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RELATIONSHIP BETWEEN MIGRAINE AND THE OCCURANCE OF BENIGN PAROXYSMAL POSITIONAL VERTIGO (BPPV)

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Abstract

Introduction: Benign Paroxysmal Positional Vertigo (BPPV) is the most common vestibular disorder. Migraine also common in general population. Several studies have shown inconsistent result for the relationship between migraine and BPPV. This study aims to determine relationship between migraine and the occurrence of BPPV

Method: This case control study selected subjects with consecutive sampling techniques. Sampling was conducted at H. Adam Malik General Hospital Medan and network hospital. Thirty two patients with BPPV were selected as case group and matched with thirty two patients without BPPV as control group. Migraine history was taken in medical record. This study began in March until June 2020.

Result: The majority of case and control group were female with eighteen subjects (56.2%) and median age about 60.5 (27-78) years old. We found eight patients (25.0%) with history of migraine in case group and in control group four patients (12.5%) with history of migraine. There is no significance relationship in migraine and the occurrence of BPPV with $p=0.33$ and $OR=2.33$ (95% CI = 0.62-8.71)

Conclusion: There is no relationship between migraine and the occurrence of BPPV.

Introduction

Benign Paroxysmal Positional Vertigo (BPPV) is the most common peripheral vestibular disorder. The prevalence of BPPV has been reported to vary from 10.7 to 140 per 100,000 population.^{1,2} The prevalence will increase every year along with the age of 7 times at the age above 60 years compared to the age 18-39 years. It was found that in women more often than in men in all age groups with a female to male ratio of 2.2: 1.^{2,3} While migraine also common complaint generally found in population. Migraine is experienced by more than 28 million people worldwide. It is estimated that the prevalence in the world reaches 10%, more women than men.^{4,5}

Several factors can trigger migraine attacks, including consumption of high-caffeinated drinks, alcohol, chocolate, cheese, citrus fruits, and foods containing thiamine, aspartame, and preservatives added by Mono Sodium Glutamate (MSG) also contribute to triggers migraines.⁶ Benign Paroxysmal Positional Vertigo (BPPV) can occur due to trauma, ipsilateral Meniere's disease (6.5%), vestibular neuritis, severe systemic disease, history of previous otologic surgery and chronic otitis media. However, most cases of BPPV have an undetermined (idiopathic) etiology.^{7,8}

A number of studies have reported the suggestion that recurrent migraine attacks can result in progressive structural and functional changes in the brain.⁹ Previous research has shown that migraine and vestibular dysfunction may have potential interactions and associations through several conditions including BPPV or other disorders associated with inner ear dysfunction.¹⁰ Based on research by Chu et al it was found that migraine patients were associated with an increased risk of developing BPPV 2.03 times higher with the average migraine patient experiencing BPPV in a median of 6.29 years. This is also in line with research conducted by Kim et al which found the risk of developing BPPV was statistically significant in the migraine sufferer group. Contrary to research conducted by Teixeira et al which found an increase in the incidence of BPPV in migraineurs, the results were not significant.¹¹

Method Study sample

The study sample was taken from patients with BPPV and non BPPV who came to H. Adam Malik General Hospital Medan and network hospital using consecutive sampling techniques. Research subjects were 32 BPPV patients as case group and 32 were non BPPV patients as control group. Sex and age in case group matched with control group. For exclusion criteria in both group are: history of other peripheral vertigo related to ear disease, history of head trauma, history of head and ear surgery, history of brain disease. Other exclusion criteria in case



group is the first migraine complaint occur after diagnosed of BPPV.

Study design

This research is a case-control design. Case group from a BPPV patient whose diagnosis was made through history taking and examination of the dix hallpike (+) while control group came from the patients who have never experienced BPPV in their life. Furthermore, the two groups of research subjects were observed for history of migraine taken from their medical records. Then the result were categorized as have migraine history and no history of migraine.

Results

The Case group subjects consisted of patients diagnosed with BPPV and undergoing treatment at H. Adam Malik General Hospital Medan and network Hospital in March until June 2020, as many as 32 subjects and controls came from 32 patient who never experienced BPPV who met the research criteria. Age characteristics of all study subjects had a median value around 60,5 (27-78) years with the most age range in BPPV and not BPPV subjects at age >44-62 years and >62 years as many as 14 subjects (43,8%). Both BPPV and not BPPV subjects were mostly female, with 18 subjects (56,2%). The highest level of education of BPPV and not BPPV subjects is senior high school, with 17 subjects (53,1%) and 12 subjects (37,5%). The occupational status of BPPV and not BPPV subjects were mostly housewives with 11 subjects (34,4%). Most of the BPPV and not BPPV patient tribes were Batak tribes with 14 subjects (43,8%) and 11 subjects (34,4%). For complete data on the characteristics of the subjects of this study are presented in table 1 below.

Table 1. Demographic Characteristics of Research Subjects

Characteristics of Research Subjects	Average	BPPV n (%)	non BPPV n(%)
Age (years)	60,5(27-78)*	60,5(27-78)*	60,5(27-78)*
• 27 – 44 years		4(12,5)	4(12,5)
• >44 – 62 years		14(43,8)	14(43,8)
• >62 years		14(43,8)	14(43,8)
Gender			
• Female		18(56,2)	18(56,2)
• Male		14(43,8)	14(43,8)
Education			
• Elementary School		0(0)	2(6,3)
• Junior High School		2(6,3)	5(15,6)
• Senior High School		17(53,1)	12(37,5)
• Bachelor		13(40,6)	13(40,6)
Occupation			
• Housewife		11(34,4)	11(34,4)
• Government employees		8(25,0)	5(15,6)
• Private employees		2(6,3)	4(12,5)
• Entrepreneur		7(21,8)	8(25,0)
• Not have a job		4(12,5)	3(9,4)
• Farmer		0(0)	1(3,1)
Ethnics			
• Batak		14(43,8)	11(34,4)
• Karo		4(12,5)	4(12,5)
• Mandailing		1(3,1)	3(9,4)
• Melayu		3(9,4)	2(6,3)
• Java		8(25,0)	7(21,8)
• Aceh		1(3,1)	2(6,3)
• Nias		1(3,1)	0(0)



In this study history of migraine were observed from medical records then the result were categorized as have migraine history and no migraine history. In the BPPV group, the proportion of migraine history was obtained by 8 subjects (25.0%), while in the non BPPV group the proportion of migraine history was 4 subjects (12.5%) so that it showed that the proportion of migraine history in the BPPV group was higher than in non BPPV group. Based on the chi-square test, it was found that p value = 0.33 and OR = 2.33 (95% CI 0.62–8.71) so it can be denied that there is no significant relationship between migraine and the risk of BPPV incidence. Migraine conditions can increase the risk of BPPV by 2.33 times, but migraine cannot be identified as a risk factor for BPPV. The complete results can be seen in table 2 below

Table 2. Relationship of Migraine and BPPV

	BPPV		p	OR (95% CI)
	Yes	No		
Migren (+)	8 (25,0%)	4 (12,5%)	0,33	2,33 (0,62-8,71)
Migren (-)	24 (75,0%)	28 (87,5%)		

Uji chi-square

Discussion

In this study, it was found that the age characteristics of all study subjects in the case and control groups has a median value about 60.5 with an age range of 27–78 years. This is in line with research by Swain et al¹², which found that the age of the study subjects was 23–76 years with mean age 41.4 years. In this study, it was found that the largest age range in BPPV subjects was at the age >44 – 62 years and >62 years as many as 14 subjects (43.8%). This is relevant to the research conducted by Arianti et al¹³ with the most subjects in the range >40 - 60 years. According to Von Brevern et al¹⁴ the prevalence of BPPV increases along with age where at 18 - 39 years the prevalence is 0.5% and at 60 years and more is 3.4% and reaches 10% at the age of 80 years. BPPV incidence increase in old age and related to the degradation of otoconia from the otolyte organs, the number and volume of the otoliths progressively decreases and the fibers that connect between the otoliths are getting weaker because it is related to the decrease in calcium carbonate crystals in the demineralization process so makes it easier to release from the membrane otolit and move freely in the endolymph.¹⁵

In the gender characteristics for the case and control groups in this study, 18 female subjects (56.2%) were found and 14 male subjects (43.8%), it can be concluded that the number of female subjects more than men ratio close to 1.5: 1. The results of this study are in line with Bhattacharyya et al¹ found that the number of BPPV sufferers more often in female than male with female and male ratio 1.5 to 2.2: 1. In the study of Kim et al¹⁰ also obtained the same results where female subjects experienced more BPPV than male subjects with a proportion of 74.5% female and 25.5% male. Another study conducted by Yetiser and Gokmen¹⁶ showed that in 263 research subjects, 159 female subjects were found and 104 male. The incidence of BPPV in female is more related to estrogen. Estrogen receptors are found in the inner ear, namely the ampulla and utricle and affect the role of autoconin 90 as a protein that maintains normal morphology and growth of autoconia. In addition, decreasing levels will disrupt the internal structure and interconnection and attachment of autoconia to the gelatinous matrix.¹⁷

The education level of the case group was mostly senior high school, namely 17 subjects (53.1%). The results of this study are relevant to previous research conducted by Arianti et al³ with the highest level of high school education as the subject of BPPV, namely 20 (50.0%). Likewise with the research of Dewi et al¹⁸ which reported the characteristics of the level of education in the BPPV subject were mostly found in senior high school. In the occupation characteristics of the case group, the most cases were housewives with 11 subjects (34.4%). The results of this study are relevant to the research of Arianti et al.¹³ who reported that the most occupations in the BPPV subject were housewives with 16 subjects (40.0%). In this study, most of the tribes of BPPV patients were the Batak ethnic group as many as 14 (43.8%). This result is the same as that reported in the study by Arianti et al¹³ who reported the Batak tribe as the largest ethnic group in the BPPV subject with 16 subjects (40.0%).

In this study, the BPPV group obtained the percentage of migraine history as many as 8 subjects (25.0%) while in the non BPPV group the percentage of migraine history was 4 subjects (12.5%) so that it can be concluded that the percentage of migraine history in the BPPV group was higher than the non BPPV group. Based on the chi-square test, it was found that p value = 0.33 and OR = 2.33 (95% CI 0.62-8.71) so there is no significant relationship between migraine and the BPPV. Migraine can increase the risk of BPPV as much as 2.33 times, but migraine cannot be identified as a risk factor for BPPV even though an increase in the percentage of BPPV



is found in migraine patients.

The results of this study are relevant to previous research conducted by Teixido et al¹¹ which reported that there was no significant relationship between migraines and the incidence of BPPV but there was a significant relationship between all types of headaches and the incidence of BPPV. Teixido et al¹¹ reported that this was due to the small number of samples. In addition, they also found an increase in the prevalence of recurrence of BPPV in BPPV patients who experienced migraine, this supports the speculation that migraine patients experience repeated inner ear damage which is a predisposing factor for BPPV recurrence. In line with this, Yetiser and Gokmen reported in their study that migraine could be related to BPPV but the presence of migraine did not indicate a risk factor for the occurrence of BPPV even though there was an increased incidence of BPPV in migraine patients.

Several other studies have shown an increased prevalence of migraine in idiopathic BPPV. A retrospective study conducted by Uneri⁹ found that 476 patients with PC variant BPPV had a history of migraine in the amount of 54.8% and this figure was higher than the population although not significant. Another study conducted by Ishiyama et al⁹ on 247 BPPV patients with a history of migraine three times more in idiopathic BPPV patients than patients with a history of headache or surgery but did not indicate a relationship between BPPV and migraine due to secondary BPPV related to trauma or surgery has the same incidence as the population.

This research differs from the study conducted by Kim et al¹⁰ with a cohort study design of a migraine group of 40,682 subjects and a control group who did not experience migraine a total of 162,728 subjects, an estimated 2% of the Korean national population to see the occurrence of BPPV during 12 years of follow-up reported a risk of the incidence of BPPV at the migraine group was significantly higher than the control group with 6.0% (n = 2431) and 2.3% (n = 3,677). According to Kim et al¹⁰, the pathophysiology of the relationship between migraine and BPPV is not well understood, but repeated vasospasm in the inner ear blood vessels can cause damage to vestibular cells, thereby stimulating the release of autoconia from the macula. Recurrent vasospasm is also associated with endothelial cell oxidative stress, which is a pathogenetic mechanism in both migraine and BPPV. This study also has different results from the research conducted by Chu et al⁹ who conducted a study with a retrospective cohort design of 8,266 subjects in the migraine group and control group. Chu et al⁹ reported that patients with migraine had a 2.03 times increased risk of developing BPPV compared to the control group with an incidence rate of 18.1 per 100,000 people-per year in the migraine group and 8.9 per 100,000 people per year.

In this study, factors causing secondary BPPV such as head trauma, labyrinthitis, Meniere's disease, post-ear surgery and history of ear infections and stroke were not included in this study. There are many studies on the relationship between migraine headaches and BPPV with contradictory results. In all of these studies, there was still no exact migraine pathomechanisms could cause BPPV. However, it is suspected that repeated vasospasm from the inner ear blood vessels as well as neurogenic inflammation that occurs during a migraine attack causes the release of otoconia from the otolithic organs, resulting in BPPV.

This research has a limitation that is not analyzing metabolic factors such as diabetes mellitus, hyperlipidemia and hypertension and also hormonal factors so that further analysis of these factors needs to be done.

Conclusion

There is no significant relationship between migraine and the occurrence of BPPV

Suggestion

Future studies can further analyze the factors that influence the incidence of BPPV, especially metabolic and cardiovascular disease and hormonal factors, then matching the case and control groups against these factors.

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