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Spontaneous nystagmus in horizontal canal benign paroxysmal positional vertigo

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ABSTRACT

Objective: Benign paroxysmal positional vertigo of horizontal semicircular canal (HSC-BPPV) is characterized by either geotropic or apogeotropic nystagmus induced by head roll test. Some patients also present with spontaneous nystagmus. The aim of this study is to examine the clinical manifestation of spontaneous nystagmus in HSC-BPPV and evaluate the effect on the treatment outcome.
Patients and methods: Electronystagmography and video eye movement recordings of 125 patients diagnosed as HSC-BPPV were reviewed retrospectively. Presence of spontaneous nystagmus was analyzed and treatment outcome after repositioning therapy was compared.
Results: Overall, spontaneous nystagmus was observed in 19 patients (15.2%) with HSC-BPPV at initial presentation. In canalolithiasis group ($n = 64$), the treatment outcome did not differ between patients with or without spontaneous nystagmus. However, in cupulolithiasis group ($n = 61$), patients presenting with spontaneous nystagmus ($n = 10$) required more repositioning therapy sessions.
Conclusion: The presence of spontaneous nystagmus at initial presentation may implicate poorer treatment outcome in cupulolithiasis HSC-BPPV patients.

1. Introduction

Benign paroxysmal positional vertigo (BPPV) is understood to result from stimulation of one or more semicircular canals by loosened otoconia upon certain head movements [1]. Diagnosis of BPPV is based on clinical suspicion of characteristic history of positional vertigo evoked by specific head motion and position. Physical examination reveals typical nystagmus in BPPV that presents after a short latency, lasts for a limited duration, shows fatigability, and is reversible. Posterior semicircular canals (PSC) are most commonly involved in BPPV. Dix–Hallpike maneuver evokes a torsionally upbeating nystagmus in PSC-BPPV [2]. Horizontal semicircular canal (HSC)-BPPV accounts for 10–20% of all BPPV patients. HSC-BPPV is characterized by direction changing horizontal nystagmus induced upon head turning to either side in supine position. When the positional nystagmus beats toward the lowermost (geotropic) ear, gravity-dependent movement of free-floating otolith in the horizontal canal is the accepted explanation (canalolithiasis). On the other hand, when the positional nystagmus beats toward the uppermost (apogeotropic) ear, gravity dependent deflection of otolithic debris attached to the cupula is considered (cupulolithiasis) [3].

Several recent studies have observed spontaneous nystagmus in HSC-BPPV [4–7]. The mechanism of underlying spontaneous nystagmus in HSC-BPPV is still debated. von Brevern et al. [4] proposed that a functional plugging of the horizontal canal and a static utriculofugal deviation of cupula causes mechanical stimulation of ipsilateral horizontal canal, resulting in spontaneous nystagmus. Other studies have described "pseudo-spontaneous nystagmus" in seated position, ascribed to otolith movement along the natural inclination of horizontal canal of 30° anteriorly with respect to horizontal plane [6]. The aim of this study is to examine the clinical manifestation of spontaneous nystagmus in HSC-BPPV and evaluate the effect of presence of spontaneous nystagmus on the treatment outcome.

2. Materials and methods

Clinical data of 188 patients diagnosed as HSC-BPPV at the Dizziness Clinic in the Department of Otolaryngology, Ajou University Hospital, Suwon, Republic of Korea, from February 2007 until January 2009 was reviewed retrospectively. Forty-five patients were excluded when they were lost to follow up after initial visit, and 18 patients were excluded because multiple canal or bilateral ear involvement of BPPV was suspected.

Electronystagmography (ENG) recordings and video-oculographic recordings were analyzed for remaining 125 patients. There was no difference in distribution of gender (56 males and 69 females), and the average age was 51.5 years (13–82 years). The HSC-BPPV patients were divided into two groups according to the

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presence or absence of spontaneous nystagmus at initial presentation. As part of our battery of clinical neurotological examinations, computer analysis of ENG recordings (Micromedical Technologies Inc., Chantham, IL) was routinely performed. A computerized video eye movement recorder (SLMED, Seoul, Korea) was used to document spontaneous nystagmus in the primary position of the eye and positional nystagmus. By otolaryngologists, clinical diagnosis of HSC-BPPV was made as follows: (1) all patients were checked for the spontaneous nystagmus in sitting position after at least 1 min without any head movement, (2) a brief and intense vertigo induced by rotating the head in the supine position, which reappears every time the patient turns the head from side to side while supine, (3) a typical bidirectional/bipositional horizontal paroxysmal nystagmus beating to the lowermost ear in the geotropic form and to the uppermost ear in the apogeotropic form, which is provoked by turning the head 180° to either side in the supine position performing the Head Yaw Test (HYT) [8,9].

Repositioning therapy for HSC-BPPV patients were initiated immediately after diagnosis. The patients were treated with barbecue rotation in the outpatient clinic. For cupulolithiasis type of HSC-BPPV, the patient's head was rotated 360° in the direction of the healthy side after vibrating the mastoid area of the pathologic ear. The patients were followed up 2 days after initial management for repeated examination. Resolution of subjective symptoms and a negative response in HYT verify the therapeutic success in HSC-BPPV [10]. Bithermal caloric tests (META-4; Micromedical Technologies Inc.) were performed in some patients to evaluate canal paresis. Statistical study was performed using SPSS 12.0 Statistics for Windows (SPSS Inc., Chicago, IL). Qualitative variables were compared with χ^2 test with 95% confidence intervals (CIs) and two-sided p values. p value of less than 0.05 was considered statistically significant.

3. Results

The HSC-BPPV patients were diagnosed as either canalolithiasis or cupulolithiasis after initial evaluation. Spontaneous nystagmus in sitting position was observed in a total of 19 (15.2%) of the 125 HC-BPPV patients: 9 (14.1%) of 64 canalolithiasis patients and 10 (16.4%) of 61 cupulolithiasis. The direction of the observed spontaneous nystagmus varied. In canalolithiasis cases, the spontaneous nystagmus beat away from the affected ear in 5, and toward the affected ear in 4 patients. Similarly in cupulolithiasis cases, the spontaneous nystagmus beat toward the affected ear in 5, and away from the affected ear in 5 patients (Table 1).

Treatment outcome was compared in patients with spontaneous nystagmus present or absent in each group. To determine the effect of spontaneous nystagmus on the treatment outcome, the patients were also divided into two groups according to the presence of spontaneous nystagmus. Among patients with spontaneous nystagmus, 11 (57.9%) of 19 patients recovered after 1 or 2 sessions of repositioning maneuver. On the contrary, 93 (87.8%) of 106 patients without spontaneous nystagmus recovered after 1 or 2 sessions (Table 2). It seemed that presence of spontaneous nystagmus had a negative effect on the treatment outcome ($p = 0.004$) (Table 3).

However, the effect of spontaneous nystagmus was different according to the type of HSC-BPPV. In the canalolithiasis group, 52 (94.5%) of 55 patients without spontaneous nystagmus recovered after 1 or 2 sessions, and 8 (88.9%) of 9 patents with spontaneous nystagmus recovered after 1 or 2 sessions ($p = 0.463$). On the contrary, in the cupulolithiasis group, 41 (80.4%) of 51 patients without spontaneous nystagmus required 1 or 2 sessions. However, when spontaneous nystagmus was present in cupulolithiasis, only 3 (30.0%) of 10 patients recovered after 1 or 2 sessions, and remaining 7 patients required 3 or more treatment sessions ($p = 0.003$) (Fig. 1).

In patients with cupulolithiasis type HC-BPPV, bithermal caloric tests were performed in 25 patients. Canal paresis less than 27% was defined as normal. In patients without spontaneous nystagmus, 17 (81.0%) of 21 patients showed normal caloric response. However, all 4 patients in whom spontaneous nystagmus was present revealed canal paresis in either affected or the unaffected ear.

Table 1
The direction of spontaneous nystagmus in 19 patients of HSC-BPPV presenting with spontaneous nystagmus.

	SN beating toward the affected ear	SN beating away from the affected ear
Canalolithiasis ($n = 9$)	4	5
Cupulolithiasis ($n = 10$)	5	5

HSC-BPPV, horizontal semicircular canal benign paroxysmal positional vertigo; SN, spontaneous nystagmus.

Table 2
Treatment outcomes of HSC-BPPV patients.

		1 session	2 sessions	3 or more sessions
Canalolithiasis ($n = 64$)	SN(+)	7	1	1
	SN(−)	44	8	3
Cupulolithiasis ($n = 61$)	SN(+)	3	0	7
	SN(−)	33	8	10

HSC-BPPV, horizontal semicircular canal benign paroxysmal positional vertigo; SN, spontaneous nystagmus.

Table 3
Canal paresis in caloric tests in 4 patients with HSC-BPPV cupulolithiasis.

	SN	CP	HC-BPPV
1	Left beating	Left 65%	Left, cupulo.
2	Left beating	Right 100%	Left, cupulo.
3	Right beating	Right 77%	Right, cupulo.
4	Right beating	Left 73%	Right, cupulo.

SN, spontaneous nystagmus; CP, canal paresis; HSC-BPPV, horizontal semicircular canal benign paroxysmal positional vertigo; cupulo., cupulolithiasis.

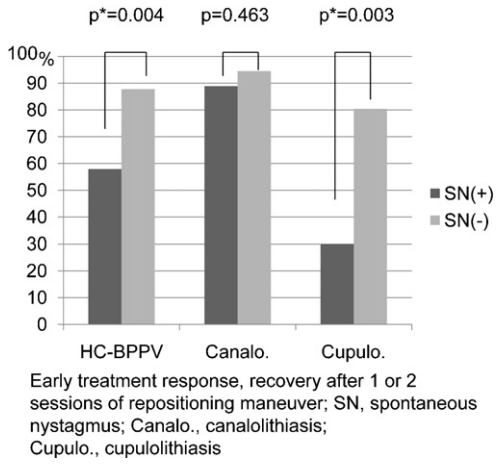

Fig. 1. Early treatment response rate according to the presence of spontaneous nystagmus. Early treatment response, recovery after 1 or 2 sessions of repositioning maneuver; SN, spontaneous nystagmus; canalo., canalolithiasis; cupulo., cupulolithiasis.