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ORIGINAL ARTICLE

Effectiveness of Canalith Repositioning Manoeuvres in the Management of Benign Paroxysmal Positional Vertigo: A Longitudinal Study Among Patients With Vestibular Disorders at a Tertiary Hospital in Tanzania

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ABSTRACT

Background: Previous studies have shown that canalith repositioning manoeuvres (CRM), such as Epley's manoeuvre, offer adequate treatment for Benign Paroxysmal Positional Vertigo (BPPV) with a success rate of over 90% after a single treatment session. Benign Paroxysmal Positional Vertigo (BPPV) is one of the otological disorders encountered during routine otorhinolaryngology practice in the study area. Data on the effectiveness of CRM in the management of BPPV in Tanzania remain extremely scarce. This study aimed to determine the proportion of BPPV and the effectiveness of CRM among patients with vestibular disorders at Muhimbili National Hospital in Tanzania.

Methods: A hospital-based longitudinal study was conducted from October 2022 to March 2023 at a vestibular clinic of Muhimbili National Hospital, Tanzania. The study included 133 male and female patients with vestibular disorders such as dizziness, vertigo, and/or imbalance. Patients underwent initial Dix-Hallpike and Supine head roll tests, with results recorded, including the site and side of the semicircular canal (SCC) involved for BPPV, followed by the performance of CRM. A one-week follow-up assessed the conversion from a positive to a negative BPPV test. For those whose tests remained positive, weekly re-evaluations and additional CRM sessions were conducted until a negative conversion was achieved. The data collected was analysed using the Statistical Package for the Social Sciences Version 25.0.

Results: A total of 133 patients were recruited and 29 (21.8%) were diagnosed with BPPV. The most affected age group was 67-86 years, 11 (36.7%), with a mean age of 55.14±17.7 years. The proportion of BPPV was higher in females, 23 (27.1%), than in males, 6 (12.5%), (M: F ratio of 1:3.8). Majority of patients, 27 (93.2%) had Posterior SCC BPPV (16 had Right Posterior SCC BPPV and 11 had Left Posterior SCC BPPV), followed by 2 (6.8%) having Horizontal SCC BPPV (One patient with Right and one with Left Horizontal SCC BPPV) However, no one was found to have Anterior SCC BPPV. The majority of BPPV-positive patients, 24 (82.8%), converted to a negative BPPV test after the first CRM, and a few required up to a fourth CRM.

Conclusion: Benign Paroxysmal Positional Vertigo is one of the most common diagnoses among patients with vestibular disorders in our setting. It is characterised by vertigo and nystagmus caused by inertia of the otoconia in the semicircular canals and diagnosed by Dix-Hallpike and supine head roll tests. In this study, CRM has shown significant effectiveness in BPPV treatment. Therefore, healthcare providers should be aware that most patients require only one manoeuvre; however, follow-up remains essential as some may need up to four manoeuvres to achieve full recovery.

Keywords: Vertigo, Benign paroxysmal positional vertigo, Canalith repositioning manoeuvre, Vestibular Disorder, Dix-Hallpike test, Tanzania

BACKGROUND

Benign paroxysmal positional vertigo (BPPV) is recognised as the most prevalent cause of vestibular vertigo, with a lifetime prevalence of 2.4% and a 10% cumulative lifetime prevalence.[1,2] It accounts for about 17% to 42% of diagnoses in specialised vestibular clinics. It entails short vertigo periods accompanied by a distinct nystagmus elicited by an imbalance in the vestibular end organs, which occurs when otoconia (free-floating calcium carbonate particles) is separated from the otolithic membrane and moves into the semicircular canal (SCC) system, as the head is moved into certain positions in relation to gravity.[3-6] Though BPPV is not a life threatening otological disorder it has a significant impact on patient's quality of life by causing intense nausea, vomiting, vertigo and a high risk of falling attacks, leading to social isolation, anxiety, depression and fall related injuries especially in the older population.[7,8]

The posterior semicircular canal is most often afflicted (80% to 90%), followed by the horizontal canal (5% to 30%). Anterior semicircular canal involvement is uncommon, accounting for about 1% to 2% of individuals in larger studies.[1,4] Published studies across different regions have shown considerable variability in the reported proportions of BPPV to other vestibular disorders, for instance, a European cross-sectional study estimated a lifetime prevalence of 2.4% and a 1-year incidence of 0.6% in the general adult population.[3] The other two studies from Sweden and Germany reported proportions estimated at 27% and 28% respectively,[7,9] while findings from the United States and India depicted proportions of approximately 29.4% and 25.1%, respectively.[10,11] Notably, research from Africa, including a study conducted in Nigeria, indicates the burden of BPPV as even higher in this region, with figures amounting to 35.65% among patients presenting with peripheral vestibular disorders.[12]

Benign paroxysmal positional vertigo predominantly affects individuals between 30 and 60 years of age, although it can also strike children. Generally, the rate of occurrence increases with age.[3,4] Studies have reported mean ages in the early to mid-forties among affected patients, with one retrospective study in Egypt noting a mean age of 43.43 years and a prospective study in Nigeria indicating a mean age of 48.7 years.[13,14] Additionally, a consistent finding across the literature is the higher prevalence of BPPV in women compared with men, with a ratio of 2 or 3 to 1.[3,4] The Dix-Hallpike test (DHT) is the gold standard used to diagnose posterior canal (PC) and anterior canal (AC) BPPV. Vertigo with torsional (toward the sick ear) and upward-directed ocular nystagmus (PC BPPV) or down-beating vertical component (AC BPPV), are the diagnostic criteria for BPPV. The DHT's sensitivity and specificity are predicted to be 79% with a 95% confidence interval (CI) of 65% to 94%) and 75% (CI, 33% to 100%), respectively. Horizontal canal evaluation is done by the supine head roll test (SHRT) and the induced nystagmus can be geotropic (ground beating direction) or apogeotropic (ceiling beating direction).[1,3,15]

The first-line treatment of BPPV is focused on a series of head repositioning movements known as Canalith Repositioning Manoeuvres (CRM), which drive the otoconia out of the afflicted canal, returning them to the vestibule where they disintegrate, and shown to be effective in delivering fast and long-term relief of symptoms. Among the various CRM techniques, Epley's manoeuvre is widely endorsed for treating PC BPPV due to its efficacy and patient comfort, as it involves controlled head turning and lateral rolling. The Epley manoeuvre begins with the DHT: The patient is seated with the head turned 45 degrees toward the affected ear to isolate and vertically orient that side's posterior canal, then rapidly reclined to supine with the head hanging slightly below the horizontal. The head is then rotated 90 degrees toward the unaffected side, and again another 90 degrees in the same direction along with the patient's whole body, until the patient is lying on their side with the unaffected ear facing down. Finally, the patient is brought back to the upright (sitting) position.[3,4,16] Alternative approaches include the Semont manoeuvre and Brandt-Daroff exercises. In the Sermont manoeuvre, starting in a sitting position, the head is turned 45 degrees toward the nonproblematic ear, the patient is then moved quickly to the side-lying position on the affected side, then rapidly to the contralateral side-lying position with the head still turned 45 degrees and nose down, and finally returned to the sitting position.[17] For Brandt-Daroff exercises, patients rapidly lie on one side, sit up, lie on the opposite side, and sit up again, maintaining each position for at least 30 seconds and repeating the sequence 10 times, the patient performs this at home three times daily for 2 to 3 weeks.[18]

In cases of horizontal canal BPPV, the barbecue roll manoeuvre is employed. This involves rotation of the head at 90 degrees intervals, completing a total of 360 degrees, with steps starting from the problematic ear being down, patient facing up, problematic ear being up, patient facing down, then completion of the final roll and returning to a sitting position. For anterior canal involvement, reverse Epley's or Yacovino manoeuvres are recommended. Reverse Epley manoeuvre also starts with DHT, then the head is turned 90 degrees to the affected ear; again, 90 degrees turn in the same direction, along with the patient's whole body, until the patient lies with his head pointing down and on the affected ear side; the patient is then placed in an upright (sitting) position. The Yacovino manoeuvre consists of four steps: the patient sits straight, brings the head to the head-hanging position 30° below the horizontal plane, elevate the head so that the chin touches the chest, and returns to the sitting position.[3,4,16,18]

Comparative studies have suggested that although both Epley's and Semont's manoeuvres are effective, Epley's manoeuvre tends to be more tolerable for patients. Moreover, evidence indicates that a single session of Epley's manoeuvre can be significantly more effective (ten times) than multiple sessions of Brandt-Daroff exercises.[5,19] Overall, most patients experience significant symptom relief after two CRM visits (75% to over 90%), with many achieving full recovery by the third or fourth visit.[3,10,20]

Despite established protocols, data on the epidemiology of BPPV and treatment outcomes remain scarce in Central, Southern, and East Africa, including Tanzania. To provide valuable regional data and improve the clinical management of BPPV in Tanzania, this study aimed to determine the proportion of BPPV among patients with vestibular disorders in our setting, evaluate the effectiveness of canalith repositioning manoeuvres and provide guidance on the number of manoeuvres and weekly follow-up visits required for effective treatment.

METHODS

Study Design, Area and Study Duration

This study was a hospital-based, longitudinal study conducted from October 2022 to March 2023 at an outpatient vestibular clinic of the Otorhinolaryngology (ORL) department at Muhimbili National Hospital (MNH), which serves as a national referral and university teaching hospital. The hospital has two campuses: the first one is on Upanga Street in the Ilala District, and the second is at Mloganzila, located in the Ubungo District of Dar es Salaam, Tanzania. The ORL department comprises four units: Rhinology which focuses on diseases of the nose

and paranasal sinuses, using modern endoscopic facilities for diagnosis and surgery; Otology and Neurotology, which deal with ear diseases; Head and Neck Surgery, which focuses on the diseases of the head and neck region; Audiology which offers hearing assessments and hearing aid fitting; and Speech and Language Therapy, which serves patients with speech and language disorders, including children with delayed speech and post-stroke adults. The department also runs four specialised clinics, one of which is the vestibular clinic.

The vestibular clinic is being run by a single neurotologist, once a week at Upanga and twice a week at Mloganzila, attending approximately 400 patients annually. The study was conducted across both campuses, which are Mloganzila and Upanga campuses.

Study Population and Sampling Technique
Patients who attended the outpatient vestibular clinic were recruited. A non-probability convenience sampling technique was used, whereby all patients who had complaints of dizziness, vertigo, and/or imbalance during the study period and were willing to participate were consecutively enrolled.

Inclusion Criteria
All patients who had complaints of dizziness, vertigo, and/or imbalance.

Exclusion Criteria
Patients diagnosed to have central nervous system diseases, known patients with cervical spine disorders, cardiac disease in failure, pregnant women, known substance abusers, patients on vestibular sedatives and vestibulotoxic medications.

Sample Size Estimation
Sample size (n) was obtained using Yamane's formula, which is the formular used when the population is known but the characteristics of the population are not known.[21,22]

The sample size (n)=N/(1+Ne^2)

In which, N=size of the study population, which is 200 vestibular patients per six months and e=level of precision, at a significance level of 95%, which was 0.05

n=200/(1+(200 x 0.05^2)=133

Therefore, the sample size (n) was 133 patients

Data Collection Methods and Tools
Patients underwent history taking, physical examination, and a neuro-otological evaluation with vestibular office tests, including the DHT (bilateral) and supine head roll manoeuvre (bilateral). The diagnosis was based on the outcome of DHT and supine head roll test and the expected nystagmus (outcome). For the PSCC BPPV, geotropic torsional up-beating nystagmus counterclockwise (Right) or clockwise (Left). Anterior SCC BPPV, geotropic torsional down-beating nystagmus counterclockwise (Right) clockwise (Left). Horizontal SCC BPPV canalithiasis type, right or left horizontal geotropic nystagmus. For HSCC BPPV cupulolithiasis type, right or left horizontal apogeotropic nystagmus.

Treatment was by CRM, which included: Epley's manoeuvre for PSCC BPPV, Barbecue roll for Geotropic HSCC BPPV, Gufoni's manoeuvre for Apogeotropic HSCC BPPV, and Reverse Epley's manoeuvre for ASCC BPPV. A single neurotologist across both campuses, performed all canalith repositioning manoeuvres thereby standardising the procedure

All data were recorded in a structured data extraction form, which included demographic information (age, sex), initial DHT or head roll test result, and site and side of SCC involved for BPPV patients at the first visit. A change from a positive DHT or supine head roll test to negative was observed and assessed after a one-week follow-up visit. Canalith repositioning manoeuvre was repeated at weekly visits for those who remained BPPV positive, and the number of visits the patient required for improvement was noted in the same data extraction sheet. All manoeuvres were performed by a single neurotologist, eliminating the need for inter-examiner standardization.

Data Management and Analysis
Demographic information (age and sex), initial DHT or head roll test result, site and side of SCC involved for BPPV, and weekly visit test results of patients were collected, re-checked, underwent coding, and then entered for analysis into computer software (Statistical Package for the Social Sciences, (SPSS), version 25.0 by IBM Corp. Armonk, NY, USA). Categorical data were summarised using percentages or proportions, while numerical data were summarised using mean and standard deviation. The chi-square or Fisher's exact test was used to extract associations between the intervention and outcome, and a p-value ≤ .05 was considered statistically significant.

Ethical Considerations
Ethical clearance was obtained from the Muhimbili University of Health and Allied Sciences (MUHAS) Directorate of Research and Publications on 8th September 2022, with approval number MUHAS-REC-09-2022-1355. The permission to conduct this study was obtained from the head of Training, Research, and Consultancy of Muhimbili National Hospital on 4th October 2022 with reference number MNH/TRCU/PERM/2022/042. Every participant was provided with all the necessary information before voluntarily signing the informed consent form.

RESULTS
Demographic Characteristics of the Recruited Patients.
A total of 133 patients with vestibular disorders were included in the study. Their ages ranged from 7 to 86 years, with a mean age of 51.44±16.89 years. The most represented age group was 47 to 66 years, accounting for 53 patients (39.8%). The majority were females, 85 (63.9%), with a male-to-female ratio of 1:1.8 (Table 1).

Proportion of BPPV Among Patients With Vestibular Disorders Attending the Vestibular Clinic
Out of the 133 patients with vestibular disorders, 29 (21.8%) were BPPV positive. The highest proportion of BPPV was observed in the age group of 67 to 86 years, affecting 11 (36.7%) patients in that group and the lowest proportion was in the 7 to 26 years age group, 1 (7.7%).

The mean age of BPPV-positive patients was 55.14±17.7 years. The proportion of BPPV was higher in females, 23 (27.1%), than males, 6 (12.5%), with a male-to-female ratio of 1:3.8. The findings were statistically significant for both age and sex with a *P* value of 0.02 and 0.05 respectively. (Table 2)

TABLE 1: Demographic Characteristics of the Patients at the Vestibular Clinic (N=133)

Variables	Frequency N (%)
Age group (years)	
7-26	13 (9.8)
27-46	37(27.8)
47-66	53(39.8)
67-86	30(22.6)
Mean age (SD)	51.44(16.89)
Sex	
Male	48(36.1)
Female	85(63.9)

Types of BPPV According to Age and Sex

Among the 29 patients with BPPV, the majority, 16 (55.2%), had Right PSCC BPPV followed by Left PSCC (n=11, 38.0%) with one case each for Right and Left HSCC BPPV. In general, 27 (93.2%) patients had PSCC BPPV, while the remaining 2(6.4%) had HSCC BPPV.

All patients in the 7 to 26 years age group had Right PSCC BPPV (n=1) followed by the 27 to 46 years age group (n=8, 72.7%). However, Left PSCC, Right HSCC, and Left HSCC BPPV were most common in the age group of 47 to 66 years.

Left PSCC BPPV was most common among males, 5 (83.3%), while Right PSCC, Left HSCC, and Right HSCC BPPV were most common among females. (Table 3) However, the findings were not statistically significant.

Effectiveness of Canalith Repositioning Manoeuvres in the Management of BPPV

The majority of BPPV patients, 24 (82.8%), achieved negative BPPV test results following a single CRM, and 1 (3.4%) required up to a fourth CRM. A single CRM was sufficient to achieve a negative result in all patients with both the conversion of both Right and left HSCC BPPV, while a second CRM was required for 3 (18.8%) of the patients with Right PSCC BPPV. In patients with Left PSCC BPPV, one patient (9.1%) required up to a fourth CRM (Table 4). The findings, however, were not statistically significant (*P*=0.38).

TABLE 2: Proportion of BPPV Among Patients with Vestibular Disorders by Age and Sex, (N=133)

Variables	Total	BPPV Test Results		Chi-square	*P Value*
		Positive	Negative		
Age group (years)					
7-26	13	1 (7.7)	12 (92.3)	10.18	.02
27-46	37	11 (29.7)	26 (70.3)		
47-66	53	6 (11.3)	47 (88.7)		
67-86	30	11 (36.7)	19 (63.3)		
Sex					
Male	48	6 (12.5)	42 (87.5)	3.81	.05
Female	85	23 (27.1)	62 (72.9)		
Total		29(21.8%)	104(78.2%)		

TABLE 3: Types of BPPV According to Age and Sex, (N=29)

Variables	Total	Type of BPPV				Fisher's Exact Test	*P-Value*
		Right PSCC BPPV	Left PSCC BPPV	Right HSCC BPPV	Left HSCC BPPV		
Age group (years)							
7-26	1	1 (100.0)	0 (0.0)	0 (0.0)	0 (0.0)	12.80	.17
27-46	11	8 (72.7)	3 (27.3)	0 (0.0)	0 (0.0)		
47-66	6	1 (16.7)	3 (50.0)	1 (16.7)	1 (16.7)		
67-86	11	6 (54.5)	5 (45.5)	0 (0.0)	0 (0.0)		

Continue

TABLE 3: Continued

Variables	Total	Type of BPPV: Right PSCC BPPV	Left PSCC BPPV	Right HSCC BPPV	Left HSCC BPPV	Fisher's Exact Test	*P-Value*
Sex							
Male	6	1 (16.7)	5 (83.3)	0 (0.0)	0 (0.0)	6.43	.1
Female	23	15 (65.2)	6 (26.1)	1 (4.3)	1 (4.3)		
Total	29	16 (55.2%)	11(38.0%)	1(3.4%)	1(3.4%)		

TABLE 4: Effectiveness of Canalith Repositioning Manoeuvres in the Management of BPPV According to Types of BPPV, (N=29)

Variables	Total	Number of CRM at the Conversion of BPPV Test: 1st CRM Negative Conversion	2nd CRM Negative Conversion	3rd CRM Negative Conversion	4th CRM Negative Conversion	Fisher's Exact Test	*P Value*
Type of BPPV							
Right PSCC BPPV	16	13 (81.3)	3 (18.8)	0(0.0)	0(0.0)	12.93	.38
Left PSCC BPPV	11	9 (81.8)	0(0.0)	1 (9.1)	1 (9.1)		
Right HSCC BPPV	1	1 (100.0)	0(0.0)	0(0.0)	0(0.0)		
Left HSCC BPPV	1	1 (100.0)	0(0.0)	0(0.0)	0(0.0)		
Total		24(82.8%)	3(10.4%)	1(3.4%)	1(3.4%)		

DISCUSSION

This study aimed to determine the proportion of BPPV and efficacy of CRM among patients with vestibular disorders in our setting. Our study involved 133 patients with vestibular disorders and among these patients, the proportion of BPPV was 21.8% which is lower compared to studies done in India by Swain et al and in Nigeria by Olusasi et al.[11,12] The difference observed could be due to a smaller sample size of our study compared to their studies. All age groups are affected by BPPV, and in our study, the mean age of 55(±17.7) years was noted, this finding is consisted with studies by Marcias et al in the USA, Sharma et al in India, and Adegbiji et al in Nigeria, where the mean ages were 58.6, 54, and 48.7 years respectively.[13,16,23] However, Macrus et al from Egypt found the mean age slightly lower, 43.43 (SD8.99) years.[24] The findings highlight the need for routine screening of vertiginous patients for BPPV using simple bedside manoeuvres such as the Dix–Hallpike test, given that it is easily treatable with repositioning techniques like the Epley manoeuvre. Strengthening clinician training and incorporating standardized vertigo assessment protocols into clinical practice may improve early diagnosis and management.

Even though BPPV affects all ages, it appears to be more common in the older population as demonstrated by our study findings. This finding is like the findings by Chua et al in the USA, who found the highest proportion of BPPV to be in the age group of 71-80 years, though this contrasts with Borgohain et al. from Nigeria who found the highest proportion in the age group of 41-60 years.[25,26] An increase in age incidence of BPPV could be due to related vascular risk factors (comorbidities) affecting the flow of the anterior inferior cerebellar artery (AICA) causing labyrinthine microvascular insults resulting in otoconia detachment from the utricle and the prognosis also worsens in advance of age (age-related degeneration and detachment of otoconia).[25] Unrecognised BPPV in the elderly, who frequently present specific issues such as challenges obtaining an accurate history, restricted mobility, and challenges with diagnostic and therapeutic manoeuvres because of vascular and orthopedic complications. These challenges may partly explain the discrepancies observed in age profiles across studies. In this study, the occurrence of BPPV showed a female predilection, with a male-to-female ratio of 1:3.83, which is similar to several other studies.[13,16,23] Females have a higher prevalence of BPPV for various reasons, including hormonal shifts as they age (after menopause) and a greater probability of osteoporosis.[27] Although BPPV can occur at any age, its higher occurrence among older adults suggests the need for routine screening of elderly patients presenting with dizziness using simple bedside tests such as the Dix–Hallpike manoeuvre. Strengthening clinician awareness and standardised vertigo assessment protocols may improve early diagnosis and reduce complications such as falls.

Posterior semicircular canal BPPV was observed in the majority of patients, followed by HSCC BPPV, but none were found to have ASCC BPPV. These findings are

similar to studies done in America, India, Egypt, and Nigeria.[11,13,16,25,28] In contrast to our findings, some studies reported cases of multiple canal involvement,[11,16,26] and ASCC BPPV cases,[11,28] which were not observed in our study. The reason for the PSCC being more affected may be explained by its anatomy, which, by gravity, easily enables otoconia to enter through the crus commune and into the canal with a low chance of spontaneous exit. On the contrary, the otoconia have to go up against gravity for the anterior canal, thus the rare occurrence of this type (steep angle to sagittal plane).[25] Regarding the HSCC, spontaneous resolutions are more common as otoconia may easily exit the canal as the patient changes position in bed; thus, it tends to be more self-limiting, thus fewer patients reached the vestibular clinic.[29-31]

Patients with PSCC BPPV had a mean age of 54.7 ±18.3 years, and patients with HSCC BPPV had a mean age of 61± 2.8 years. So et al found a similar mean for PSCC BPPV (54.2 ±14 years) and a lower mean for HSCC BPPV (55.5 ±14 years).[32] These differences may be attributable to the relatively smaller sample size of the present study.

However, we observed more occurrence of BPPV in the right ear as compared to the left ear, and similar findings were also reported by Chua et al., Borghorain et al., and Adegbiji et al.[13,25,26] Right PSCC BPPV was most common across most age groups. Left PSCC BPPV was most common among males, while Right PSCC BPPV was most common among females. This finding was also reported by So et al in Korea, who noted that the BPPV type with the highest proportion in males and females was PSCC BPPV accounting for 60.2% and 61.4%, respectively.[32] The higher occurrence of BPPV in the right ear suggests the need for careful positional testing of both ears during vertigo assessment to ensure accurate diagnosis and appropriate repositioning therapy.

Canalith repositioning manoeuvre is the gold standard in the management of BPPV. Regarding its effectiveness, this study found that 82.8% of patients had a negative BPPV test at the one-week follow-up after a single CRM. The remaining required either a second, third, or fourth manoeuvre. The high percentage of patients converting to a negative BPPV test from the first manoeuvre supports evidence from previous studies,[4,14,23,28,] although it is a slightly contrasting finding from Abdelghaffar et al who found that some of the HSCC BPPV patients required second and third manoeuvre unlike in our study, where only one CRM was required.[28]

Study Limitations

The follow-up period of this study was short. Consequently, the recurrence of BPPV, which may occur months after initial symptoms' resolution, was not assessed. Furthermore, as the study was conducted at a single tertiary hospital in Tanzania, the findings may not be generalised countrywide. Future studies with larger sample sizes are recommended to explore a broader range of causes of vestibular disorders beyond BPPV. Further large-scale studies are required to assess the sensitivity and specificity of DHT diagnostic approaches.

CONCLUSION

This study has found that BPPV accounted for 21.8% among patients with vestibular disorders in our setting, making it one of the most common diagnoses in this group. The PSCC, particularly on the right-hand side, was the most frequently affected. Benign Paroxysmal Positional Vertigo predominantly affected females and patients in the 67–86-year age group. Canalith repositioning manoeuvres were highly effective, with most patients achieving a negative result after a single CRM. We therefore recommend awareness to be enhanced among healthcare practitioners regarding early diagnosis and appropriate management of vestibular disorders, particularly BPPV, in order to alleviate symptoms and improve patients' quality of life.

In this study, a single CRM was selected for each affected canal. Further studies comparing manoeuvres for each canal are warranted to compare their relative effectiveness, patients' comfort, and side effect profile. Additionally, studies of longer duration are recommended to better characterise the recurrence rate of BPPV in our setting.

REFERENCES

1. Von Brevern M, Bertholon P, Brandt T, Fife T, Imai T, Nuti D, et al. Benign paroxysmal positional vertigo: Diagnostic criteria. J Vestib Res Equilib Orientat. 2015;25:105–17. https://doi.org/10.3233/VES-150553
2. Von Brevern M, Radtke A, Lezius F, Feldmann M, Ziese T, Lempert T, et al. Epidemiology of benign paroxysmal positional vertigo: A population based study. J Neurol Neurosurg Psychiatry. 2007;78:710–5. https://doi.org/10.1136/jnnp.2006.100420
3. You P, Instrum R, Parnes L. Benign paroxysmal positional vertigo. Laryngoscope Investig Otolaryngol. 2019;4:116–23. https://doi.org/10.1002/lio2.230
4. Gaur S, Awasthi SK, Bhadouriya SKS, Saxena R, Pathak VK, Bisht M. Efficacy of Epley's Manoeuvre in Treating BPPV Patients: A Prospective Observational Study. Int J Otolaryngol. 2015;2015:487160. https://doi.org/10.1155/2015/487160
5. Hilton MP, Pinder DK. The Epley (canalith repositioning) manoeuvre for benign paroxysmal positional vertigo. Cochrane Database Syst Rev. 2014;2014. https://doi.org/10.1002/14651858.CD003162.pub3
6. Kerrigan MA, Costigan MF, Blatt KJ, Mathiason MA, Domroese ME. Prevalence of Benign Paroxysmal Positional Vertigo in the Young Adult Population. PM R. 2013;5:778–85. https://doi.org/10.1016/j.pmrj.2013.05.010
7. Lindell E, Rpt LK, Karlsson T, Johansson M, Finizia C. Benign paroxysmal positional vertigo and vestibular impairment among older adults with dizziness. Laryngoscope Investig Otolaryngol. 2021;6:488–95. https//doi.org/101002/lio2566.
8. Elabedein AZ, Elhamid HA, Ragab A, Mokhtar AS. Does benign paroxysmal positional vertigo impact the psychological state of patients ? A case – control study. The Egyptian Journal of Otolaryngology. 2025;41:81. https://doi.org/10.1186/s43163-025-00828-0.
9. Hulse ÃR, Stuck B, Erhart M, Biesdorf A, Ho K, Hu M, et al. Peripheral Vestibular Disorders : An Epidemiologic Survey in 70 Million Individuals. 2018;:88–95. https://doi.org/10.1097/MAO.0000000000002013
10. Wang A, Zhou G, Kawai K, O'Brien M, Shearer AE, Brodsky JR. Benign Paroxysmal Positional Vertigo in Children and Adolescents With Concussion. Sports Health. 2021;13:380–

6. https://doi.org/10.1177/1941738120970515

11. Swain SK, Behera IC, Das A, Sahu MC. Prevalence of benign paroxysmal positional vertigo: Our experiences at a tertiary care hospital of India. Egypt J Ear, Nose, Throat Allied Sci. 2018;19:87–92. https://doi.org/10.21608/ejentas.2018.5246.1040

12. Olusesi AD, Abubakar J. 10 years of Vertigo Clinic at National Hospital Abuja, Nigeria: what have we learned? Eur Arch Oto-Rhino-Laryngology. 2016;273:3567–72. https://doi.org/10.1007/s00405-016-3969-6

13. Adegbiji WA, Aremu SK, Adewoye KR, Ibrahim T. Diagnosis and management of benign paroxysmal positional vertigo in a West African Country. J Crit Rev. 2021;8:1–8.

14. Mahrous AK, Ahmed MAM, El Habashy HSE, Sarhan MM. Effectiveness of Epley's Manoeuvre in the treatment of Benign Paroxysmal Positional Vertigo (BPPV). EJNSO. https://doi.org/10.21608/EJNSO.2020.79334.

15. Helminski JO, Zee DS, Janssen I, Hain TC. Effectiveness of particle repositioning manoeuvremanoeuvres in the treatment of benign paroxysmal positional vertigo: A systematic review. Phys Ther. 2010;90:663–78. https://doi.org/10.2522/ptj.20090071

16. Macias JD, Lambert KM, Massingale S, Ellensohn A, Fritz JA. Variables affecting treatment in benign paroxysmal positional vertigo. Laryngoscope. 2000;110:1921–4. https://doi.org/10.1097/00005537-200011000-00029

17. Nuti D, Masini M, Mandalà M. Benign paroxysmal positional vertigo and its variants. Handb Clin Neurol. 2016;137:241–56. https://doi.org/10.1016/B978-0-444-63437-5.00018-2

18. Choi SY, Cho JW, Choi JH, Oh EH, Choi KD. Effect of the Epley Manoeuvre and Brandt-Daroff Exercise on Benign Paroxysmal Positional Vertigo Involving the Posterior Semicircular Canal Cupulolithiasis: A Randomized Clinical Trial. 2020;11:603541. https://doi.org/10.3389/fneur.2020.603541

19. Bhattacharyya N, Gubbels SP, Schwartz SR, Edlow JA, El-Kashlan H, Fife T, et al. Clinical Practice Guideline: Benign Paroxysmal Positional Vertigo (Update). Otolaryngol - Head Neck Surg (United States). 2017;156;3_suppl:S1–47. https://doi.org/10.1177/0194599816689667

20. Van Duijn JG, Isfordink LM, Bijvank JAN, Stapper CW, Van Vuren AJ, Wegner I, et al. Rapid systematic review of the epley manoeuvre for treating posterior canal benign paroxysmal positional vertigo. Otolaryngol - Head Neck Surg (United States). 2014;150:925–32. https://doi.org/10.1177/0194599814527732

21. Singh AS, Masuku MB. Sampling techniques & determination of sample size in applied statistics research, Int J Econ Commerce Bus Manage. 2014;2(2):1-22.

22. Jeffry J, Raymond J, Raymond T, Punzalan B. On the misuse of Slovin's Formula . Philipp Stat. 2012;61:129–36.

23. Sharma R. Treatment response of Epley's manoeuvre in the management of posterior semicircular canal benign paroxysmal positional vertigo. Int J Otorhinolaryngol Head Neck Surg. 2021;7:1863. https://doi.org/10.18203/issn.2454-5929.ijohns20214457

24. Ali HY, Al Shehabi MH. Effectiveness of Epley's Manoeuvre in the treatment of Benign Paroxysmal Positional Vertigo (BPPV). Bahrain Med Bull. 2006;28:18–22.

25. Chua K, RE G, S S. Demographic and clinical characteristics of BPPV patients: a retrospective large cohort study of 1599 patients. J Otolaryngol Res. 2020;12:20–30. https://doi.org/10.15406/joentr.2020.12.00451

26. Borgohain, Rupam; Dey, R, Brahma, D, Timungpi G. Epley ' s Manoeuvre -Its Role in Management of BPPV: A Prospective Study. IOSR J Dent Med Sci. 2019;18:01–5.

27. Hülse R, Biesdorf A, Hörmann K, Stuck B, Erhart M, Hülse M, et al. Peripheral Vestibular Disorders: An Epidemiologic Survey in 70 Million Individuals. Otol Neurotol. 2019;40:88–95. https://doi.org/10.1097/MAO.0000000000002013

28. Abdelghaffar H. Effect of canalith repositioning procedures (CRP) in management of subjective benign paroxysmal positional vertigo. J Int Adv Otol. 2010;6:34–8.

29. Soto-Varela A, Santos-Perez S, Rossi-Izquierdo M, Sanchez-Sellero I. Are the three canals equally susceptible to benign paroxysmal positional vertigo? Audiol Neurotol. 2013;18:327–34. https://doi.org/10.1159/000354649

30. Lopez-Escámez JA, Gámiz MJ, Fiñana MG, Perez AF, Canet IS. Position in bed is associated with left or right location in benign paroxysmal positional vertigo of the posterior semicircular canal. Am J Otolaryngol - Head Neck Med Surg. 2002;23:263–6. https://doi.org/10.1053/ajot.2002.124199

31. Çakir BÖ, Ercan I, Çakir ZA, Civelek Ş, Turgut S. Relationship between the affected ear in benign paroxysmal positional vertigo and habitual head-lying side during bedrest. J Laryngol Otol. 2006;120:534–6. https://doi.org/10.1017/S002221510600082X

32. So YM, Ji SK, Kim BK, Jae IK, Lee H, Son S Il, et al. Clinical characteristics of benign paroxysmal positional vertigo in Korea: A multicenter study. J Korean Med Sci. 2006;21:539–43. https://doi.org/10.3346/jkms.2006.21.3.539

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