a useful continuum of our report.

We conclude that patients with a negative DH should undergo a HSDH, which may reveal presence of pBPPV. To better understand the natural and "post intervention" history of BPPV, further studies are required with a larger population.

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**Table 1:** Comparison of clinical characteristics of patients diagnosed with BPPV by DH (group 1) and those diagnosed only after using the HSDH (group 2)

	Group- 1 DH positive (n=69)	Group 2- Positive only on DSHS (n=12)	P value
Age (years $\pm$ SD)	59.6 $\pm$ 14.5	59.7 $\pm$ 15	0.97
Gender Male: Female	1:2.4	1:2	0.86
Duration of symptoms until diagnosis (days $\pm$ SD)	44.1 $\pm$ 52.4	63.7 $\pm$ 70.8	0.37
No. of visits to cure	1.68 $\pm$ 1.26	1.5 $\pm$ 0.8	0.51
Conversion to horizontal BPPV	7	1	OR 1.24 (CI 95% 0.138-11.11)
Recurrence	0	0	

DH- Dix Hallpike, HSDH- Dix Hallpike while shaking head ; OR- odds ratio. SD- standard deviation.

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