CLINICAL STUDY

THE ANALYSES OF BENIGN PAROXYSMAL POSITIONAL VERTİGO WİTH VIDEONYSTAGMOGRAPHY AMONG THE ELDERLY POPULATION

Esra ERYAMAN MD

Özel Mecidiyeköy Çevre Hastanesi, KBB, İstanbul, Turkey

SUMMARY

Objectives: The purpose is to discuss the behavior of benign paroxysmal positional vertigo among the elderly population.

Design: A total of 52 BPPV patients aged, 60 to 92 (mean age 70.7± 8.57) between April 2013 and November 2016 were included in the study. Visual images during diagnostic maneuvers were recorded and analyzed by videonistagmography (VNG). The European Evaluation of vertigo scale (EEV) was administered before and after the treatment. The R Project for Statistical Computing was used for statistical analyses.

Results: 52 (9.4 %) elderly people over 132 total BPPV patients in Ozel Cevre Hospital, Istanbul, Turkey were included in the study. 63.5 % (33) of the BPPV were in posterior canals, 19.2 % (10) were in lateral canals, 17.3 % (9) were in anterior canals. 21.2% of the elderly population was secondary, 1.9 % was pluricanal (bilateral), 5.8% had canal changing patterns and 7.7% showed recurrence. The EEV value for all the patients before the therapeutic maneuvers was found to be 11.9 decreasing to 2.1 following the maneuvers. The result was meaningful with a p- value = 6.907 * 10^ (-38) (<.0.05) (paired sample T test)

Conclusion: The most popular canal was found to be the posterior canal among the elderly. With VNG, we can easily differentiate the positions of the debris in the exact canal and side. This gives accurate diagnosis and therapy with high success rate and a great comfort for the elderly people whose balance systems already degrade.

Keywords: Balance, gait, exercise, benign paroxysmal positional vertigo, vertigo, geriatrics, old, elderly

İLERİ YAŞ HASTALARDA VİDEONİSTAGMOGRAFİ İLE BENİN PAROKSİSMAL POZİSYONEL VERTİGO ANALİZİ

ÖZET

Amaç: İleri yaş hastalarda benin paroksismal pozisyonel vertigonun (BPPV) seyrini incelemektir.

Metod: Nisan 2013 ve Kasım 2016 tarihleri arasında 60 ila 92 (ortalama yaş 70.7± 8.57) yaş aralığında toplam 52 BPPV teşhisli hasta çalışmaya dâhil edilmiştir. Diagnostik manevralar sırasında göz hareketleri videonistagmografi (VNG) ile kayıt edilmiştir. Tedavi öncesi ve sonrası Avrupa Vertigo Değerlendirme Ölçeği (EEV) uygulanmıştır. İstatistiksel analizler için ‘’The R Project for Statistical Computing ‘’ programı kullanılmıştır.

Sonuçlar: İstanbul Özel Çevre Hastanesi, Türkiye’de 132 BPPV lı hastalar arasında 52 (% 9,4) ileri yaş grubu hasta incelenmiştir. %63,5 (33) posterior kanallarda, %19,2 (10) lateral kanallarda, %17,3 (9) anterior kanallarda BPPV görülmüştür. İleri yaş hastaların %21,2’ sinde sekonder, %1,9’ unda çok kanallı, %5,8’inde kanal değiştiren ve %7,7’ inde tekrarlayan BPPV görülmüştür. Tedavi edici manevralardan önceki EEV değerleri 11,9 olup manevralar sonrasında 2,1 e düşmüştür. P- değeri = 6.907 * 10^(-38) (<.0.05) (paired sample T test) olarak anlamlı bulunmuştur.

Sonuç: İleri yaş hastalarda BPPV en sık posterior kanalda görülmüştür. VNG ile debrilerin yerleştiği kanal ve yer kolaylıkla tespit edilmiştir. Bu teşhis ve terapide yüksek başarı getirir. Ayrıca, dengenin yaş ile daha çok bozulduğu ileri yaş hasta grubu için önemli bir konfor sağlar.

Anahtar Sözcükler: Denge, yürüyüş, egzersiz, benin paroksismal pozisyonel vertigo, vertigo, geriyatrik, yaşlı, yaşlılık

INTRODUCTION

Benign paroxysmal positional vertigo (BPPV) is the most common peripheral vestibular disorder among the adults. Definition of the older person changes due to the development state of the nations. Chronological age, other environmental and personal factors influence functional reserves and overall determines the real geriatrics category. Eventually, the United Nations has agreed that 60+ years may be accepted as elderly population [1].

Corresponding Author: Esra Eryaman MD Özel Mecidiyeköy Çevre Hastanesi, KBB, İstanbul, Turkey, E-mail: dr.eryaman@gmail.com

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The sensation of vertigo or dizziness is defined as postural instability or sensation of spinning. This is considered as a real handicapping situation for the older people [2]. Otoconia in the canals are the main detectors of the horizontal and vertical movements. With aging the fragmentation of the otoconia takes place and idiopathic BPPV becomes a popular pathology [3]. In canalithiasis (CAN) fallowing a certain latent period, the symptoms resolve as otoconia dissolve into the canal. In cupulolithiasis (CUP) the otoconia adhere to the cupula. Vertigo starts immediately without the latent period and it doesn't get tired. [4,5]. There are female and elder (5th and 6th) preponderance [6]. It is rather idiopathic and a higher risk of recurrence such as 27% is given in older people [3,7].

In general, the most frequent form is posterior canal (PC) BPPV (80% of observed cases), followed by both geotropic and ageotropic lateral canal (LC) BPPV (15%) and anterior canal (AC) BPPV [8]. Dix-Hallpike and head rolls identify the canals. Among the canalith repositioning procedures (CRP), Epley and Barbecue are the widely accepted ones [9,10]. Semont liberation maneuver removes the particles on the cupula with the speed of the movement and prevents them from falling back [11]. Brandt-Daroff exercises dislocate the debris in a place where the symptoms are not triggered anymore [12,13].

BPPV negatively affects the older adult's balance and increases the risk of falling and accidents and less self-confidence in physical activities.

MATERIAL and METHODS

A retrospective nonrandomized study was designed and the informed consents were obtained from the patients and the results were discussed. A total of 52 patients with BPPV, aged 60 to 92 (mean age 70.7 ± 8.57) were included in the study between April 2013 and November 2016. Detailed medical history was obtained and all the patients underwent regular ear nose and throat examination and videonistagmography (VNG). Distribution of gender and affected side and the affected canal was reviewed.

VNG (VF405 Fire wire Video Frenzel System from Interacoustics, DK-5610 Assens, Denmark) contained external camera in the goggles for recording the video images of the eye movements during user-defined all the balance tests. The VF 405 software module was operated from the "Otoacces tm" patient database [14].

The European Evaluation of vertigo scale (EEV) was administered to all the patients before and after the treatment maneuvers and the results were discussed [15].

Dix Hallpike test was used to observe the anterior and posterior canals. In Dix Hallpike, the up-beating, ipsi-torsional, rotational nystagmus with latency and habituation lasting less than 1 minute and with or without the reversal in sitting position represented PC-CAN. The downbeat rotational nystagmus version with the same features showed AC-CAN. Among the CRP maneuvers, ipsilateral Epley was performed for the ipsilateral PC- CAN, reverse (contralateral side) Epley for the AC-CAN [10]. For PC or AC CUP Semont liberation maneuver was used [11].

Lateral canals were observed with supine roll test. Nystagmus that is ageotropic (about 25%) was considered as CUP, that is geotropic (about 75%) was considered as CAN [16]. Barbecue maneuver was used as CRP in geotropic nystagmus. In ageotropic nystagmus, opposite Barbecue was tried first. If it hadn't worked, then Brandt Daroff exercises were applied. Multiple repetitions of these exercises at least twice a day were recommended [17]. In the case of bilateral pathologies, the therapy was started from the side where the symptoms were dominant [17].

The R Project for Statistical Computing was used for multiple variance analysis of the data Licensed under the GNU Free Documentation Licence, version 1.3 or later, Copyright Infringement Notification, Powered by Media Wiki and Semantic Media Wiki Source Code JavaScript License information) was used for statistical analyses.

This study was approved by Bakırkoy Dr. Sadi Konuk Education and Research Hospital Institutional Review Board (project no 2015/147).

RESULTS

Over 357 patients, 132 (51.4 %) were diagnosed as BPPV in Ozel Cevre Hospital, Istanbul, Turkey. Over 132 BPPV patients, 52 (39.4%) were the elderly population and accordingly 25% were PCc, 7.6 % were LCs, 6.8 % were ACs (Table 1). Of the elderly population 63.5 % (33) were PCs, 19.2% (10) were LCs, 17.3 % (9) were ACs (Table 2). In this group, 23.1% (12 patients) were CUP, 71.2 % (37patients) were CAN (Table 3). The pluricanals and canal changing ones after the maneuvers were not included in this CAN and CUP differentiation.

23 of the PC patients (66.7 %), 8 of the LC patients (80 %), 7 of the AC patients (77.8 %) were on the left side. A dominance of left side with 73.1 % rate was elicited in all. The result was not found not to be meaningful with a p-value =0.18 (< .95) (chi-square test).

Among the 33 PC- BPPV patients 24 (72.7 %) were CAN, 7 (21.2%) were CUP. In 12 of the PC-CAN patients, the disease was rehabilitated with 1 Epley maneuver (50 %), in 12 patients more than 1 Epley maneuver (50%) with minimum 2, maximum 4 maneuvers (a mean of 2.7) and in 1 of them, Brand Daroff exercise was advised. All of the 7 PC- CUP patients were rehabilitated with 1 Semont maneuver (100%) (Table 4). 2 (6.1%) of the PC - BPPV patients changed canals during and after the maneuver. It was not included in the pure CAN or CUP group. 1 right PC- CAN changed to ipsilateral AC- CAN, 1 left PC-CUP changed to ipsilateral AC – CAN. 2 (6.1%) of the PC-BPPVs, 1 of them being CAN, 1 of them

being CUP recurred in a period of minimum 10 days, maximum 6 months. 1 traffic accident, 2 vestibular neuritis, 1 vertebrobasilar insufficiency, 1 recurrent vestibulopathy, 1 previous cerebral hemorrhage were recorded as patient history (6/33) (18.1%). The rest was accepted as idiopathic (27/33) (81.8 %) (Table 5). The EEV was found as 11.8 in average (minimum value 7, maximum value 15) before the treatment and 2.1 in average (minimum value 1, maximum value 6) after the treatment. The EEV The result was meaningful with a p-value = 2 * 10^ (-25) (<0.05) (paired sample T-test) (Table 6).

Among the 10 LC BPPV patients, 5 (50 %) were CAN, 4 (40 %) were CUP .1 was bilateral CAN with right CAN dominance, and after the right Barbecue left dominance in CAN occurred. In 4 of the LC-CAN patients, the disease was rehabilitated with 1 Barbecue maneuver (80 %), in 1 patient more than 1 Barbecue maneuver (20 %). Among the LC-CUP, 3 (75 %) of them were rehabilitated with 1 maneuver, 1 (25 %) of them with more than 1 maneuver (opposite Barbecue and Brand Daroff) (Table 4). There was 1 (10 %) pluricanal LC-BPPV. Bilateral CAN with the right dominance at the beginning, ending up with the left dominance after the maneuver and was treated accordingly. 1 (10 %) of the LC- BPPVs recurred in 5 months as left PC-CAN. 1 vestibular neuritis and 1 cerebral infarct were recorded as patient history (2/10) (20%). The rest was accepted as idiopathic (8/10) (80 %) (Table 5). The EEV was found as 11 in average (minimum value 8, maximum value 15) before the treatment and 1.9 in average (minimum value 1, maximum value 4) after the treatment. The result was meaningful with a p-value = 1.725 * 10^ (-7) (<0.05) (paired sample T-test) (Table 6).

Among the 9 AC- BPPV patients 7 (77.8 %) were CAN, 1 (11.1%) was CUP. In 7 of the AC-CAN patients, the disease was rehabilitated with 1 opposite side Epley maneuver (100%). 1 AC-CUP was rehabilitated with the Semont maneuver (100%) (Table 4).1 (11.1 %) right AC-CAN changed to right PC- CAN. CRP was reapplied due to the change. 1 (11.1 %)of the AC- left side CUP recurred in a period of 5 months as left AC-CAN. 1 vertebrobasilar insufficiency and 1 anxiety using antidepressant medication, 1 cerebellar insufficiency were recorded as patient history (2/9)(17.6%) (Table 5).The rest was accepted as idiopathic (7/9) (77.8 %). The EEV was found as 10.8 in average (minimum value 6, maximum value 14) before the treatment and 2.3 in average (minimum value 1, maximum value 4) after the treatment. The result was meaningful with a p-value = 1.089 * 10^ (-7) (<0.05) (paired sample T-test) (Table 6).

In our total elderly population, 19.2 % was defined as secondary, 1.9% as pluricanal (bilateral), 5.8 % as canal changing the pattern and 7.7 % showed recurrence (Table 5).

In total, the EEV value before the maneuvers was found to be 11.9, decreasing to 2.1 after the maneuvers. The result was meaningful with a p-value = 6.907 * 10^ (-38) (<.0.05) (Table 6).

Table 1: Overall ratio of the elderly group

Total Patients	BPPV	Elderly patients
357	132 (51.4%)	52 (39.4%) PC 25 % AC6.8 % LC 7.6 %

Table 2: The ratios of the canals in the elderly patients

Total elderly people	PC	AC	LC
52	33 (63.5%)	9 (17.3%)	10(19.2%)

Table 3: The ratio of CAN and CUP

Total elderly people	Canalithiasis (CAN)	Cupulolithiasis (CUP)
52	37 (71.2%)	12(23.1%)

Table 4: The ratios of the CRPs and the liberation maneuvers

	Canalithiasis (CAN)		Cupulolithiasais (CUP)
PC	24(72.7%)		7(21.2%)
	1 Epley 12(50%)	>1 Epley+1 Brand Daroff 12 (50%)	1 Semont 7 (100%)
AC	5 (50%)		4(40%)
	1 Barbecue 4(80%)	>1 Barbecue 1(20%)	1 opposite Barbecue 3(75%)
LC	7(77.8%)		1(11.1%)
	1 opposite Epley 7(100%)		1 Semont (100%)

Table 5: Problems during the course of BPPV

Changing canals after the maneuvers		Recurrences	Pluricanals	Secondary
5.8%		7.7%	1.9%	19.2%
PC	2	2		6
LC	0	1	1	2
AC	1	1		2

Table 6: The EEV values before and after the treatment maneuvers

	EEV before treatment	EEV after treatment	P value(paired sample T test)
PC	11.8	2.1	2 * 10^(-25) (<0.05)
LC	11	1.9	1.725 * 10^(-7) (<0.05)
AC	10.8	2.3	1.089 * 10^(-7) (<0.05)
Total	11.9	2.11	6.907 * 10^(-38) (<0.05).

DISCUSSION

VNG is a precise method for the exact localization of the otoliths [18]. ENG and VNG have been compared in a study and the results have been found similar so VNG has been suggested as a valuable method for assessment and discrimination of peripheral and central lesions. In this study, VNG is decided to be more practical and easier to assess the characteristics of nystagmus. It is a device much cheaper than ENG and easily installed. Frenzel goggles are important in magnifying nystagmus. Once started; one gets used to discriminating the nystagmus. Here all the VNGs are performed by the same specialist; hence the evaluation of the results has become stable and credible.

EEV is a questionnaire assessing the symptoms and allowing physicians to quantitatively evaluate vertigo. In the EEV form, the instability, the feeling of swaying to the right or left, ascending or descending movements, lightheadedness, listing, rolling, the impression of spinning (either of self or of the environment) are questioned in detail. DHI (Dizziness handicap inventory) score is also useful in predicting the BPPV. If DHI score is equal or greater than 50, the diagnosis is considered to be 16 times correct [2,15]. In a study, DHI scores of the elderly population with BPPV have been found meaningful compared to the normal geriatric population [19].

In Yetiser's and also Kollen's study a significant gender difference with higher prevalence in women was found [20,21,22]. This study confirms this as 25% male, 75%female.

The right side has found to be affected more, maybe because the habit to sleep on the right side is more popular [21]. On the contrary, in this study, a dominance of left side as 73.1 % in total was found. However, this value was not found to be meaningful statistically.

Dizziness was found in 61% of the older patients, whereas balance disorders were found in 77%. 9% were diagnosed as unrecognized BPPV, where they have reduced daily activities ending up with depression [23]. People with BPPV reported significantly more subjective problems with dizziness and balance compared with people without BPPV [21]. However in another study, among a large group of elderly patients, only one quarter experienced dizziness of which 1.4 % had BPPV [24].

Patients aged > 80 and aged 60-65 years old with BPPV were retrospectively analyzed. The most popular canal in both groups was PC. The duration of dizziness, the duration of balance disturbance and vegetative symptoms, the efficacy of CRPs, the recurrence rate were significantly different, probably due to psychological factor and over fatigue [25]. In this study, there were 9 patients over 80 years old with the average EEV value 12.2 before the maneuvers, and 2.1 after the maneuvers.

According to Jackson, among 260 BPPV patients, PC was found in 66.9 %; LC in 11.9 %, AC in 21.2%. CUP was observed in 27.3% of the ACs, 6.3% of the PCs and 41.9% of the LCs [26]. In this study, over total 132 BPPV patients, 25% were elderly PCc, 7.6 % LCs, and 6.8 % were ACs and % 23.1 (12 patients) were CUP, 71.2 % (37 patients) were CAN. This means ¼ of the patients were elderly population. It is a quite noticeable percentage. The ratio of the ACs in this study was found close to LCs. The reason for this may be that the diagnosis of ACs were not confused with PCs since VNG differentiated easily the characteristic nystagmus of each.

BPPV is typically unilateral, although sometimes it may be bilateral. Some of them may show canal changing patterns [27]. Here; 3 patients showed canal changing pattern (5.8 %).

Primary or idiopathic BPPV is the most commonly seen (%50-70) origin [6]. Etiopathogenesis of secondary BPPV is given as head trauma, vestibular neuritis, Meniere's disease, otitis media, otosclerosis, inner ear surgery. Hydropic changes, the inflammatory response from viral attack, diffusion of toxins into the endolymph through the round window, degenerative changes of otosclerosis in the utricle and dislodgment of the otoliths following trauma may be the physiopathology of BPPV [6]. In people over 50 years old, it may be related to natural age-related degeneration of the otolithic membrane [28]. It may be associated with a migraine and ototoxicity and viral diseases as well 28. 19.2 % was this study's ratio for the secondary BPPV.

Spontaneous resolution is not desirable. Symptoms may be dangerous during daily activities and may mask other otologic or neurologic diseases. However, BPPV recurs in in one-third of the patients after 1 year and in half of them after 5 years [28]. A recurrence rate of 29.2 % -was given in 139/475 patients (29.2%). The recurrence rate was significantly higher in female and older patients. Forty-two patients (8.8 %) reported a cranial trauma as a triggering event. Post-traumatic patients showed a significantly higher persistence rate (45.2 %) compared to patients affected by non-traumatic BPPV (20.5%). Recurrence rates were similar between the two groups [29]. In this study, in total, 7.7 % of the patients showed recurrence.

Benign Paroxysmal Positional Vertigo is the most common cause of dizziness in the elderly people. CRPs are important for the treatment. The findings suggest that additional Vestibular Rehabilitation did not influence the recurrence or a number of maneuvers to achieve a cure in the older patients with chronic BPPV [30].

Since most of them are PC, Epley maneuver gives success rate over %80 [28,31]. Karkos and friends have summarized the treatment as 1 or 2 Epley maneuvers as the first step and Semont liberation as the final step in case of resistance. Brand Daroff exercises are recommended in the failure of the maneuvers [32]. Clinical and functional aspects of body balance in geriatrics with BPPV improve after CRPs[33]. In a study, although the long-term improvement rate was found to be decreased with age and CRPs were found definitively effective for every group [34].

In this study, all of the patients were treated with maneuvers specific for each canal. Epley maneuvers for PCs, reversed Epley maneuvers for ACs, Barbecue maneuvers for LC s were found to be effective. Semont as liberation maneuver and or Brand Daroff exercises were given in cases where even after applying maximum 4 CRPs, no total cure was obtained. So both CRP and liberation maneuvers were successful since the precise localization of the debris was evaluated by VNG. The total EEV value before the maneuvers was found to be 11.9, decreasing to 2.1 after the maneuvers. The result was meaningful with a p-value = 6.907 * 10^ (-38) (<0.05).

Medical treatments among the patients with BPPV have shown no significant differences in dizziness symptom scores [30,35].They may be given as a support to general balance system or as placebo. Generally, CRP is the effective treatment for BPPV and can restore the health-related quality of life in the elderly patients with BPPV [36].

As a result, BPPV is a disease with a treatment of high success rate. In this study, all of the patients were cured. In huge, dense cities with heavy traffic like Istanbul, it may be a stress for the older people dealing with normal life such as walking on the street or ascending the stairs of the apartments. BPPV may disturb the general balance and psychology of the elderly patients. That may cause fallings and accidents thereby providing new orthopedic problems. These conditions make them even more over aged swiftly. Exact diagnose the exact canal and pathology by VNG brings a rapid treatment and accordingly a great comfort for the elderly people.

Compliance with Ethical Standards

This study is supported by the Cevre Hospital Research Fund. It is compatible with Helsinki Declaration 2008 principles [37]. The conflict of interest is none. Informed consents are obtained from all individual participants included in the study.

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