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Clinical features of recurrence and osteoporotic changes in benign paroxysmal positional vertigo

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ABSTRACT

Objective: Several previous studies have demonstrated that comorbidities, secondary causes, physical inactivity, and osteoporosis may cause recurrence of benign paroxysmal positional vertigo (BPPV). However, there has also been some controversy over the clinical course(s) and cause(s) of recurrent BPPV (rBPPV). We identified clinical features and associated factors, including decreased bone mineral density, in the recurrence of BPPV.

Methods: In total, 198 patients with idiopathic BPPV, diagnosed at the otolaryngology clinics of Seoul National University Boramae Medical Center, were enrolled. The medical data of these patients were reviewed retrospectively. Recurrent BPPV was defined as the recurrence of BPPV after at least 1 month of a symptom-free interval following previous successful treatment.

Results: Of the BPPV patients, 67 (33.8%) were classified as rBPPV. Among them, about 16% showed changes in the involved semicircular canals and about 6% showed multiple semicircular canal involvement. rBPPV was more common in patients with comorbidities ($P < 0.001$). Involved semicircular canals showed no statistically significant difference according to the recurrence of BPPV. The mean symptom-free interval of the rBPPV group varied from 1 to 50.2 (mean, 11.6) months; however, 90% of BPPV recurrence occurred within 24 months. Bone mineral density in dual-energy X-ray absorptiometry (DEXA) was markedly decreased in BPPV patients versus normal controls, but there were no significant differences according to BPPV recurrence.

Conclusion: The incidence of rBPPV in idiopathic BPPV patients was 33.8% in the present study. The mean period of recurrence after a symptom-free interval was about 11.6 months; most patients showed recurrence within 2 years after the first attack of BPPV. Furthermore, about 16% of patients suffered from rBPPV at a different kind or type of canal from the semicircular canal of the initial BPPV attack. Comorbidities, but not age, gender, or the involved semicircular canal, might be correlated with BPPV recurrence. Decreased bone mineral density did not show significant association with BPPV recurrence, but showed a significant relation with BPPV occurrence.

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1. Introduction

Typical benign paroxysmal positional vertigo (BPPV) presents as an intermittent attack of vertigo over a brief period and torsional or horizontal nystagmus on provocative head motion. The most commonly involved canal in BPPV is the posterior semicircular canal (PSC) [1,2]; however, according to

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the clinical setting of studies, the horizontal semicircular canal (HSC) accounts for up to 40.5% of sites for BPPV [3].

In many cases, BPPV resolves spontaneously within a few weeks. It was reported that using canalith repositioning therapy (CRT), BPPV can be resolved in more than 95% of cases [4]. Attacks tend to occur in clusters, and symptoms may recur after an apparent period of remission. The recurrence rate of BPPV is variable (7–50%), depending on the clinical setting. There have been several studies reporting that up to 70% of recurrences affected a different side and/or different semicircular canal than the primary BPPV [4–7].

There are several factors associated with recurrent BPPV (rBPPV). Several studies have demonstrated that age, family history, comorbidities [8], and delayed BPPV treatment using CRT [9] may be associated with the recurrence of BPPV. Some studies have shown that multiple canal involvement and anterior canal BPPV can be risk factors for BPPV recurrence [5]. Secondary causes of BPPV, such as inner ear pathology and head trauma, can affect the rate of recurrence of BPPV. For example, the rate of BPPV recurrence in patients with endolymphatic hydrops was significantly higher than in those without it, with up to a 75% recurrence rate [10]. Thus, secondary causes of BPPV have to be excluded before evaluating other factors associated with BPPV. Recently, several studies demonstrated that osteoporotic changes, such as decreased bone mineral density (BMD) and serum vitamin D levels, may increase the risk of BPPV [11–15].

To date, the related factors and the clinical courses of recurrent BPPV are controversial. Thus, in this study, we assessed the recurrence rate and the time interval, and identified the factors associated with rBPPV versus non-recurrent BPPV (nBPPV) in idiopathic BPPV patients.

2. Materials and methods

2.1. Ethical considerations

This study was approved by Institutional Review Board of Boramae Medical Center.

2.2. Study participants

A retrospective study was performed for the patients with BPPV, diagnosed at the otolaryngology clinics of Seoul National University Boramae Medical Center from January 2010 through December 2013. Among these, BPPV patients who did not undergo clinical follow-up for more than 1 year after successful CRT with resolution of BPPV, plus those with other vestibular diseases or central nervous system diseases, were excluded. To exclude known risk factors of recurrence of BPPV, only patients with idiopathic BPPV were enrolled and analyzed. As a result, the 198 idiopathic BPPV patients were enrolled in the present study.

In all of the enrolled patients, BPPV was demonstrated by videonystagmography (VNG). BPPV was diagnosed based on the results of the Dix-Hallpike and head-turning tests. For posterior semicircular canal-BPPV (PC-BPPV), the Dix-Hallpike test was positive if nystagmus was recorded with

appropriate positioning, latency, duration, and fatigability, and reversed when the patient returned to a sitting position. Lateral semicircular canal-BPPV (LC-BPPV) was diagnosed by horizontal direction-changing positional nystagmus concurrent with vertigo triggered by the head-turning test. LC-BPPV was classified as canalithiasis and cupulolithiasis, according to the direction of the nystagmus as horizontal geotropic and apogeotropic nystagmus, respectively. A down-beating nystagmus accompanied by a less pronounced torsional component to the affected side was suggested Anterior semicircular canal-BPPV (AC-BPPV) when moving the patient from a sitting to a lying position with the head straight and bent backward as far as possible.

Patients were treated using the appropriate repositioning maneuver according to the type of BPPV. Usually, Epley's maneuver was performed for posterior canal BPPV (PC-BPPV), a reverse Epley maneuver was performed for AC-BPPV, and the barbeque maneuver was performed for LC-BPPV with or without a vibrator. Generally, patients were re-evaluated 1 week after CRT. Resolution of BPPV was defined as the absence of nystagmus and positioning vertigo. The CRTs were repeated until successful repositioning of the canalith with improvement in positional vertigo. At follow-up visits, patients were asked about their experience with dizziness and physical examinations were made to check for BPPV recurrence.

2.3. rBPPV

rBPPV was defined as the recurrence of BPPV after at least a 1-month symptom-free interval following previous successful BPPV treatment. Recurrence was defined as vertigo and nystagmus, according to the position and positioning tests, during the follow-up period. Patients who did not show BPPV confirmed by appropriate nystagmus throughout the clinical follow-up period were categorized as nBPPV. Each patient underwent clinical follow-up for more than 1 year.

2.4. Clinical data comparison

Patient information on age, gender, comorbidities (diabetes, hypertension, and osteoporosis), time interval of recurrence, and the semicircular canals involved at the initial and recurrent BPPV attacks was reviewed retrospectively.

2.5. Comparison of BMD

When available, a *T*-score of BMD was compared between groups. The *T*-score of BMD was defined as the standard deviation of BMD compared to the mean BMD of a young normal adult of the same gender. Dual-energy X-ray absorptiometry (DEXA) was measured at the first lumbar vertebra (L1) and proximal femur. DEXA that had been performed for another medical purpose, such as the diagnosis of osteoporosis, was used to estimate BMD. The DEXA was conducted less than 1 year from the initial BPPV attack for the purpose of the health check. This could cause selection bias because only part of the study population underwent DEXA. To make the study sample as representative as possible, we

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