

Is the Yacovino maneuver effective in the treatment of anterior canal benign paroxysmal positional vertigo?

Anterior kanal benign paroksizmal pozisyonel vertigo tedavisinde Yacovino manevrası etkili midir?

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ABSTRACT

Objectives: The purpose of our study was to objectively identify the often-overlooked anterior canal benign paroxysmal positional vertigo (BPPV) and to assess the efficacy of the Yacovino treatment maneuver in patients through both objective and subjective evaluations.

Patients and Methods: The prospective study evaluated 360 patients (246 females, 114 males; mean age: 58.7±12.7 years; range, 18 to 75 years) with BPPV between December 2020 and March 2024. We applied the Yacovino treatment maneuver to patients diagnosed with anterior canal BPPV. We evaluated the treatment outcomes using videonystagmography and the Dizziness Handicap Inventory.

Results: Benign paroxysmal positional vertigo of the posterior semicircular canal was observed in 275 (76.3%) cases, BPPV of the horizontal semicircular canal was observed in 62 (17.2%) cases, and BPPV of the anterior semicircular canal was observed in 23 (6.5%) cases. A comparison of total Dizziness Handicap Inventory scores before maneuvers and after recovery revealed a statistically significant improvement in patients ($p<0.001$).

Conclusion: The Yacovino maneuver is easy to apply and highly effective in treating anterior canal BPPV. Supine head hanging test should be conducted in patients who are suspected of having BPPV.

Keywords: Anterior semicircular canal, diagnosis method, Yacovino maneuver.

ÖZ

Amaç: Çalışmamızın amacı genellikle gözden kaçan anterior kanal benign paroksizmal pozisyonel vertigo (BPPV)'yu objektif olarak tespit etmek ve Yacovino tedavi manevrasının hastalardaki etkinliğini hem objektif hem de subjektif olarak ortaya koymaktır.

Hastalar ve Yöntemler: Aralık 2020-Mart 2024 tarihleri arasında yapılan prospektif çalışmada 360 BPPV'li hasta (246 kadın, 114 erkek; ort. yaş: 58.7±12.7 yıl; dağılım, 18-75 yıl) değerlendirildi. Anterior kanal BPPV tespit edilen hastalara Yacovino tedavi manevrası uygulandı. Tedavi sonuçları videonistagmografi ve Baş Dönmesi Engellilik Envanteri ile değerlendirildi.

Bulgular: İki yüz yetmiş beş olguda (%76.3) posterior semisirküler kanalda BPPV, 62 (%17.2) olguda horizontal semisirküler kanalda BPPV ve 23 (%6.5) olguda anterior semisirküler kanalda BPPV saptandı. Manevra öncesi ve iyileşme sonrası toplam Baş Dönmesi Engellilik Envanteri skorları karşılaştırıldığında hastalarda iyileşmede istatistiksel olarak anlamlı fark vardı ($p<0.001$).

Sonuç: Yacovino manevrasının anterior kanal BPPV'de uygulaması kolay ve tedavide etkinliği yüksektir. Benign paroksizmal pozisyonel vertigo düşünülen hastalarda mutlaka "supine head hanging test" yapılmalıdır.

Anahtar sözcükler: Anterior semisirküler kanal, tanı yöntemi, Yacovino manevrası.

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Benign paroxysmal positional vertigo (BPPV), first described by Barany in 1921, is a condition characterized by brief, sudden episodes of rotational dizziness triggered by changes in head position relative to the direction of gravity.^[1-3] Benign paroxysmal positional vertigo is most common in individuals aged 50 to 70 years but can occur in all age groups. It is twice as common in women as in men.^[2]

Benign paroxysmal positional vertigo frequently occurs when the patient lies down, gets up, turns in bed, or bends forward or backward. Patients with BPPV may occasionally report dizziness and a feeling of imbalance, but a careful medical history often indicates that their symptoms tend to worsen with changes in head position.

The pathophysiology of BPPV is explained by two mechanisms, which are “canalithiasis,” where otoconia that have separated from the utricular macula move freely within the affected semicircular canal, and “cupulolithiasis,” where otoconia attach to the cupula.^[4] It can be observed in all the semicircular canals. Previous studies have demonstrated that posterior canal BPPV is the most common form of BPPV, accounting for 60 to 90% of cases, followed by horizontal canal BPPV, accounting for 5 to 30%, and anterior canal (AC)-BPPV, accounting for 1 to 2%.^[5]

Benign paroxysmal positional vertigo treatment involves maneuvers and exercises developed according to the underlying pathology. Identifying the affected canal is crucial for determining the appropriate treatment. The Dix-Hallpike (DHP) maneuver, designed for diagnosing the posterior canal, and the McClure Pagnini (MCP) maneuver (supine roll test), developed for diagnosing the lateral canal, are widely used today.^[3-5] The DHP maneuver and the supine head hanging (SHH) test have become more frequently used for diagnosing AC-BPPV.^[6]

The purpose of our prospective study was to objectively identify the frequently overlooked AC-BPPV and evaluate the efficacy of the Yacovino treatment maneuver in patients through both objective and subjective measures.

PATIENTS AND METHODS

The prospective study evaluated 360 patients (246 females, 114 males; mean age: 58.7±12.7 years; range, 18 to 75 years) with BPPV who were admitted to the Ear, Nose, and Throat Clinic of the Medilife Hospital between December 2020 and March 2024. The duration and type of vertigo, any accompanying hearing loss, tinnitus, aural fullness, neurological

deficit concomitant of the attacks (e.g., facial paralysis, mental haziness, power loss, and syncope), systemic disease, continuous drug use, and history of trauma were questioned. All patients performed pure tone audiometry and stapedius reflex test so as not to omit any additional middle-inner ear pathology. Written informed consent form was obtained from the participants. The study was approved by the Bakırköy Dr. Sadi Konuk Training and Research Hospital Ethics Committee (Date: 20.07.2020, No: 2020/327). The study was conducted in accordance with the principles of the Declaration of Helsinki.

Videonystagmography (VNG) is a computerized, non-invasive, objective test that measures eye movements using infrared goggles. Interacoustics VN415/VO425 (Interacoustics A/S, Middelfart, Denmark) VNG machine was used in our study. Before conducting a VNG, standard precautions were followed. We evaluated oculomotor activities such as saccades, smooth pursuit, gaze with and without fixation, and responses to horizontal high frequency head shake, hyperventilation, lateral canal head impulse test, and positional tests.

Positional nystagmus was checked by performing DHP maneuver with VNG for the posterior canal, MCP maneuver for the lateral canal, and SHH for the anterior canal. For the SHH test, the patient was positioned sitting upright on the stretcher, similar to the DHP maneuver. The practitioner stood behind the patient. The patient's head was not positioned at any angle. The patient was laid on their back on the stretcher with support for their head and neck. After being laid down, the head was tilted as much as possible, hanging off the stretcher (approximately 30°). If nystagmus was observed, the latency, amplitude, duration, and direction were recorded. After the nystagmus stopped, the patient was helped back into a sitting position, while keeping the head in place and supporting the head and neck (Figure 1).

A diagnosis of AC-BPPV was made if a short duration (less than a minute) of vertical down beating nystagmus with or without a torsional component was observed during the DHP maneuver or SHH test. The nystagmus beats predominantly downward but with a small torsional component in which the upper pole of the eye beats toward the affected ear. Patients with AC-BPPV were included in our study.

All AC-BPPV patients were treated by the Yacovino maneuver with the head in hyperextension without a vibrator or drug treatment. The patient was first placed in a sitting position on the examination bed and was then rapidly laid down with the head hanging at an angle of at least 30° over the end of the bed for



Figure 1. The supine head hanging test with videonystagmography.

a duration of 30 sec. The head was then brought up quickly to touch the patient’s chest, and 30 sec later, the head and body were both brought back to a seated position.

The AC-BPPV was classified as definite if the vertigo was resolved by a repositioning maneuver (Yacovino maneuver) and probable if it was refractory.

In our study, in addition to the SHH test with objective VNG, all patients were required to complete the Turkish version of the Dizziness Handicap Inventory (DHI) prior to the maneuver to evaluate the improvement in their quality of life. One week after the Yacovino maneuver procedures, SHH with VNG were repeated for control purposes. The Yacovino maneuver was repeated in patients with ongoing positivity. Recovery was considered improved symptoms and negativity in the control SHH maneuver. All patients were required to recomplete the DHI two weeks after their first arrival.

All patients presenting with AC-BPPV were evaluated by gadolinium-enhanced brain magnetic resonance imaging (MRI) to eliminate a posterior fossa lesion, as cerebellar tumors can present with positional vertigo and vertical down beating nystagmus.

Patients with gaze-evoked nystagmus (30° horizontally and vertically), positive result of the DHP and MCP maneuvers, evidence of ongoing central nervous system disease (e.g., transient ischemic attack), otitis media, otosclerosis, vestibular complaints other than positional vertigo, and patients who were unable to tolerate the DHP maneuver were excluded.

Statistical analysis

The patients’ data were analyzed using IBM SPSS version 29.0 software (IBM Corp., Armonk, NY, USA). Descriptive statistics were expressed as frequency and percentage. The paired samples t-test was used to compare pre- and post-treatment DHI results. A p-value <0.05 was considered statistically significant for all tests.

RESULTS

The diagnostic criteria corresponded to BPPV of the posterior semicircular canal in 275 (76.3%) cases, BPPV of the horizontal semicircular canal in 62 (17.2%) cases, and BPPV of the anterior semicircular canal in

Table 1 Clinical and demographic characteristics of patients with AC-BPPV (n=23)			
	n	%	Mean±SD
Sex			
Male	10	43.4	
Female	13	56.6	
Duration of vertigo (days)			4.9±9.8
Etiology			
Trauma	4	17.4	
Idiopathic	19	82.6	
First episode of vertigo			61

AC: Anterior canal; BPPV: Benign paroxysmal positional vertigo; SD: Standard deviation.

Pre-treatment total DHI average	Post-treatment total DHI average	
60.95	13.05	p<0.001
DHI: Dizziness handicap inventory.		

23 (6.5%) cases. Anterior canal BPPV patients' female to male ratio and demographic data were recorded (Table 1).

At the first week follow-up of 23 patients with AC-BPPV, nystagmus was not detected in 19 during the SHH test with VNG. These patients did not report any complaints. These 19 (82.6%) patients were confirmed to have AC-BPPV.

Although the symptoms improved in the other four patients, nystagmus persisted. Yacovino maneuvers were repeated. After one week, no symptoms or nystagmus were observed. These four (17.4%) patients were diagnosed with probable AC-BPPV.

A comparison of total DHI scores before maneuvers and after recovery revealed a statistically significant improvement in patients ($p<0.001$; Table 2).

Gadolinium-enhanced brain MRI was normal in every case of BPPV of the anterior semicircular canal. No relapse was detected during the six-month follow-up of patients who underwent Yacovino maneuvers. No complications were observed.

DISCUSSION

The initial report on AC-BPPV was presented by Katsarkas^[7] in 1987. Anterior canal BPPV is considered rare for anatomic considerations because the anterior canal is higher than both the posterior and lateral ones. Furthermore, the fact that the posterior arm of the anterior canal descends directly into the common crus and vestibule should cause a continuous self-clearing of otoliths from the canal.^[8]

The anterior (superior) canal is rarely stimulated during daily activities because of positional factors. Anatomical factors, including the direct connection of the posterior canal to the vestibule via the crura and the quick removal of any debris inside, help explain why this canal is involved in only 1 to 2% of BPPV cases.^[3] However, the frequency of BPPV of the anterior semicircular canal may be higher than it appears, as some studies estimate that it represents 1.2 to 21.2% of all cases of BPPV.^[9] This difference is due to the fact that the diagnosis can sometimes be overlooked, and because of its anatomical position,

there is tendency for spontaneous healing. In our cases, the rate of AC-BPPV was found to be 6.5%.

Each type of BPPV is diagnosed by observing nystagmus patterns triggered during repositioning, which is designed to move the affected canal in the direction of maximum gravitational force. However, to observe nystagmus correctly, it is necessary to eliminate fixation during the maneuvers.^[1-4] In our study, we performed VNG on all patients for diagnosis and treatment follow-up due to its accuracy and objectivity. In addition, we subjectively administered the DHI before and after treatment to assess quality of life.

Stimulation of the anterior semicircular canal leads to the contraction of the ipsilateral superior rectus and contralateral inferior oblique muscles, resulting in a torsional vertical component that causes downward nystagmus.^[10] The diagnosis of AC-BPPV can be made using the DHP maneuver, while the SHH maneuver, proposed by Yacovino et al.,^[6] can also be used as an alternative. In the DHP maneuver, the vertical component of the horizontal-rotatory nystagmus in anterior and posterior canal cupulolithiasis is downward. Katsarkas^[7] noted that in some cases of BPPV, nystagmus during the DHP maneuver lasted more than 25 to 30 sec and was directed toward the uppermost ear. It was suggested that this condition could involve either cupulolithiasis in the lower ear or stimulation of the superior (anterior) canal in the upper ear. If the downward-beating torsional nystagmus during the positional test is directed toward the lower ear, the anterior canal should be considered, whereas if it is directed toward the opposite side (ageotropic), posterior canal cupulolithiasis should be prioritized. However, particularly in anterior canal cases, the short duration of nystagmus can make it difficult to detect visually in practice. Thus, distinguishing between the anterior and posterior canals and the affected side is quite challenging in these cases. Furthermore, variations in the anatomy of the anterior canal can affect the nystagmus observed during the supine position or when transitioning from supine to a sitting position.^[5] Crevits^[3] stated that the SHH technique provided more reliable and noticeable responses in patients compared to the DHP maneuver. In our cases, we used the SHH technique in combination

with VNG. We consider SHH to be effective in diagnosis.

Anterior canal BPPV is frequently missed during examinations. In many clinics, patients undergo only the DHP maneuver, and if the results are normal, further tests are planned to rule out other vestibular or central disorders. This leads to a loss of both time and labor, as well as extending the patient's treatment period. Evren et al.,^[11] demonstrated in a study published in 2017 that repeating diagnostic maneuvers during clinical assessment improved the diagnostic accuracy in BPPV patients.

In numerous cases, a specific cause of BPPV may not be determined. Factors associated with the etiology of BPPV include temporal bone and head trauma, labyrinthitis, stapes surgery, female sex, older age, Meniere's disease, and osteoporosis.^[12,13] In our patients, trauma emerged as the most prominent factor (19.4%). Apart from these patients, no specific cause could be determined. The proportion of females (56.6%) was greater than that of males (43.4%). However, this difference was not statistically significant ($p > 0.005$).

Anterior (superior) canal BPPV is uncommon because its structure is not conducive to the entry of otoconia. Compared to other BPPV cases, its symptoms are of shorter duration. Some cases can resolve with other canalith repositioning maneuvers (CRMs). Because distinguishing between sides is challenging, there are differing opinions on which CRM should be applied. It has been put forward that treatment is provided with the reverse Epley or Semont maneuvers.^[14] Imbaud-Genieys^[15] reported treating 20 cases of AC-BPPV using the modified Epley maneuver. Honrubia^[16] diagnosed AC-BPPV in four patients within BPPV series and reported a 50% success rate with the reverse Epley maneuver. Yacovino et al.^[6] reported successful results using the SHH technique.

In our patients, after confirming the diagnosis using VNG, we performed the Yacovino maneuver. At the seven-day follow-up, 19 of our 23 patients fully recovered, according to VNG. The remaining four patients fully recovered with repeated Yacovino maneuvers. Furthermore, the DHI scoring we conducted showed a statistically significant difference before and after treatment. ($p < 0.001$).

Downward nystagmus caused by AC-BPPV and cerebellar or brainstem pathologies should be carefully examined and differentiated.^[17] Therefore, we made sure to perform MRI imaging on all patients where AC-BPPV was suspected. We did not detect any problems on MRI in any of our patients.

The primary limitation of this study is the limited number of patients; however, we believe the findings are meaningful due to the infrequency of anterior canal cases. We did not consider it appropriate to include a control group receiving no treatment maneuvers or alternative maneuvers.

In conclusion, the effectiveness of the Yacovino maneuver in AC-BPPV cases was demonstrated both objectively, using VNG, and subjectively, through a questionnaire. The Yacovino maneuver is simple to perform and highly effective for treating AC-BPPV. The SHH test should be conducted in patients who are suspected of having BPPV.

Data Sharing Statement: The data that support the findings of this study are available from the corresponding author upon reasonable request.

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