

Original Research

Clinical study of Meniere's disease in the outpatient vertigo clinic at Kyoto Medical Center

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Abstract

The details of the patients who visited the vertigo outpatient department of the Kyoto Medical Center were retrospectively investigated from the medical records. Most of the first-visit patients were benign paroxysmal positional vertigo (BPPV) patients, followed by Meniere's disease patients. The number of vertigo patients tended to be large in March, June and September. In addition, many patients who were first diagnosed with Meniere's disease were seen in June. We also examined the details of vertigo attacks in 107 patients who were diagnosed with Meniere's disease and had been followed up for more than 6 months. As a result, about 40% of Meniere's disease patients had BPPV-like attacks, and 55% of all vertigo attacks were considered to be BPPV-like vertigo attacks. As for the lesion of semicircular canals, there were many lateral semicircular canals and posterior semicircular canals, and no difference was observed between them. In terms of treatment, 13% received regular oral medications, but 65% did not receive any medication. In conclusion, about 40% of patients with Meniere's disease suffered from benign paroxysmal positional vertigo (BPPV)-like attacks and more than 50% of all vertigo attacks were BPPV-like attacks. Thus, vertigo attacks in patients diagnosed as Meniere's disease must be carefully treated because the therapy for such vertigo attacks is totally different from the therapy for BPPV. It is necessary to conduct a detailed interview and carefully examine the patient condition, keeping in mind the possibility of BPPV.

Key words: Meniere's disease, vertigo attacks, BPPV

Introduction

In the emergency outpatient department, vertigo patients account for about 10% and vertigo is one of the 10 most common reasons for consultations (Moulin et al., 2003). The causes of vertigo are divided into central and peripheral, and although the peripheral vertigo is more frequent, central vertigo might sometimes be fatal, so careful diagnosis is required. However, in the case of vertigo or dizziness-only symptoms, it is often difficult to diagnose immediately. The main peripheral vertigo diseases include benign paroxysmal positional vertigo (BPPV), Meniere's disease and vestibular neuritis, and the most frequent diagnoses is BPPV.

The patients who are diagnosed as BPPV and Meniere's disease repeat vertigo attacks, but the pattern of attacks is not always same. BPPV is caused by otoliths and Meniere's disease is caused by endolymphatic hydrops, both of which are different diseases, but there are reports that they are partly related (Hughes et al., 1997; Inagaki et al., 2008; Balatsouras et al., 2012). Taura et al. reported that about one-third of Meniere's disease had BPPV-like attacks at Kyoto University Hospital (Taura et al., 2014). Generally, the proportion of BPPV is higher in general hospitals than in university hospitals (Taura et al., 2010), but we examined the details of whether or not BPPV-like attacks are observed in Meniere's disease as in general hospital.

Material and methods

The subject was retrospectively recruited from patients who first visited the vertigo outpatient department at Kyoto Medical Center between June 2013 and May 2016. Patients with Meniere's disease were recruited and followed for more than 6 months. The following variables were checked: age, sex, the type of vertigo attack, concomitant symptoms, detailed clinical and history treatment. Diagnosis was based on the guidelines of the Japan Society for Equilibrium Research. Physical examination is important, and evaluation of ocular movement is a key procedure, along with evaluation of balance under static and dynamic conditions.

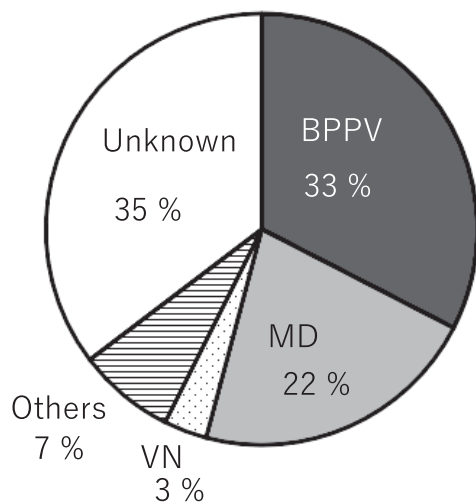
As for the diagnosis of Meniere's disease, vertigo attacks that are accompanied by cochlear symptoms, such as fluctuating low-frequency sensorineural hearing loss or tinnitus, are diagnosed as Meniere's disease. Spontaneous, gaze, positional, and positioning nystagmus were ob-

served using an infrared eye camera (IRN-2; J. Morita Co., Tokyo, Japan). Pure-tone audiometry was performed in most patients at the first visit and was repeated as necessary during follow-up period. We classified the attacks into five categories using the following criteria same as previous report (Taura et al., 2014). (1) Definite Meniere's disease attack: the patient had either transient hearing threshold elevation or aural fullness in one ear, and the vertigo continued for >20 min with accompanying unidirectional nystagmus. (2) Suspicious Meniere's disease attack: the patient experienced vertigo for >20 min with cochlear symptoms (this is based on the report of patients). (3) Definite BPPV attack: positional nystagmus typical for BPPV was observed in the clinic, with a short vertigo duration and without accompanying cochlear symptoms. (4) Suspicious BPPV attack: the patient experienced short-term positional vertigo without cochlear symptoms (this is based on the report of patients). (5) Unknown: the episodes met none of the above criteria. In definite BPPV attacks, we further explored which canal was involved by examining the patient's eye movements. We judged the affected side of BPPV by the directional change of nystagmus. In posterior semicircular canal (PSCC) type, the direction of torsional nystagmus at Dix-Hallpike position was adapted as the affected side. In lateral semicircular canal (LSCC) type, the direction of nystagmus changed between the lower right head position and the lower left head position.

Results

The total number of outpatients with vertigo in 3 years was 2330, and the number of first-visit patients was 866. In the classification of the causative diseases in the first-visit patients, BPPV was observed in 282 cases (32.8%), Meniere's disease (MD) was observed in 187 cases (21.7%), and vestibular neuritis (VN) was observed in 28 cases (Figure 1). Next, we examined the number of patients who received medical consultation by month. The average of patients per month was 193 and the number of patients tended to be larger in March (232 cases), June (225 cases) and September (225 cases) compared with other months (Figure 2a). When classified by season, the average of patients per season was 583 and the number of patients tended to be smaller in winter of December-February (504 cases) (Figure 2b).

An analysis of the number of patients who



BPPV : benign paroxysmal positional vertigo
 MD : Meniere's disease
 VN : vestibular neuritis
 BPPV was observed in 282 cases (32.8%), Meniere's disease (MD) was observed in 187 cases (21.7%), and vestibular neuritis (VN) was observed in 28 cases.

Figure 1 The classification of the causative diseases in the first-visit patients.

diagnosed as MD for the first time, the average of patients per month was 16 and the number of patients was very large in June (33 cases) (Figure 3a). In the seasonal classification, the number of MD patients was large in the summer of June-August (71 cases) (Figure 3b).

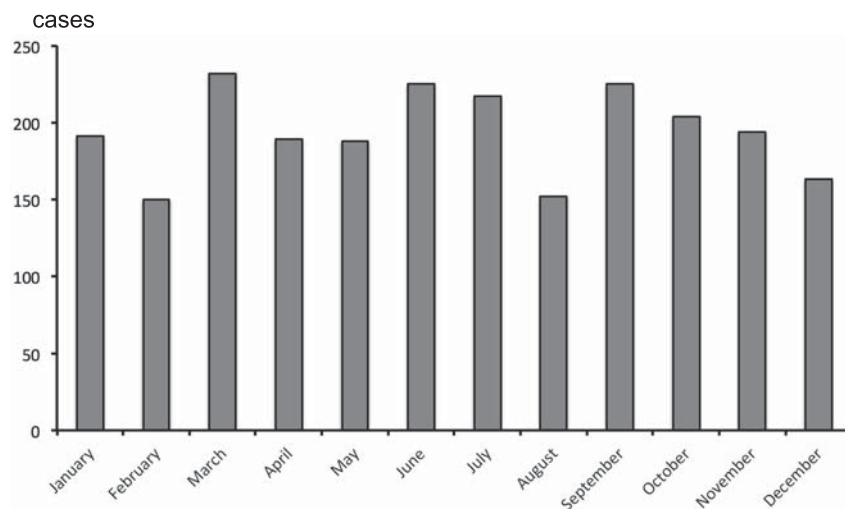
The average age of 107 MD patients who could be followed for more than 6 months, was 59 ± 14 years (mean \pm standard deviation, SD), and the male-female ratio was 26:81 (=1:3.1), which was about three times. The affected side ratio was right: left: both sides=34: 49: 24 and left side

affected cases were more than right side. As a result of examining the details of vertigo attack in these 107 MD patients, 43 cases (40.2 %) were found to have BPPV-like vertigo attacks. The average age was 58 ± 14 years (mean \pm standard deviation, SD), the male-female ratio was 11:32 (=1:2.9), and the affected side was right:left:bilateral=16:18:9.

When the details of these vertigo attacks (119 times) were classified, the number of the definite MD attacks was 5 times (4%) and that of the suspicious MD attacks was 45 times (38%). The total of BPPV-like vertigo containing definite BPPV attacks (13 times: 11%) and suspicious cases (52 times: 44%) was 65 times, which was about 55% (Figure 4). Most of the focal semicircular canals were the lateral semicircular canals (19 cases) and the posterior semicircular canals (20 cases), and no clear difference was observed between them (Figure 5). The contents of treatment were as follows: regular prescription was given in 14 cases (13%), medication only as needed was given in 23 cases (21%), and 65% was given no medication.

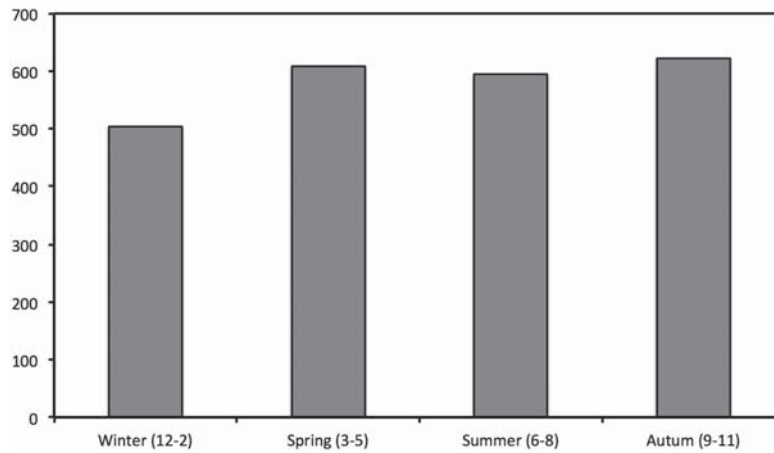
Discussion

The total number of outpatients with dizziness in 3 years was 2330, and the frequency of BPPV (33%) was highest, which was similar to previous report (Uno et al., 2001). The frequency of MD (22%) was relatively high compared with other studies. Meniere's disease reportedly accounts for 3-11% of patients in specialized vertigo clinics (Neuhauser et al., 2001; Brandt, 2004). In addition, the number of patients with vertigo per month

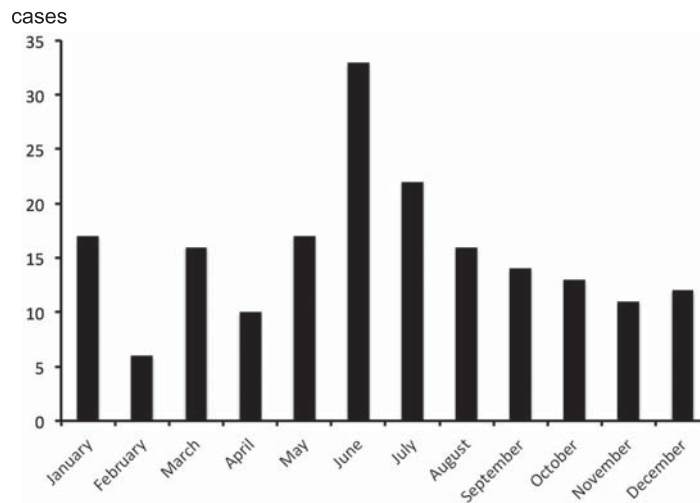


The number of patients was larger in March, June and September, compared with other months

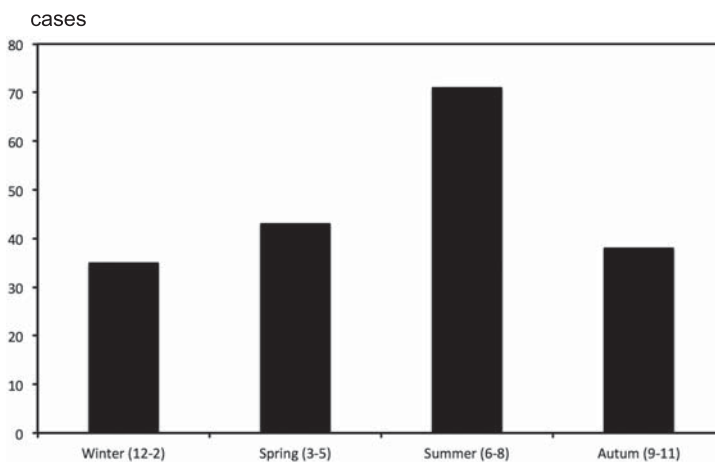
Figure 2a The average of patient number per month



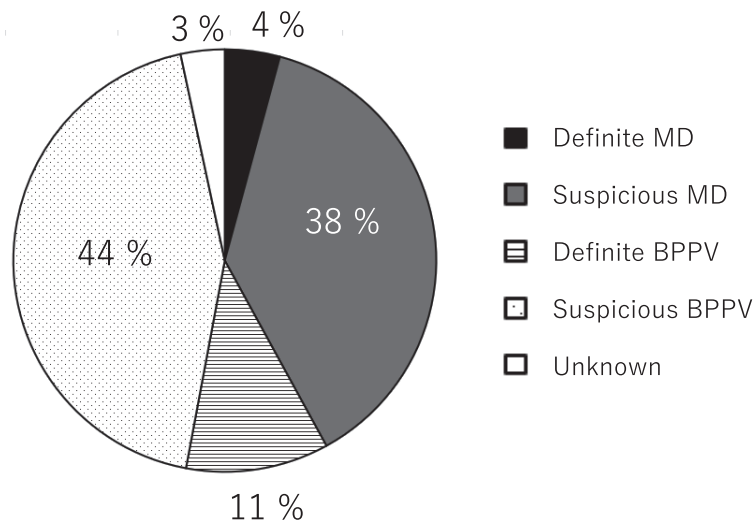
The number of patients tended to be smaller in winter of December-February
Figure 2b The average of patient number per season



The number of patients was very large in June
Figure 3a The number of patients who diagnosed as MD for the first time

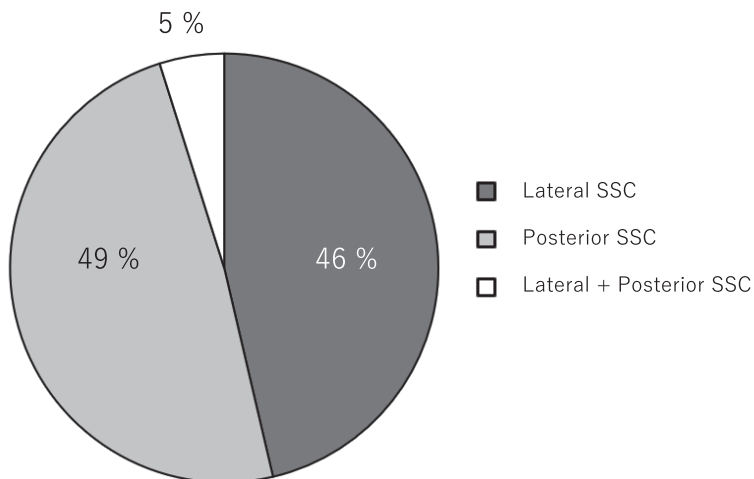


The number of MD patients was large in the summer of June-August
Figure 3b Number of MD patients by season



The definite MD attacks was 4% and that of the suspicious MD attacks was 38%. The rate of total BPPV-like vertigo containing definite BPPV attacks (11%) and suspicious cases (44%) was about 55% in all attacks

Figure 4 Classification of dizziness attacks in MD cases. 119 times



Most of the focal semicircular canals were the lateral semicircular canals (19 cases) and the posterior semicircular canals (20 cases), and no clear difference was observed between them

Figure 5 Focal semicircular canals

tended to be larger in March, June and September than other months. Lots of patients were seen at the turn of the season. It is reported that the incidence of BPPV, which is the most common cause, correlates with changes in temperature (Saeed et al., 2016). They also stated that the higher incidence of BPPV in winter can be explained by the fact that shorter daytime and lower exposure to sunlight may result in vitamin D deficiency and cause bone demineralization and osteoporosis. But in our data, the number of patients in winter seemed to be smaller compared with other seasons. This result was inconsistent with previous reports, but the reason is unclear.

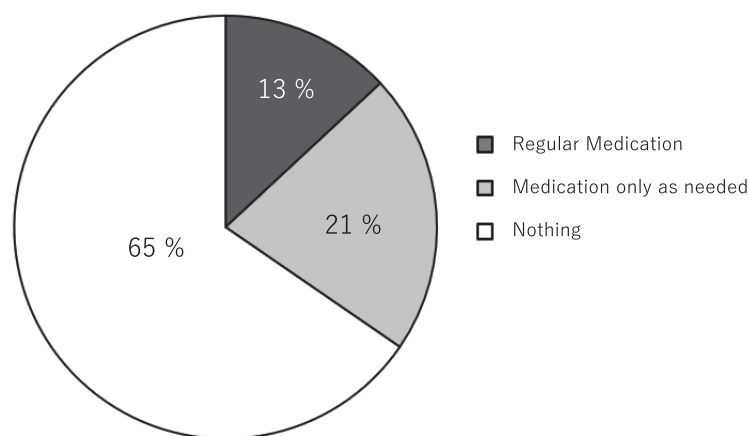
Regarding Meniere's disease, Schmidt sug-

gested that lower atmospheric pressure was associated with higher odds of vertigo attacks (Schmidt et al., 2017). In other reports, there are also many vertigo attacks in the spring (Watanabe et al., 1993; Fujita, 2017). In this study, lots of MD patients were observed in June and the incidence of MD was relatively high in summer. This is compatible to previous report. The seasonal incidence of MD was reported relatively high in summer and autumn due to the high humidity and low atmospheric pressure (Kim MH et al., 2020).

Patients with previously diagnosed MD were also suffered from BPPV attacks during clinical follow-up (Taura et al., 2014). These two diseases have different pathologies, but are often thought

to be mixed. Meniere's disease is well known to cause recurrent vertigo attacks and hearing disorders. However, vertigo attacks in patients with MD are not always caused by hydrops. Meniere's disease is sometimes accompanied by BPPV (Hughes et al., 1997; Inagaki et al., 2008; Balatsouras et al., 2012). In such patients, BPPV attacks is secondary to Meniere's disease (Karlberg et al., 2000). However, in our study, BPPV attacks was also observed during the follow-up period in patients previously diagnosed with Meniere's disease, and these BPPV attacks were not so severe in most cases. The total number of vertigo attacks in this study was 119. Among these vertigo attacks, 65 (54.6%) were BPPV attacks. This was much higher than generally expected. In this study of patients with MD, the mean age was 58 years, and women comprised 74.4% of the patients, compatible to a previous report (Taura et al., 2010). Sex differences have been previously reported as well, with a female to male ratio of 1.7-2.0 to 1.0 (Sekine et al., 2005). In the present patients with MD, 43 cases (39.8%) exhibited BPPV-like attacks during the follow-up period. There was no difference between the mean age of patients with BPPV and without BPPV. The prevalence of BPPV in patients with MD was thus much higher than that in the normal population (10.7-64.0 per 100000 population (Froehling, 1991). Hughes also reported that 31% of patients with BPPV had an associated diagnosis of MD (Hughes et al., 1997). One possible explanation for this high prevalence of BPPV in patients with MD is that the endolymphatic hydrops secondarily affects the otolith organ, leading to detachment of the otoconia and subsequent BPPV. Takeda reported

that the utricular function changed in patients with BPPV (Takeda et al., 1997), suggesting that floating debris from the damaged otolith causes BPPV. Another possibility is that the membranous labyrinth becomes expanded by endolymphatic hydrops and lead to adherence of the otolith to the membranous labyrinth and partial obstruction of the otolith (Karlberg et al., 1997). The cause of MD still remains unclear, but Paparella reported that free-floating otoliths might generate endolymphatic hydrops by obstructing the endolymphatic duct (Parnes et al., 1993; Paparella et al., 1991). There might be some relationship between MD and otoliths; the frequency of patients with accompanying BPPV is higher than that of other vestibular disorders (Takeda et al., 1997). When the canal repositioning treatment improperly performed, it might also cause obstruction within the membranous duct of the canal (Parnes et al., 1993). In previous papers, BPPV associated with MD was reported to be secondary or symptomatic; it was also reported to be intractable (Gross et al., 2000; Perez et al., 2002). However, in this study, for most BPPV like vertigo attacks, no regular medication was needed. The canal involved in the BPPV attacks was the LSCC (19/41 patients, 46.3%) and PSCC (20/41 patients, 48.8%). The most involved canal in patients with BPPV was the PSCC (Lee et al., 2010). This relatively high involvement of the LSCC in BPPV associated with MD is also compatible with a previous report. Buckingham discussed that loose otoliths could more easily slide onto the LSCC cupula, when a supine patient turns to one side or the other because of the adjacent location of the ampulla of the LSCC (Buckingham et al., 1999).



Regular prescription was given in 14 cases (13%), medication only as needed was given in 23 cases (21%), and 65% was given no medication

Figure 6 Contents of treatment

Additional therapies for each vertigo attack were quite different. For most patients with vertigo attacks due to MD, anti-vertigo injections or additional oral medications were required. In contrast, for most BPPV-like vertigo attacks, positional maneuvers were useful. Thus, most of the BPPV attacks encountered during the follow-up of patients with MD were not difficult to cure. This is compatible to previous papers (Taura et al., 2014). Ganança et al. also reported that BPPV attacks associated with MD were eliminated by the Epley maneuvers (Ganança et al., 2007).

In summary, we have reported the epidemiological features of vertigo attacks in patients with MD treated at Kyoto Medical Center. In 107 patients with MD, 43 (40.2%) suffered from BPPV-like attacks. Among these vertigo attacks (119), 65 vertigo attacks (54.6%) were thought to be BPPV attacks. These BPPV attacks were not intractable. Thus, vertigo attacks encountered during the follow-up period in MD patients must be carefully examined to prevent unnecessary treatment.

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Declaration of interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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