



What Benefits Does Dix-Hallpike Maneuver Yield?

Abdurrahman Bozkurtan, Süheyl Haytoğlu, Soner Kadıköylü, Gökhan Kuran, Osman Kürşat Arıkan

Objective: Benign paroxysmal positional vertigo (BPPV) is a disease characterized by typical symptoms and signs that can be diagnosed easily with the Dix–Hallpike maneuver. The aim of our study was to highlight the importance of rapidly diagnosing and treating this situation by referring patients suffering from vertigo and BBPV to an ear-nose-throat (ENT) specialist for appropriate management. Thus, the unnecessary health expenses of our country and increasing expenses worldwide for the diagnosis and treatment of BPPV can be prevented, and further unnecessary investigations conducted on these patients admitted to hospitals will be decreased. Also, health will be restored in a short period.

Methods: In this study, 38 patients which applied to Adana Numune Education and Research Hospital ENT clinic between January 2013 and June 2013 with the complaint of vertigo and in which detected posterior semicircular canal pathology by Dix Hallpike maneuver were included. The lab tests and imaging analyses performed by other clinics were queried to exhibit the cost of unnecessary studies before applying to an ENT specialist.

Results: The type of vertigo, period of vertigo, vertigo with tinnitus, fullness in the ear, hearing loss, vertigo attacks with neurologic deficit (weakness, balance impairment, facial paralysis, headache, syncope attacks etc.), permanent drug use, systemic disease, presence of trauma history were queried in patients history. Neurologic and ear-nose-throat examination were performed to all patients. Thirty-eight patients with posterior BBPV according to examination results were included to our study. Twenty-six women (68.4%) and 12 men (31.6%) between the age of 40-72, totally 38 patients, with median age 55.1 were included.

Conclusion: The diagnosis of BBPV can be exhibited according to anamnesis and Dix-Hallpike maneuver. Easily diagnosable and treatable disease of BBPV by ENT specialist which is unknown and is not considered important by other clinics increases 7 times more the unnecessary spendings. For his reason when these patients's anamnesis are taken and are thought as BBPV, before any examination and imaging studies they should be referred to ENT specialist. Thus according to prevention of unnecessary health spendings contributes economy of our country.

Keywords: Benign paroxysmal positional vertigo (BPPV), Dix–Hallpike, Epley

Introduction

Benign paroxysmal positional vertigo (BPPV) is the most common peripheral vestibular disorder (1, 2). It was first defined by Barany in 1921 (3). BPPV is a clinical picture encountered in an intense vertigo clinic with a frequency constituting 17% of vertigo cases. (1). Epley (4) reported that 25% of dizziness is because of BPPV. It has been reported that to occur more in women, and the onset age of the disease for both sexes becomes more frequent in the fourth decade of life (5). Posterior BPPV, which develops depending on the posterior semicircular canal pathology, is a syndrome characterized by brief rotational vertigo and nystagmus attacks that may occur with the head turned aside in the supine position, with the head extended in the upright stance, while leaning forward, and with all kinds of head rotations (6). The diagnosis of BPPV is made by analyzing the medical history and by observing a typical positional nystagmus that can be provoked with the Dix–Hallpike maneuver (7).

Methods

For this research, ethical approval was obtained from Adana Numune Training and Research Hospital, Non-interventional Clinical Research Ethics Committee with the number EK. 2015/118.

Thirty-eight patients who applied to the Adana Numune Training and Research Hospital ear-nose-throat (ENT) clinic between January 2013 and June 2013 due to dizziness and in whom vertigo and nystagmus findings specific to the semicircular canal pathology were observed were included in this study. In the Dix–Hallpike maneuver, the following were considered as positive criteria: 1) After a latent period of 10–15 s, when the left ear was below, a clockwise rotational nystagmus was seen and when the right ear was below (toward the ear below), a counter-clockwise rotational nystagmus was seen, which were for generally less than 30 s; 2) When the person was seated, a rotational nystagmus at the opposite side was seen; 3) When the Dix–Hallpike maneuver was repeated, the nystagmus slowed down and disappeared; and 4) Vertigo was simultaneously observed with the nystagmus.

This study was presented at the 2nd Vertigo Academy International, 22-23 May 2015, Moscow, Russia.

Clinic of Otorhinolaryngology, Adana Numune Training and Research Hospital, Adana, Türkiye

Address for Correspondence:
Abdurrahman Bozkurtan
Phone: +90 506 781 42 44
E-mail: abozkurtan@gmail.com

Received:
14.12.2014

Accepted:
18.04.2015

© Copyright 2015 by Available online at
www.istanbulmedicaljournal.org

The patients were asked about their vertigo form and duration, ringing in the ears because of vertigo, aural fullness, hearing loss, neurological deficits with vertigo attacks (strength less, balance disorder, facial paralysis, severe headaches, or syncope attacks), continuous drug use, a systemic disease, and whether there was a previous history of trauma. Written informed consent was taken from all patients included in this study.

Statistical analysis

Descriptive statistics were used in this study, and while obtaining the descriptive statistics, n (%) for discrete variables and the mean for continuous variables were provided.

Results

All patients underwent detailed neurological and otolaryngology examinations. Thirty-eight patients diagnosed with posterior BPPV were included in the study. Twenty-six (68.4%) of these 38 patients were females, and their ages ranged from 40 to 72 years. The mean age of the patients was 55.1 years.

Dix–Hallpike maneuver

The Dix–Hallpike maneuver begins after seating the patient on an examination table. Immediately after turning the patient's head 45° to the right, the patient is quickly laid under the control of the doctor (Figure 1). To bring the posterior semicircular canal to an upright position with the horizontal semicircular canal, the patient's head should be drooping over the edge of the examining table at 30° and 45° facing to the right (Figure 2). When in this position, nystagmus findings and potential complaints of vertigo are monitored. After a while, the patient is brought to the initial sitting position. The same maneuver is also repeated for the left side (Figure 3, 4).

Observing an increase in the number vertigo complaints and rotational nystagmus in patients through the Dix–Hallpike maneuver shows that the ear below is affected. During the test, the patient's eyes must be open. To ensure this, the doctor, while supporting the patient's head with one hand, can keep the eyelids open with the other. In a patient with BPPV, during the Dix–Hallpike maneuver, when the head is laid, a latent period of 3–10 s, followed by 20–45 s of rotational nystagmus and vertigo that are in crescendo–plateau–decrescendo phases occur. The observed rotational nystagmus is toward the ear below in clockwise direction for the left ear and counter-clockwise direction for the right ear. When we bring the patient in an upright sitting position, a rotational nystagmus that is shorter and in the opposite direction is observed. A gradual decrease in the number of complaints by repeating the test is a significant finding. A fatigue and adaptation mechanism is the matter.

In our study, a detailed anamnesis was taken from all patients. Other clinics they applied to since the beginning of dizziness, laboratory tests conducted, and imaging methods and treatments given during this time were questioned. The beginning time of the dizziness of patients ranged from 1 day to 90 days with a 21-day average; it was 10 days and less in 16 patients, 11–15 days in 8 patients, 20–30 days in 10 patients, and 60–90 days in 4 patients. Ten of the 38 patients had applied to another ENT clinic before our clinic. The Dix–Hallpike maneuver was performed in only 1 of these 10 patients, and the patient said that it was negative.



Figure 1. Turning the patient's head 45° to the right

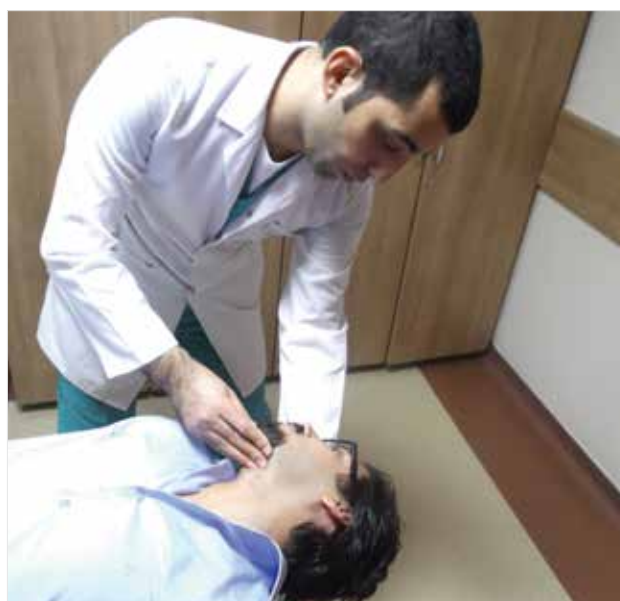


Figure 2. The patient's head should be drooping over the edge of the examining table at 30° and 45° facing to the right



Figure 3. Turning the patient's head 45° to the left



Figure 4. The patient's head should be drooping over the edge of the examination table at 30° and 45° facing the left

Only 1 of the 38 patients had applied only to an ENT clinic. The other 37 patients had been seen by at least 2 specialty clinics for vertigo; 30 patients went to a neurology clinic, 20 went to an emergency department, and 4 went to internal medicine clinics, and all these patients were seen by a family doctor at least once to be treated or to get a prescription of the medication they used. Only 1 of the 38 patients did not undergo a laboratory and imaging examination. The reason for this was that the patient who first applied to an internal medicine clinic applied to our ENT clinic before going to the laboratory for the blood test and he was told that he did not need to undergo examinations; the tests were thus canceled. In addition, brain magnetic resonance (MR) imaging and brain computed tomography (CT) requested for another patient were canceled. Twenty-two of the 37 patients had applied to us with laboratory tests (whole blood, biochemistry, and sedimentation), 10 with brain MR imaging, 30 with brain CT, 4 with vertebral artery Doppler ultrasonography, 2 with posteroanterior chest X-ray, 4 with electrocardiogram, and 4 with pure tone audiometry. When the patients applied to our clinic, drug therapy had been started with 20 of them. Double vestibular suppressant medications with 14 patients, triple vestibular suppressant medications with 2, and a single vestibular suppressant medication with 4 had been started. The duration of use was 2–90 days and the average was 17 days. Two of the patients had been using medications for 90 days, and 10 of them had been using for less than 10 days. After identifying the affected side through the Dix–Hallpike maneuver, 34 (89.4%) patients in whom the canalith repositioning procedure was performed completely recovered at the first application and 4 (10.5%) completely recovered after the second application. The mean age of these 4 patients was 63 years.

Epley maneuver

Turning the patient's head by approximately 45° toward the direction where the pathology is, the patient is quickly laid on the table with the head hanging by approximately 30°. Dizziness and nystagmus are observed when the patient is in this position, and if any, symptoms recovery is awaited. When the patient's head is in a 30°-drooping position, it is brought to the medium level; after this, the head is turned by approximately 45° in the other direction. If vertigo or nystagmus is observed in the patient in these positions, the recovery of complaints is awaited; if they are not observed, an approximately 1-min waiting time is required. After

that, the patient told to turn onto the shoulder where the pathology does not exist. When the patient turns, the doctor turns the patient's head 90 more degrees, and in this position, a waiting period of approximately 1 min is needed. The patient is brought to the sitting position, and bringing the patient's head 20° forward and down, after a 1-min waiting period in this position, the maneuver is completed.

All patients were advised to avoid sudden head movements, to hold their head upright to prevent otolithic debris to return to the posterior semicircular canal, to sleep with their head as high as 30–45°, and to avoid sleeping with their head turned to the affected side for 7 days following the treatment. Seven days after the canalith repositioning procedure, the complaints of patients were questioned and the Dix–Hallpike maneuver was performed. The canalith repositioning procedure was repeated in unresolved cases.

Discussion

Benign paroxysmal positional vertigo is most frequently seen among vertigo causes related to peripheral vestibular system disorders. It comes the first among the causes of vertigo encountered by ENT specialists. The lifetime prevalence in Germany is 3.2% in women and 1.6% in men, with an average of 2.4%. The annual incidence was calculated to be 0.6%; 480,000 German adults suffer from BPPV in a year (8). BPPV is a disorder that disrupts a patient's quality of life causing loss of labor, and it has an important place in health care expenditure because of unnecessary laboratory and imaging tests (Table 1, 2); despite this, it is a disorder that can be easily diagnosed and treated. In the United States of America, it is estimated that in 2011, \$ 3.9 billion was spent for imaging and laboratory tests on patients applying to emergency services because of severe dizziness, and that expenditure will be \$ 4.4 billion in 2015 (9). If it is considered that the reason of a significant number of patients applying with a complaint of dizziness caused by the inner ear and a significant proportion of them are due to BPPV, the importance of the Dix–Hallpike maneuver is seen to prevent unnecessary health care expenditures to make the diagnosis of BPPV. In the current study, the total amount of health care expenditures to diagnose the 38 patients applying to other clinics rather than an ENT clinic with the complaint of dizziness is 4026 Turkish Liras (Table 1, 2). If the Dix–Hallpike maneuver had been performed before laboratory and imaging tests were demanded from these 38 patients, the health care expenditure for the patients would have been 589 Turkish Liras, which is only the total of the examination fees. According to this calculation, it was seen that in BPPV, not performing the Dix–Hallpike maneuver in the first examination increased the diagnosis cost by approximately 7 times (Table 3). Considering that in America the health costs associated with vertigo in 2015 will be \$ 4.4 billion and that the annual number of new patients with BPPV in Germany whose population is close to Turkey's, the contribution of the Dix–Hallpike maneuver to health care expenditure cannot be underestimated. BPPV was first defined by Barany in 1921 (3). Its other characteristics were determined by Dix and Hallpike in 1952 (7). Positional nystagmus specific to this condition was also described by Dix and Hallpike (7). Schuknecht developed the cupulolithiasis theory through pathognomonic studies of the disease in 1963 (3). Epley (4) reported that BPPV is related to canalolithiasis and developed a maneuver known as Epley maneuver. Ménière's disease, labyrinthitis,

Table 1. Imaging and analysis costs paid by the Social Security Institution (SSI) to public hospitals in 2013

Whole blood analysis	22	3
Biochemical analysis	22	15
Brain computed tomography	26	55
Brain MR imaging	10	65
Doppler ultrasonography	4	21
ECG	4	3
Audiological examination	4	3
Chest radiography	2	6
Total (TL)		
MR: magnetic resonance; ECG: electrocardiography		

Table 2. Examination costs paid by the Social Security Institution (SSI) to public hospitals in 2013

Neurology	30	15.5
Emergency	20	15.5
Internal medicine	4	15.5
Ear, nose, and throat	38	15.5
Total		

Table 3. Cost ratio increased by 6.8 times in patients diagnosed without the Dix–Hallpike Maneuver

Other clinics	38	4026 (2600+1426)
Ear, nose, and throat clinic	38	589

trauma, stapes surgery, advanced age, and female gender are factors that cause BPPV (12-15). The place of medical treatment in BPPV is still controversial. Medical treatments with various drugs are not as effective as physical treatments. However, they can be used in patients with dizziness and in the treatment of nausea. Ondansetron, diazepam, and meclizine can be used (16).

In vertigo related to the posterior semicircular pathology, a therapeutic maneuver was first defined by Semont et al. (17) in 1988. With this maneuver called the Semont maneuver, success was obtained at a rate of 84% after the first application and 93% after the second application (17). Epley (4), in 1992, defined the canalith repositioning maneuver, which involves less jarring of the patient in comparison to the Semont maneuver, to treat patients with vertigo related with posterior semicircular canal pathologies in the same way using specific repositioning maneuvers. With this maneuver called the Epley maneuver, a recovery at a rate of 70–90% was obtained (18-21). Blakley (22), using a modified Epley maneuver in 38 patients with vertigo complaints, compared two patient groups in which he performed and did not perform treatment. He reported that there was no significant difference between these two groups of patients who he observed for a month in terms of recovery of vertigo complaints. Lynn et al. (23), in a study which they conducted in 36 patients with vertigo complaints depending on posterior semicircular canal pathologies, reported recovery by the end of a

month at a rate of 27% in the first group that had no treatment and in the second group in which the Epley canalith repositioning maneuver was applied, a recovery rate of 89% was obtained, although it was asymptomatic. Steenerson et al. (24) treated 20 of 40 vertigo patients with the Epley maneuver and the other 20 with vestibular habituation exercises. When they compared these groups with 20 patients who did not receive any treatment, they found that after 3 months, although recovery at a rate of 25% was obtained in the group receiving no treatment, vertigo complaints recovered in all patients undergoing the Epley maneuver and vestibular habituation exercises. After the Epley maneuver, Özturan et al. (25) reported a success rate of 88%, Erdamar et al. (26) a rate of 80%, İşeri et al. (27) a rate of 84.4%, and Ünal et al. (28) a rate of 81.4%. In this study, 34 (89.4%) of the 38 patients for whom we diagnosed BPPV and performed the Epley maneuver stated that their complaints resolved after the first application and 4 (10.5%) stated that their complaints resolved after the second application; these patients also reported that they felt more confident.

Benign paroxysmal positional vertigo diagnosis that severely distorts the quality of life and has a widespread occurrence in the community can be made with the observation of positional nystagmus obtained through a good history and the Dix–Hallpike maneuver and increasing vertigo complaints. In patients who do not have any vestibular and neurologic complaints except positional vertigo depending on head movements, performing maneuvers with the intention of disease diagnosis and treatment before laboratory and imaging test will provide great advantages in terms of time and cost. The canalith repositioning procedure is inexpensive, effective, non-invasive, and without a serious risk; can be applied in 10 min in the examination room immediately after BPPV diagnosis; and gives results in a short time. This clinical picture where the diagnosis and treatment can be made by an ENT specialist is not sufficiently known by other branches or the importance required is not given, and this increases medical expenses by approximately 7 times to diagnose this disorder (Table 3). Considering the annual incidence of BPPV in our country with a population of approximately 77 million, the contribution of the Dix–Hallpike maneuver to the national economy can be seen in our study. ENT clinic rooms must be equipped in accordance with these maneuvers and thus, these patients should be cured sparing the time needed to the patient. When the history of patients is taken and when there a thought of probable BPPV by other branches, they should be directed to an ENT specialist before undergoing any tests or imaging. Patients with any neurological deficit together with vertigo (mental fuzziness, weakness, syncope, and facial paralysis), a history of a systemic disease or trauma causing vertigo, and with vertebral or muscular disease forming an obstacle in performing the Dix–Hallpike maneuver were not included in this study.

Conclusion

Among vestibular system diseases, BPPV is most frequently seen, and it considerably disrupts a patient's quality of life; despite this, it is a disorder that can be easily diagnosed and treated. The diagnosis of BPPV can be made by obtaining the medical history and by observing positional nystagmus through the Dix–Hallpike maneuver. The canalith repositioning procedure in BPPV to make a diagnosis is inexpensive, effective, non-invasive, without a serious risk, can be applied in 10 min in an examination room immediately after diagnosis, and gives a result in a short time. Therefore,

when the history of patients is taken by other branches and BPPV is considered, they should be directed to an ENT specialist before undergoing any examination and imaging.

Ethics Committee Approval: Ethics committee approval was received for this study.

Informed Consent: The patients were appraised of the study details prior to providing written informed consent.

Peer-review: Externally peer-reviewed.

Author Contributions: Concept - A.B., S.H., S.K., G.K., O.K.A.; Design - A.B., S.H., S.K., G.K.; Supervision - A.B., S.H., S.K., G.K., O.K.A.; Funding - A.B., S.H.; Materials - A.B., S.H., G.K.; Data Collection and/or Processing - A.B., S.H.; Analysis and/or Interpretation - A.B., S.H.; Literature Review - A.B., S.H., S.K.; Writer - A.B., S.K.; Critical Review - O.K.A.

Conflict of Interest: No conflict of interest was declared by the authors.

Financial Disclosure: The authors declared that this study has received no financial support.

References

- Nedzelski JM, Barber HO, McIlmoyl L. Diagnosis in a dizziness unit. *J Otolaryngol* 1986; 15: 101-4.
- Bath AP, Walsh RM. Therapeutic Efficiency of the Epley Canalith repositioning maneuver. *Am J Otol* 2000; 21: 92-7. [\[CrossRef\]](#)
- Schessel DA, Minor LB, Nedzelski J. Meniere's Disease and Other Peripheral Vestibular Disorders. in: Fredricksson JM, Harker LA, Krause CJ, Schuller DE, Richardson MA, editors. *Pediatric Otolaryngology Head&Neck Surgery Third Edition* 1998; 137: 2686-8.
- Epley JM. The canalith repositioning procedure: for threatment of benign paroxysmal positional vertigo. *Otolaryngol Head Neck Surg* 1992; 107: 399-404.
- Mizukoshi K, Watanabe Y, Shojaku H, Okubo J, Watanabe I. Epidemiological studies on benign paroxysmal vertigo in Japan. *Acta Otolaryngol Suppl (Stockh)* 1988; 37: 371-8. [\[CrossRef\]](#)
- Baloh RW, Honrubia V, Jacobsan K. Benign positional vertigo: Clinical and oculographic features in 240 cases. *Neurology* 1987; 37: 371-8. [\[CrossRef\]](#)
- Dix MR, Hallpike CS. The pathology, symptomatology and diagnosis of certain common disorders of the vestibular system. *Proc R Soc Med* 1952; 54: 341-54. [\[CrossRef\]](#)
- Von Brevern M, Radtke A, Lezius F, Feldmann M, Ziese T, Iempert T, et al. Epidemiology of benign paroxysmal positional vertigo: a population based study. *J Neurol Neurosurg Psychiatry* 2007; 78: 710-5. [\[CrossRef\]](#)
- Ali S. Saber Tehrani, Yu-Hsiang Hsieh, Georgios Mantokoudis, Frederick K. Korley, and Kevin D. Frick, Cost Of Treating Dizziness In The Emergency Room Soars. *Hopkins Medicine Fall* 2013.
- Akyıldız N. Kulak Hastalıkları ve Mikrocerrahisi 2002; 2: 84-140.
- Honrubia V, Baloh RW, Harris MR, Jacobson KM. Paroxysmal positional syndrome. *Am J Otol* 1999; 20: 465-70
- Chang WC, Hsu LC, Yang YR. Balance ability in patients with benign paroxysmal positional vertigo. *Otolaryngol Head Neck Surg* 2006; 135: 534-40. [\[CrossRef\]](#)
- Jason AT, Parne LS. Benign paroxysmal positional vertigo: mechanism and management. *Otology and neurootology* 2001; 9: 284-9.
- Tanimoto H, Doi K, Nishikawa T, Nibu K. Risk Factors for Recurrence of Benign Paroxysmal Positional Vertigo. *J Otolaryngol Head Neck Surg* 2008; 37: 832-5.
- Atacan E, Sennaroglu L, Genc A, Kaya S. Benign Paroxysmal Positional Vertigo After stapedectomy. *Laryngoscope* 2001; 111: 1257-9. [\[CrossRef\]](#)
- Hain TC, Uddin M. Pharmacological Treatment of Vertigo. *CNS Drugs* 2003; 17: 85-100. [\[CrossRef\]](#)
- Semont A, Freyss G, Vitte E. Curing the BPPV with a liberatory maneuver. *Adv Otorhinolaryngol* 1988; 42: 290-3. [\[CrossRef\]](#)
- Haynes DS, Resser JR, Labadie RF, Girasole CR, Kovach BT, Scheker LE, et al. Treatment of benign positional vertigo using the semont maneuver: efficacy in patients presenting without nystagmus. *Laryngoscope* 2002; 112: 796-801. [\[CrossRef\]](#)
- Pollak L, Davies RA, Luxon LL. Effectiveness of the particle repositioning maneuver in benign paroxysmal positional vertigo with and without additional vestibular pathology. *Otol Neurotol* 2002; 23: 79-83. [\[CrossRef\]](#)
- Nunez RA, Cass SP, Furman JM. Short- and long-term outcomes of canalith repositioning for benign paroxysmal positional vertigo. *Otolaryngol Head Neck Surg* 2000; 122: 647-52.
- Wolf JS, Boyev KP, Manockey BJ, Mattox DE. Success of the modified Epley maneuver in treating benign paroxysmal positional vertigo. *Laryngoscope* 1999; 109: 900-3. [\[CrossRef\]](#)
- Blakley BW. A randomized, controlled assessment of the canalith repositioning maneuver. *Otolaryngol Head Neck Surg* 1994; 110: 391-6.
- Lynn S, Pool A, Rose D, Brey R, Suman V. Randomized trial of the canalith repositioning procedure. *Otolaryngol Head Neck Surg* 1995; 113: 712-20. [\[CrossRef\]](#)
- Steenerson RL, Cronin GW. Comparison of the canalith repositioning procedure and vestibular habituation training in forty patients with benign paroxysmal positional vertigo. *Otolaryngol Head Neck Surg* 1996; 114: 61-4. [\[CrossRef\]](#)
- Özturan O, Çökkeser Y, Saydam L, Kızılay A, Solmaz F. Benign Paroksizmal pozisyonel vertigo ve kanalit repozisyon prosedürü. *Kulak Burun Boğaz İhtisas Dergisi* 1998; 5: 516-21.
- Erdamar B, Süoğlu Y, Katırcıoğlu S, Sunay T, Karatay MC. Partikül yeniden yerleştirici manevra: Benign paroksizmal pozisyonel vertigoda egzersiz tedavisi. *Kulak Burun Boğaz İhtisas Dergisi* 1998; 5: 178-81.
- İşeri M, Keskin G, Akdeniz Ö, Özkarakas H, Kutluay P. Benign paroksizmal pozisyonel vertigoda modifiye Epley Manevrası. *Kulak Burun Boğaz İhtisas Dergisi* 1999; 9: 50-4.
- Ünal M, Görür K, Özcan C. Benign Paroksizmal Pozisyonel vertigo tedavisinde modifiye Epley manevrası ile elde edilen sonuçlar. *Otoskop* 2000; 1: 113-9.