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THE TREATMENT OF HORIZONTAL CANAL BENIGN PAROXYSMAL POSITIONAL VERTIGO

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Abstract - The aim of our study was to assess the outcome of treatment of horizontal canal benign paroxysmal positional vertigo and to analyze the influence of the different prognostic factors on treatment failure. Fifty-nine patients with horizontal canal benign paroxysmal positional vertigo were included in the study. They were divided into two groups according to the treatment protocol, randomly. The first group, after treatment with the barbecue maneuver or inverted Gufoni, depending on the nystagmus form, was instructed to sleep on the side with weaker nystagmus, and the second group did not. In the first group, 88.9% of patients were cured and 91.3% in the second one. There was no significant difference between the two groups. Migraine and the apogeotropic form of nystagmus had a significant effect on treatment outcome, while other variables had no effect.

Key words: Benign paroxysmal positional vertigo, horizontal canal, treatment, prognostic factor

INTRODUCTION

Unlike the benign paroxysmal positional vertigo of the posterior semicircular canal (PC-BPPV), which is well known and whose treatment outcome has been excellent, horizontal canal benign paroxysmal positional vertigo (HC-BPPV) is a newly recognized cause of vertigo, the symptoms of which were earlier attributed to the central pathology, and thereby diagnosis was often missed. There are two forms of HC-BPPV. The first and the most common, geotropic form was first mentioned and described in the literature by McClure (1985). Later, the less common apogeotropic form of HC-BPPV was reported by Pagnini (1989) and then by Baloh (1993).

There are several repositioning maneuvers that have been used for treating HC-BPPV: barbecue rotations, forced prolonged position, the Gufoni maneuver, Vannuchi Asprella, etc. (Lempert, 1994; Vannucchi et al., 1997; Gufoni et al., 1998). The barbecue maneuver is the most frequently used. There is still a disagreement as to which prognostic factors can lead to a poor response to physical treatment (Del Rio et al., 2004; Korres et al., 2006).

The aim of our study was to assess the outcome of treatment of horizontal canal benign paroxysmal positional vertigo and to analyze the influence of the different prognostic factors on treatment failure.

MATERIALS AND METHODS

A prospective study that included 59 patients with HC-BPPV was conducted from January 2008 to January 2012. Diagnosis of HC-BPPV was made after

typical history and positive supine roll test. In addition, all patients were submitted to an otoneurological assessment. Magnetic resonance and neurologic examination were used only for patients with the apogeotropic form of nystagmus and those who failed to respond to maneuvers.

The patients were divided into two groups randomly, according to the applied treatment protocol. After treatment (barbecue maneuver or inverted Gufoni, depending on nystagmus form), the first group (36 patients, group with FPP) was instructed to sleep on the side where nystagmus was weaker (forced prolonged position-FPP), whereas the second group (23 patients, group without FPP) did not follow any instruction. Both groups were homogenous in regard to the number of patients (χ^2=2.864; p>0.05) and gender (χ^2 =3.814; p>0.05). All patients with the geotropic form of nystagmus (49) were treated with only one barbecue maneuver per session. The treatment consisted of head and body rotations starting from supine, until full rotation (360°) was accomplished toward the healthy side. After every 90° rotation, each position lasted 30 s. Patients with the apogeotropic form (10), were first treated with the inverted Gufoni maneuver (ipsilesional side-lying), with up to three maneuvers per session, in order to convert the apogeotropic into geotropic nystagmus. The Gufoni maneuver starts from a sitting position on a bed with the legs hanging over the side; the patient is then asked to lie down rapidly toward the affected side. This position is followed by a quick rotation of the head toward the bed for 45°. The patient remains in this position for 2 min, before being slowly brought back to the sitting position. After the conversion of nystagmus was completed, patients were treated by the barbecue maneuver. All patients were asked to come for a checkup every two days until symptoms and nystagmus disappeared. The absence of nystagmus in the supine roll test after one or two barbecue, or up to six Gufoni maneuvers, was considered as the success of treatment. Applying more than two barbecues or more than six inverted Gufoni maneuvers were considered as treatment failure, since HC-BPPV can be resolved spontaneously in a few days. After successful treatment, patients were asked to return after one, three, six months and after one year for a checkup, or immediately if relapse of the disease occurred.

The studied variables included as a prognostic factor were: age (≤60 years and >60 years), gender, etiology (primary vs. secondary) duration of symptoms (≤7days and >7 days), vascular risk factors, osteoporosis, migraine, affected side and canal, previous history of positional vertigo, form of nystagmus, duration of nystagmus (≤30 s and >30 s), number of maneuvers needed for healing, and the application of instruction – FPP. The treatment outcome was assessed and compared between the two groups. The impact of the prognostic factor on the treatment outcome was evaluated. SPSS (for Windows 16) was used for statistical analysis. Statistical significance was accepted at the p <0.05 level. Chi-square test-χ^2 and Fisher's exact test for nominal data were applied and unpaired t-test for numeric data.

RESULTS

Out of the 59 patients considered, 22 (37.3%) were males and 37 (62.7%) were females. The average age was 56.949 ±11.67 years (range from 27 to 80 years). The cause of HC-BPPV was unknown in 88.1% of cases. In 7 cases (11.9%), the cause was an otologic disease (chronic otitis media – 3, sudden deafness – 2, Meniere's disease – 1, vestibular neuronitis – 1). More than four sessions were needed for the treatment of 3.8% patients with unknown cause, and 28.5% for patients with a coexisting otologic disease (sudden deafness and chronic otitis media). The duration of symptoms was up to seven days in 34 (57.6%) patients and more than seven days in 25 (42.4%) patients. Vascular risk factors were present in 36 (61%) patients, osteoporosis in 6 (10.2%) and migraine in 9 (15.3%). The right horizontal canal was more frequently affected than the left (66.1%: 33.9%). Only one (1.7%) patient had multi-canal involvement (right horizontal and right posterior canals). Geotropic nystagmus included 49 (83.1%) patients while the apogeotropic form included 10 patients (16.9%). 18.7% of patients had relapsing episodes of BPPV. The duration of nystagmus was up to 30 s in

Figure 1. Treatment outcome in two groups of patients

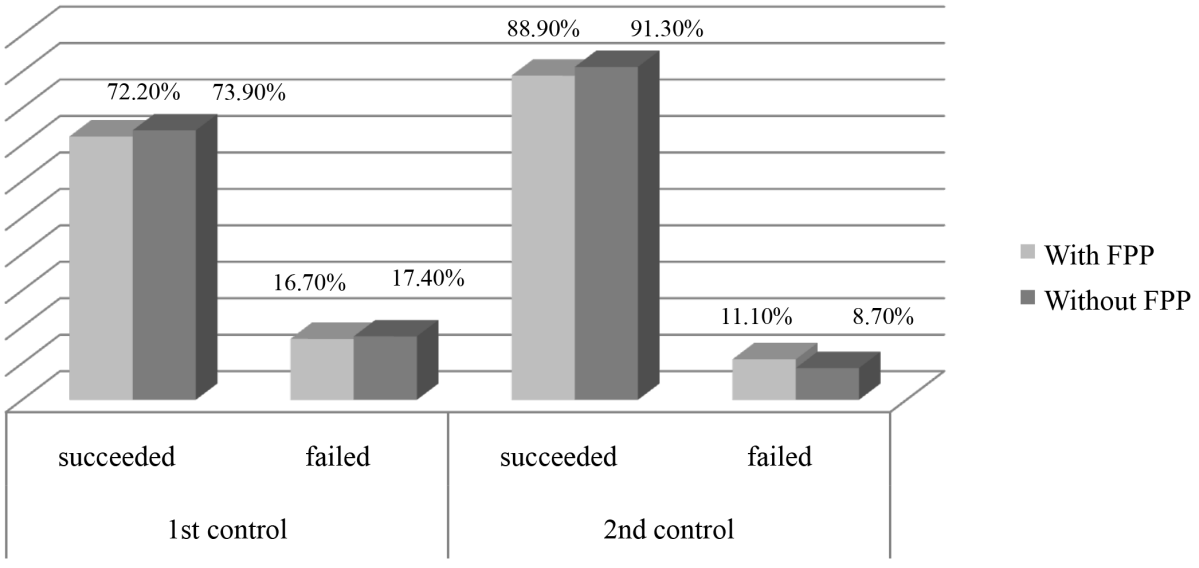
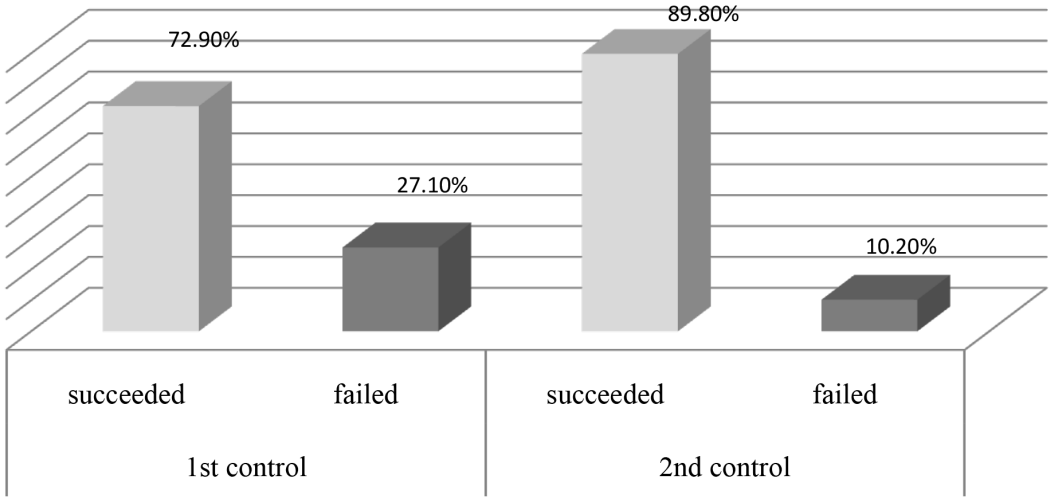


Figure 2. Distribution of patients (entire study group) according to the treatment outcome



50.85%, while 49.15% had nystagmus lasting more than 30 s. Demographic data and the clinical characteristics of the two groups of patients, with and without FPP, are presented in Table 1. In the first group of patients the success rate after the second treatment was 88.9% (32/36), and in the second group it was 91.3% (21/23) (Fig. 1). Because the difference was not found to be statistically significant (P=0.767) be-

Table 1. Demographic data and clinical features in the groups of patients

Variables		1st group with FPP	2nd group without FPP	Probability
Mean age (years)		57.39±11.53	56.26±12.11	t=-0.359;p=0.721 NS
Gender	Females	22 (37.3%)	15 (25.4%)	χ^2=0.101;p=0.750 NS
	Males	14 (23.7%)	8 (13.5%)	
Etiologic factor	Primary	31 (52.5%)	21 (35.6%)	P=0.694 NS
	Secondary	5 (8.5%)	2 (3.4%)	
Average duration of symptoms		10.42±11.74	33.17±74.49	t=1.807;p=0.076 NS
Previous history of positional vertigo	Yes	10 (16.9%)	5 (8.5%)	χ^2=0.461;p=0.497 NS
	No	26 (44.1%)	18 (30.5%)	
Form of nystagmus	Geotropic	29 (49.1%)	20 (33.9%)	P=0.725 NS
	Ageotropic	7 (11.9%)	3 (5.1%)	
Average duration of nystagmus (sec.)	right	57.11±53.81	39.69±26.39	t=-1.144;p=0.155 NS
	left	43.69±35.81	36.74±31.44	t=-0.762;p=0.449 NS
Affected side	right	25 (42.4%)	14 (23.7%)	χ^2=0.461;p=0.497 NS
	left	11(18.6%)	19 (32.2%)	
Vascular risk factor	Yes	25 (42.4%)	11 (18.6%)	χ^2=2.757;p=0.097 NS
	No	11 (18.6%)	12 (20.3%)	
Migraine	Yes	7 (11.9%)	2 (3.4%)	P=0.460 NS
	No	29 (49.1%)	21 (35.6%)	
Osteoporosis	Yes	1 (1.7%)	5 (8.5%)	P=0.523 NS
	No	35 (59.3%)	18 (30.5%)	
Treatment outcome	Succeeded	32 (88.9%)	21 (91.3%)	P=0.767 NS
	Failed	4 (11.1%)	2 (8.7%)	
Relapses of BPPV	Yes	7 (19.4%)	4 (17.4%)	χ^2=0.039;p=0.843 NS
	No	29 (80.6%)	19 (82.6%)	

NS= non-significant

tween the two groups of patients, according to the treatment outcome, further study investigated the influence of prognostic factors on the entire study group (59 patients).

After 1-3 Gufoni maneuvers, the conversion of apogeotropic nystagmus into geotropic was observed in 6 patients, after which the barbecue maneuver was performed. At the first checkup, 43 patients out of 59 were cured, and at the second the number of cured patients increased to 53 (Fig. 2). For six patients (10.2%) (2 with geotropic and 4 with apogeotropic nystagmus) treatment failed. The treatment sessions were continued, and within one month all the patients were cured. In one case, three treatment sessions were necessary for recovery (apogeotropic form), while in five cases more than four sessions were needed. In all patients with apogeotropic nystagmus, the NMR findings and neurologic examination were within the norm.

There was no statistical difference in the distribution of patients between treatment outcome and the studied prognostic factors (Table 2.). However, the distribution of patients according to treatment outcome and migraine exhibited a statistical difference ($p<0.05$). In addition, Fisher's exact test showed statistically significant differences ($p< 0.01$) between patients with the two forms of nystagmus. Patients with migraine and the apogeotropic form of nystagmus had the poorest outcome of treatment.

DISCUSSION

In this article we present the results of a prospective study of the treatment of patients with HC- BPPV,

Table 2. Distribution of patients according to the treatment outcome and studied variables

Variables		Outcome of treatment		Probability
		Failed	Succeeded	
Gender	Female	1	21	P=0.396 NS
	Male	5	32	
Age (years)	≤60	3	30	P=1.000 NS
	>60	3	23	
Etiologic factor	Unknown (idiopathic BPPV)	2	48	χ^2=2.944; p>0.05 NS
	Secondary BPPV	5	5	
Durations of symptoms	≤7 days	1	33	P=0.074 NS
	>7 days	5	20	
Migraine	Yes	3	6	P=0.040*
	No	3	47	
Osteoporosis	Yes	1	5	P=0.490 NS
	No	5	48	
Vascular risk factors	Yes	4	32	P=1.000 NS
	No	2	21	
Form of nystagmus	Geotropic	2	47	P=0.006**
	Apogeotropic	4	6	
Affected side	Right	4	35	P=1.000 NS
	Left	2	18	
Durations of nystagmus right	≤30 seconds	2	25	P=0.678 NS
	>30 seconds	4	28	
Durations of nystagmus left	≤30 seconds	2	31	P=0.390 NS
	>30 seconds	4	22	
Previous history of positional vertigo	Yes	2	18	P=1.000 NS
	No	4	35	
FPP	Yes	4	32	P=0.767 NS
	No	2	21	

Statistically signigicant difference: * p<0.05, **p<0.01
NS= non-significant

using two different treatment protocols. The first protocol included the barbecue maneuver alone for geotropic HC-BPPV, or the inverted Gufoni maneuver for apogeotropic HC-BPPV, and the second protocol consisted of the barbecue or inverted Gufoni maneuver in combination with forced prolonged position (FPP). In addition, we studied the impact of the twelve prognostic factors on treatment outcome. Due to the lack of comparative studies and the lower frequency of HC-BPPV compared to PC-BPPV, it was difficult to decide which maneuver is the most appropriate for treatment. According to present knowledge, the treatment of HC-BPPV using different physical maneuvers has a success rate of approximately 60-90% (Escher et al., 2007; Casani et al., 2002). Escher et al. (2007) stated that after applying the first barbecue maneuver alone, 74% of patients were cured and after the second maneuver, 80% were cured. Other authors found similar results regarding the efficacy of the barbecue maneuver applied alone or combined with other maneuvers (Casani et al., 2002). FPP applied alone has a success rate of about 70-90% (Casani et al., 2002). The results of the current study are similar to those of the previous studies. The group of patients treated with the barbecue maneuver alone, after the second session had a success rate 91.3% versus 88.9% in patients that were treated with barbecue maneuver and FPP. No statistically significant difference was found in the success rates of treatment of BPPV

between those patients who were treated with the barbecue maneuver alone and patients who had followed FPP. Analyzing the results of the entire group of patients (59), treatment succeeded in 72.9% of patients after the first session and 89.8% after the second.

The patients' age, gender, etiology, duration of symptoms, affected the side and canal, duration of nystagmus. Previous history of positional vertigo, vascular risk factor and osteoporosis were not negative prognostic factors for treatment failure. We found seven patients with coexisting otologic diseases. Del Rio et al. (2004) found that patients with coexisting otologic pathology had significantly lower initial success rates in the treatment of BPPV. In our study, etiology did not show as a negative prognostic factor, possibly due to the small number of patients with secondary BPPV. Nonetheless, our results showed a significantly higher percent of patients with coexisting otology pathologies that required more than four treatments compared with patients with an unknown cause of BPPV (28.5%:3.8%). Several other negative prognostic factors for treatment outcome have been proposed in the literature, but there is still disagreement between authors about the issue: head trauma, age, duration of symptoms, multi-canal involvement, Meniere's disease (Korres et al., 2006; Lorin et al., 2011). Unlike the results of this study, Lorin et al. (2011) in a review of 30 patients with HC-BPPV found that those that were treated soon after the onset of disease recovered more quickly than patients whose duration of symptoms was longer. In this study, the patient who had multi-canal involvement required more than four treatments for recovery. Due to the small number of cases per group, this variable did not show as a statistically significant prognostic factor.

However, our results indicate that migraine and the form of nystagmus are associated with the poorest success rates. It seems that the relationship between migraine and BPPV exists, but is still not completely understood (Korres et al., 2006). It has been suggested that migraine causes vasospasm of the internal auditory artery that leads to labyrinth ischemia. These changes facilitate otoconia detachment from the utricular macula.

The results of this study are similar to those of previous studies regarding the relationship between apogeotropic HC-BPPV and the poorest treatment success rate. It has been accepted that the apogeotropic form of HC-BPPV is more difficult to treat. The apogeotropic form of nystagmus points to the involvement of cupulolithiasis or canalolithiasis in the pathophysiological mechanisms of BPPV. If otoconial debris are located on the canal side of the cupula, conversion into the geotropic form of nystagmus can be achieved and treatment is successful. Treatment is more difficult in those cases where debris are attached to the cupula or is placed on the vestibular side of the cupula. For those cases, precise protocol treatment has not yet been established. In this study, the conversion of nystagmus succeeded in six out of ten patients with apogeotropic HC-BPPV, and failed in four. In all four patients treatment was unsuccessful.

The probability of relapses of BPPV after successful treatment is around 20-30%, which is similar to the results of the current study (18.7%).

CONCLUSION

Our study showed that the combination of barbecue maneuver and forced prolonged position is an equally effective therapeutic method to barbecue maneuver applied alone in the treatment of the geotropic form of HC-BBPV. An apogeotropic form of nystagmus and migraine are negative prognostic factors for the success of treatment. Further studies should focus on finding a precise treatment protocol for patients with the apogeotropic form of HC-BPPV.

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