

New Horizontal Canal Benign Paroxysmal Positional Vertigo Treatment: Kurtzer Hybrid Maneuver

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Abstract

Horizontal canal benign paroxysmal positional vertigo (HC-BPPV) can be difficult for practitioners to treat. It can also be difficult for patients to tolerate the treatment effects. We have developed a treatment that reduces the number of positions required during the treatment process while effectively treating all HC-BPPV variants.

Introduction

Benign Paroxysmal Positional Vertigo (BPPV) occurs when otoconia become displaced into one, or more, semicircular canals. Due to the posterior canal's position with respect to gravity, it is the most typical canal for the debris to settle into [1]. However, both the superior and horizontal canals are not immune to debris displacement. The horizontal, or lateral, canal is less likely to have debris than the posterior, but more likely than the superior canal. This canal is the focus of the Kurtzer Hybrid Maneuver (KHM) presented herein.

Horizontal canal BPPV (HC-BPPV) frequently occurs post head trauma [2]. Other factors that may influence otoconia to become displaced into the horizontal canal include: hypovitaminosis D due to its effect on calcium absorption [3], fluctuating blood pressure that affects the arterial supply to the labyrinth, fluctuating blood sugar [4], and improper treatment methods for the posterior or superior canals causing debris to migrate into the horizontal canal. Keeping debris from entering the horizontal canal is of utmost importance because this canal can be more resistant to treatment. As well, subjective experiences of BPPV differ depending on which canal is involved. HC-BPPV is described as more intense of an experience for the patient than posterior canal BPPV (PC-BPPV).

HC-BPPV can be divided into two different variants: canalolithiasis and cupulolithiasis. With respect to the right ear, the cupulolithiasis variant causes ampulofugal movement of fluid in the canal and causes the cupula to signal inhibition

when laying on the affected side (Figure 1). This will result in nystagmus beating away from the affected ear (left-beating, in this case). Laying on the unaffected left side, in this example, will cause ampulopetal movement of the fluid and the cupula to be deflected to an excitatory position, causing right-beating nystagmus.

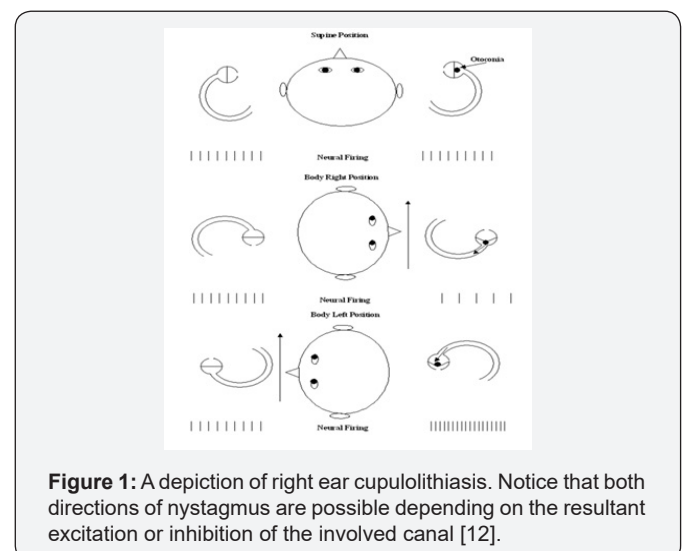


Figure 1: A depiction of right ear cupulolithiasis. Notice that both directions of nystagmus are possible depending on the resultant excitation or inhibition of the involved canal [12].

The canalolithiasis variant, with respect to right ear involvement, will cause the inverse of nystagmus patterns to occur (Figure 2). Laying on the affected right side will cause ampulopetal fluid movement and deflect the cupula to an

excitatory position, causing right-beating nystagmus. Whereas laying on the unaffected side will cause ampulofugal movement and the cupula to be put in the inhibitory position, causing left-beating nystagmus.

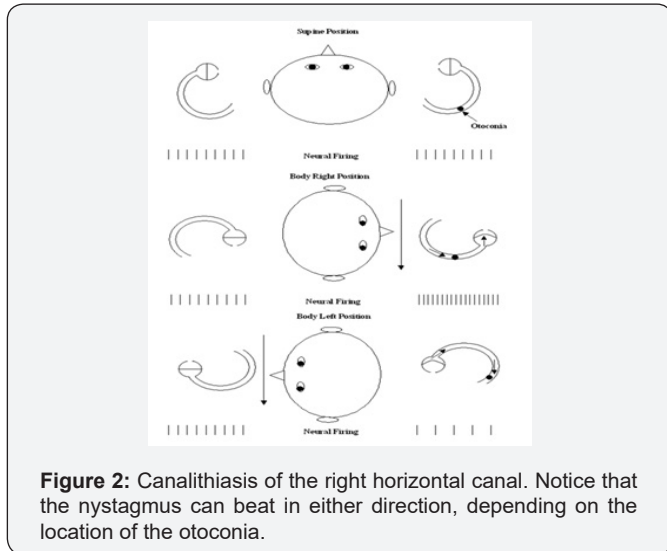


Figure 2: Canalithiasis of the right horizontal canal. Notice that the nystagmus can beat in either direction, depending on the location of the otoconia.

Thus, it can be quite difficult to determine the affected side when a patient presents with transient lateral nystagmus during positional testing as patients may have multi-ear, multi-canal variants, or both cupulo- and canalithiasis. There have been methods proposed to help determine the affected side and the treatment options (Figure 3 for our clinical pathway at The American Institute of Balance).

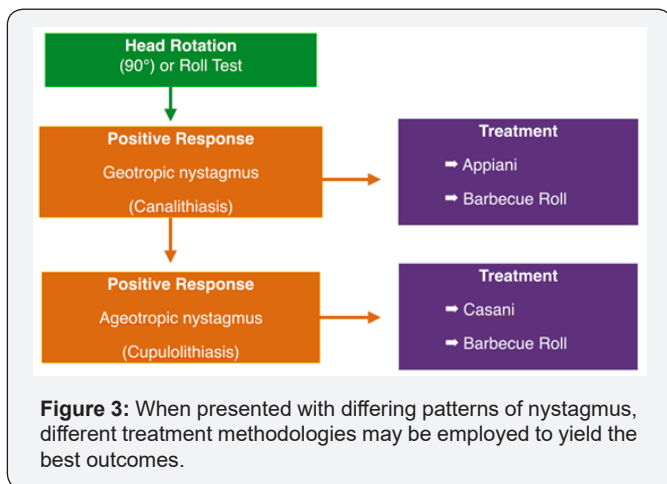


Figure 3: When presented with differing patterns of nystagmus, different treatment methodologies may be employed to yield the best outcomes.

However, in practice, when a patient is extremely dizzy and nauseous from HC-BPPV of any variant, it is often rapid and efficacious to perform a Barbecue Roll technique and then have an academic discussion regarding the side of involvement afterwards. The downsides are that this method can lead to emesis and extreme discomfort for the patient as it would require up to eight different positions to effectively treat all HC-BPPV variants. The KHM consists of Appiani/Casani/Gufoni maneuvers combined into one fluid treatment, which has shown great success (see “Results” section) thus far, has a low incidence

of emesis as it only requires 2-4 potentially provoking positions to treat all variants of HC-BPPV instead of 4-8, and can be utilized without identification of the involved side prior to treatment – although, we recommend reviewing video recordings and/or observations afterwards to determine the nature of the problem.

The Appiani and Casani maneuvers were designed to treat canalithiasis and cupulolithiasis variants of HC-BPPV [5,6]. For the Appiani maneuver, if a patient had geotropic nystagmus (canalithiasis), then they would lay on the unaffected side and proceed to turn the nose down. For the Casani: if the patient had ageotropic nystagmus (cupulolithiasis), they would lay on the affected side and then proceed to turn the nose down [7]. The Gufoni maneuver for ageotropic nystagmus has the patient turn the nose up, which can convert the nystagmus to geotropic [8]. Then, an Appiani maneuver would be completed to finish the treatment process. Combining these three maneuvers into one fluid treatment for nearly all cases of HC-BPPV is the goal of the KHM.

Method of Treatment



Figure 4: A progression through the KHM.
a. The patient begins in a similar position to a side-lying Hallpike test. With the head rotated to the left, the patient will lay on the right side.

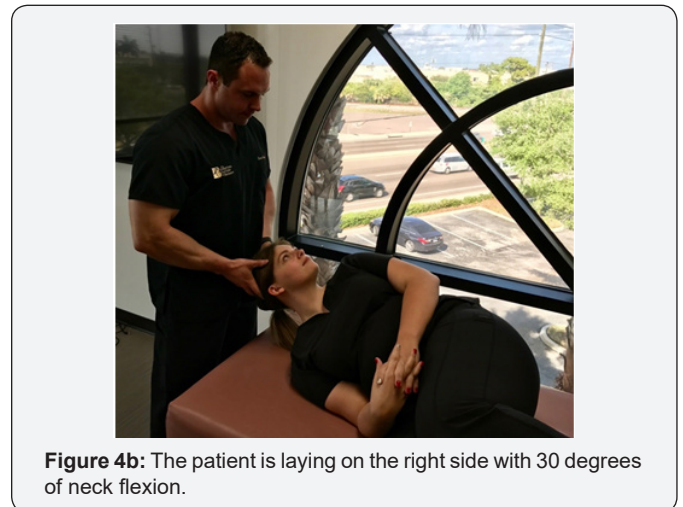


Figure 4b: The patient is laying on the right side with 30 degrees of neck flexion.



Figure 4c: The head is rotated nose-down with 30 degrees of flexion.



Figure 4d: The patient turns the nose back up with 30 degrees of neck flexion and rotates the lower torso to the other side.



Figure 4e: The patient rotates the head nose-down with 30 degrees of flexion, now on the other side. This is the end of the KHM.

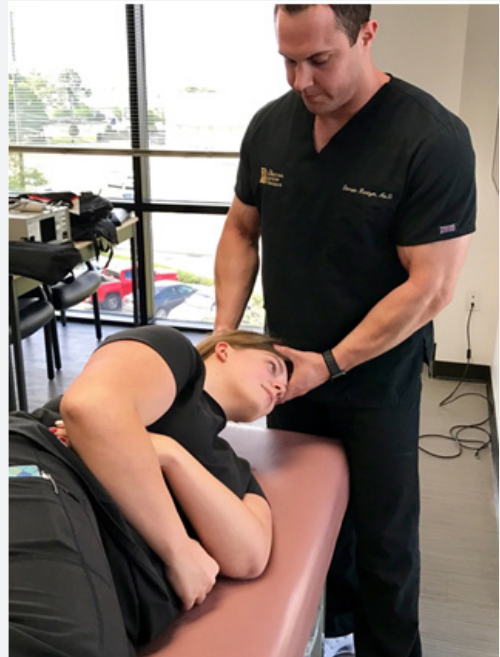


Figure 4f: To re-check (optional), the patient turns their head so that they are looking straight - with no neck rotation.

The KHM (Figure 4) combines the Appiani, Casani, and Gufoni maneuvers so that all variants of HC-BPPV can be treated in a maximum of 4 positions. The patient first lays on the subjectively weaker side with the nose up. However, it is not necessary for the patient to lay on the weaker side first. The patient may lay on either side first with the nose up; the weaker side has preference as the treatment may be more tolerable for the patient. The patient is kept in the nose up position with 30 degrees of flexion for one minute after any nystagmus subsides [9]. This part of the maneuver would be the Gufoni portion. If there were ageotropic nystagmus, it may convert to geotropic after or during this position. The patient then turns the nose down with 30 degrees of flexion. This part of the maneuver is now an Appiani for the opposite horizontal canal, if there was geotropic nystagmus, or a Casani for the side the patient is laying on, if there was ageotropic nystagmus.

The patient remains in this position for one minute after the nystagmus subsides. The patient then turns the nose back up with 30 degrees of flexion and rotates their body to the opposite side so that they are prepared to repeat the same procedure with the head turning in the opposite direction. Theoretically, 50% of patients will be clear by this part of the treatment (see "Discussion" section). However, from our data, 33% of patients were clear by this part of the treatment. We recommend completing the next position as verification for this population, regardless of whether they appear to be clear. If there is any nystagmus, the patient is kept in this position for one minute after it subsides [10,11]. This part of the treatment will be a Gufoni, which may convert ageotropic nystagmus to geotropic

(remember, the patient is laying on the opposite side now). The patient then turns the nose down with 30 degrees of flexion. This part of the treatment is now an Appiani for the opposite ear and a Casani for the side the patient is laying on if there was geotropic or ageotropic nystagmus, respectively. The patient is kept in this position for one minute after any nystagmus subsides. This is the end of the treatment. However, if you would like to verify that the BPPV has cleared, you can turn the patient's head so that they are looking straight (with no rotation) to ensure both vertigo and nystagmus are absent.

Results

Patient age range: 36-93 (Table 1 & 2).

Table 1: Shows 5 patients with geotropic nystagmus in the first treatment position. The initial side of treatment was the subjectively less intense side to the patient. If this was unknown, then the right side was used as the initial side of treatment.

Initial Geotropic Nystagmus	# After ½ Treatment	# After Full Treatment
Emesis	0	1
Cleared during visit	2	3
Clear at follow-up	2	2
Clear at second follow-up	2	3
Total Cleared	2/2	3/3

Table 2: Shows 4 patients with ageotropic nystagmus in the first treatment position. The initial side of treatment was the subjectively less intense side to the patient. If this was unknown, then the right side was used as the initial side of treatment.

Initial Ageotropic Nystagmus	# After ½ Treatment	# After Full Treatment
Emesis	0	0
Cleared during visit	1	3
Clear at follow-up	1	3
Clear at second follow-up	1	3
Total Cleared	1/1	3/3

7 females, 2 males

Discussion

Findings in this collection of data are very promising. Most patients were successfully cleared after one full treatment. Although our treatment does share some properties with the Barbecue Roll (Log Roll) technique, its simplified implementation makes it more beneficial to both the practitioner and the patient. Foremost, our maneuver only requires 4 positions to treat all standard variants of HC-BPPV; the Barbecue Roll would require 8 positions to accomplish this task. The lower amount of provoking positions that induce vertigo lead to less likelihood of emesis (11% in this study). The recurrence rate is very low, with only 1 of the 9 patients requiring an additional treatment on a

follow-up visit one week after the initial treatment. In addition, patients with mobility issues and orthopedic concerns find this maneuver much more comfortable as there is only one necessary body change during the KHM.

Another important benefit of the KHM is that the practitioner does not have to know the involved side prior to treatment initiation. It is expedient and efficacious to perform the full maneuver without regard to the involved canal. By this method, we will not have to put the patient through unnecessary provoking positions trying to find the involved side before the treatment is introduced. Afterwards, review of video recordings and/or observations will help illuminate the side of involvement for a better understanding of the problem.

Theoretically, approximately 50% of patients may require only the first half of the KHM. This is due to the prevalence of the different variants of ageotropic versus geotropic HC-BPPV, and the fact that we prefer to begin on the subjectively weaker side. In this study, 33% were successfully cleared after the first half of the treatment, which reduces the total provoking positions encountered during the KHM to 2. No patients experienced emesis in the ½ treatment category.

Limitations herein include the small sample size. However, we are still actively collecting data for a more expansive project with the KHM compared to other methods, including the Barbecue Roll. Uncommon variants of HC-BPPV, such as those patients with stenotic canals, or other anatomical abnormalities, are unlikely to find additional efficacy with this treatment method as it does nothing to circumvent these issues.

Future research may seek to expand on sample size and further break down the demographics by gender, age, comorbidities, etc.

Conclusion

Our Hybrid HC-BPPV treatment method successfully treated 89% of patients after one maneuver. After an additional visit, 100% of patients in this study were successfully treated. Patients reported this treatment method to be more tolerable than other maneuvers that they have encountered in the past. The emesis rate was lower than what we have encountered here at The American Institute of Balance with other HC-BPPV repositioning maneuvers.

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