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"EFFECTIVENESS OF CANALITH REPOSITIONING MANEUVERS IN DIFFERENT TYPES OF BPPV AT A TERTIARY CARE HOSPITAL IN LAHORE"

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Abstract

Objectives: *To determine effectiveness of canalith repositioning maneuvers in different types of benign paroxysmal positional vertigo.*

Study Design: *Quasi-experimental study.*

Place and Duration of Study: *"Combined Military Hospital, Lahore from July 2024 to December 2024".*

Methodology: *Eighty one patients who presented with "benign paroxysmal positional vertigo (BPPV)" were included in the study. Based on diagnostic criteria, type of BPPV as identified. All the patients underwent "canalith repositioning maneuvers" and its effectiveness was determined. Data was analyzed using SPSS v22.00.*

Results: *Median age was 55.00 (70.00 – 39.00) years. There were 32 (39.51%) males and 49 (60.49%) were females. Median DHI score was 56.00 (74.00 – 46.00). Effectiveness of canalith repositioning maneuvers in patients with BPPV was 61.73% with highest effectiveness observed in posterior canal followed by horizontal and anterior canal BPPV at 64.58%, 61.91% and 50.00%respectively.*

Conclusion: *Effectiveness of canalith repositioning maneuvers in patients with BPPV was 61.73%.*

INTRODUCTION

"Benign Paroxysmal Positional Vertigo (BPPV)" is one of the most common causes of vertigo, characterized by transient episodes of dizziness provoked by specific head movements. [1] BPPV despite being a benign condition, has a significant and adverse impact on life quality of the ailing patient. [2] Globally, BPPV accounts for approximately 20-30% of all cases of dizziness and is most commonly seen in individuals over the age of 50 years. [3] In Pakistan, data regarding the burden of BPPV in general population lacks grossly, however, one study reported that among patients who presented at a tertiary level hospital of Pakistan with complaint of vertigo, frequency of BPPV was 33.2%. [4]"Canalolithiasis" and "cupulolithiasis" are the primary pathophysiological mechanisms of BPPV in which the "otoconia" (that are small crystals made up of calcium carbonate) either freely float in the semicircular canals or adhere to the cupula causing an abnormal gravitational pull resulting in vertigo. [5] In addition, secondary BPPV also exists that is often linked to trauma, viral infections or inner ear

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surgeries, which can alter the mechanical integrity of the otolithic membrane. [6] There are three main types of BPPV based on the canal involved, that is posterior, horizontal and anterior canal BPPV. [7]

Diagnosis of BPPV is primarily clinical for which gold standard clinical test is "Dix-Hallpike test". [8] Additionally, "Head impulse, Nystagmus and Test of Skew (HINTS) plus" test is also used to differentiate central and peripheral vertigo. [8] Since the clinical features of different types of BPPV have some degree of variability the management through "canalith repositioning maneuvers (CRM)" (which are cornerstone in management of this condition) also needs to be modified as per type of BPPV. [9] Since availability of data regarding BPPV in generally lacking in Pakistani population, alongside the effectiveness of "canalith repositioning maneuvers" in different BPPV types, it was essential to conduct further research in this regard to fill this literature gap. Therefore, present study was conducted with the aim to determine the frequency of various types of BPPV being observed in the clinical practice and assessing the effectiveness of "canalith repositioning maneuver" in different types of BPPV in local population.

METHODOLOGY

$$n = \frac{z^2_{1-\alpha/s} P(1-P)}{d^2}$$

This quasi-experimental study was conducted at "Combined Military Hospital, Lahore from July 2204 to December 2024". Appropriate sample size was calculated using following formula:

For calculations, following assumptions were used; confidence level of 95%, absolute precision of 8% and anticipated effectiveness of CRM in BPPV of 84%. [10] This gave a sample size of 81.

Inclusion criteria: Patients aged more than 18 years, both males and females, presenting at ENT outdoor department and were diagnosed with BPPV based on clinical history and Dix Hallpike maneuver, were included in this study.

Exclusion criteria: Patients who had evidence/history of hearing loss, cerebellar lesion, vestibulo-pontine angle tumor, use if ototoxic drugs, ear infection, cervical spondylosis and pregnancy were excluded from the study.

Patients were selected by using non-probability purposive sampling. A detailed interview was conducted with the patient and baseline characteristics of the patients including age, gender and pre-treatment "dizziness handicap inventory (DHI)" score were documented. To make diagnosis of BPPV, clinical diagnostic positional tests were performed to elicit positional vertigo and nystagmus. To determine the type of BPPV specific clinical positioning tests were performed including "Dix-Hallpike test (for posterior and horizontal canal BPPV)", and "supine straight head-hanging position test (for anterior canal BPPV)". Diagnosis confirmation was done by assessing the patients for the clinical diagnostic criteria for each type of BPPV given in a study conducted by Kumar Swain. [11] Once diagnosed, patients were guided regarding the CRM that was planned to be performed on them based on the type of BPPV being diagnosed.

In case of "posterior canal BPPV", CRMs used were "Epley's maneuver", "Semont maneuver" and " Foster maneuver". " Epleys maneuver" was most commonly employed technique. With the patient seated, head was rotated towards positive "Dix-Hallpike test" side and patient was rapidly put into supine position for thirty seconds with slightly extended neck. After this head was rotated towards the opposite side while patient being supine and was kept in place for thirty seconds. Then the patients was rolled over towards this side and was put into sitting position on the tilted side rapidly. In case of "horizontal canal BPPV", choice of CRM was "Barbeque roll maneuver" in which patient was put for thirty second intervals in three positions including on the right, supine and then on the left side. In case of "anterior canal BPPV" "Yacovino maneuver" was employed. With the patient seated, the head is transitioned in supine position with head hanging from the couch for thirty seconds. After this chin to chest position was made and was held in position for thirty seconds to compete the maneuver. After performing the respective CRMs, DHI score was reassessed and > 50% reduction in DHI score was labeled as effective.

Statistical analysis of collected data was performed by using Statistical package for Social Sciences version 20. Normality of data was checked by Shapiro-Wilk test. Age and DHI score was not distributed normally

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and was represented using median interquartile range (IQR). Qualitative data (gender, type of BPPV and effectiveness) was represented by using percentage and frequency. Comparison of CRM effectiveness between age groups, genders and different types of BPPV was performed using Chi-square test and a p-value of ≤ 0.05 was considered to be statistically significant.

RESULTS

In this study, 81 patients were included. Median age was 55.00 (70.00 – 39.00) years. There were 32 (39.51%) males and 49 (60.49%) were females. Median DHI score was 56.00 (74.00 – 46.00). Most common type of BPPV was "posterior canal BPPV" found in 48 (59.26%) patients. Baseline characteristics of study participants is given below in Table-I:

Table-I: Baseline characteristics of study participants (n = 81)

Parameter	Median (IQR); n (%)
Median age	55.00 (70.00 – 39.00) years
< 50 years	20 (24.69%)
≥ 50 years	61 (75.31%)
Gender	
Male	32 (39.51%)
Female	49 (60.49%)
Median DHI score	56.00 (74.00 – 46.00)
BPPV type	
Posterior canal	48 (59.26%)
Horizontal canal	21 (25.93%)
Anterior canal	12 (14.81%)

Median post-CRM DHI score was 20.00 (51.00 – 9.00). Based on this effectiveness of CRM in BPPV patients was 50 (61.73%). Among patients aged < 50 years (n = 20), effectiveness of CRM was 11 (55.00%) while in patients aged ≥ 50 years (n = 61) it was 39 (63.93%), (p = 0.476). This comparison is given below in Table-II:

Table-II: Comparison of CRM effectiveness between age groups (n = 81)

Effectiveness	< 50 years (n = 20)	≥ 50 years (n = 61)	p-value
Yes	11 (55.00%)	39 (63.93%)	0.476
No	9 (45.00%)	22 (36.07%)	

Among male patients (n = 32), effectiveness of CRM was 19 (59.38%) while in female patients (n = 49), it was 31 (63.27%), (p = 0.725). This comparison is given below in Table-III:

Table-III: Comparison of CRM effectiveness between genders (n = 81)

Effectiveness	Male (n = 32)	Female (n = 49)	p-value
Yes	19 (59.38%)	31 (63.27%)	0.725
No	13 (40.62%)	18 (36.73%)	

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Among patients with "posterior canal BPPV" (n = 48), effectiveness of CRM was 31 (64.58%), in patients with "horizontal canal BPPV" (n = 21), it was 13 (61.91%) and in patients with "anterior canal BPPV" (n = 12), it was 6 (50.00%), (p = 0.649). This comparison is given below in Table-IV:

Table-IV: Comparison of CRM effectiveness by BPPV types (n = 81)

Effectiveness	Posterior canal (n = 48)	Horizontal canal (n = 21)	Anterior canal (n = 12)	p-value
Yes	31 (64.58%)	13 (61.91%)	6 (50.00%)	0.649
No	17 (35.42%)	8 (38.09%)	6 (50.00%)	

DISCUSSION

BPPV is a common ENT pathology occurring secondary to the abnormality in the semicircular canals located in the inner ear. [12] Dizziness and vertigo are the primary symptoms with which patients with BPPV presents and they can be severe enough to debilitate the patients. [13] Luckily, simple clinical maneuvers known as CRM involving position changing of the patient can prove to be highly effective in mitigating BPPV symptoms. [14] Present study focused on assessing the effectiveness of various CRM in management of different types of BPPV.

In present study, it was found that average age of the patients who were diagnosed to have BPPV was above forty five years. This finding can be explained by the fact that BPPV is relatively more common in older adults, as evidenced by findings of multiple previous studies. [15, 16] Majority of patients who presented and diagnosed with BPPV were females which is congruent with the findings of previous literature reporting BPPV to be more common in women as compared to men. [17, 18] To assess patients for BPPV severity and effectiveness of CRMs in management of BPPV, DHI score was used which is known to highly validated tool in this regard. [19] "Posterior canal BPPV" was most common type of BPV which has been reported to be the most common BPPV type in previous literature. [20, 21]

In terms of CRM effectiveness, it was found that these repositioning maneuvers were found to be effective in 61.73% with highest effectiveness observed in "posterior canal BPPV" (64.58%) followed by "horizontal canal BPPV" (61.91%) and "anterior canal BPPV" (50.00%). Compared to this one study conducted by Ali et al. [22], it was found that effectiveness of "Epley's maneuver" was 60% which was comparable to the results of present study. Similar to the results of current study, Altaf et al. [23] reported the effectiveness of CRM in managing BPPV was 63.83%. Contrary to the findings of present study, Akula et al. [10] reported that CRM effectiveness in BPPV ranged from 84.3% to 96.8% which was much higher as compared to present study. Similarly, Abdel Kader et al. [24] found that effectiveness of CRM in BPPV cases ranged from 80 to 90% which was also much higher compared to present study. Additionally, it was found that age, gender or type of BPPV had no significant impact on the effectiveness of canalith repositioning maneuvers.

Results of present study suggest that CRMs can prove to be highly beneficial and effective in managing patients presenting with BPPV. However, sole dependence on the clinical canalith repositioning maneuvers may not be a better choice and use of adjunctive agents should be considered while managing patients with BPPV. Limitations of present study include limited sample size and study sample being confined to a single center.

CONCLUSION

Effectiveness of canalith repositioning maneuvers in patients with BPPV was 61.73% with highest effectiveness observed in posterior canal followed by horizontal and anterior canal BPPV at 64.58%, 61.91% and 50.00%.

CONFLICT OF INTEREST

None.

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AUTHORS CONTRIBUTIONS

Please add

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REFERENCES

Edlow JA, Kerber K. Benign paroxysmal positional vertigo: A practical approach for emergency physicians. Acad Emerg Med. 2023;30(5):579-588. https://doi.org/10.1111/acem.14558.

Madrigal J, Manzari L, Figueroa JJ, Castillo-Bustamante M. Understanding benign paroxysmal positional vertigo (BPPV) and its impact on quality of life: a systematic review. Cureus. 2024;16(6):e63039. https://doi.org/10.7759/cureus.63039.

Zhou F, Yu B, Luo J, Ma Y, Li J, Zhang T, et al. Global trends in the research on benign paroxysmal positional vertigo: A 20-year bibliometric and visualization analysis. Front Neurol. 2022;13:1046257. https://doi.org/10.3389/fneur.2022.1046257.

Arshad M, Abbas S, Qureshi IA. Delay in diagnosis and treatment of benign paroxysmal positional vertigo in current practice. J Ayub Med Coll Abbottabad. 2013;25(1-2):93-95. https://www.ayubmed.edu.pk/JAMC/25-1/Arshad.pdf

Imai T, Inohara H. Benign paroxysmal positional vertigo. Auris Nasus Larynx. 2022;49(5):737-747. https://doi.org/10.1016/j.anl.2022.03.012.

Yetiser S. Review of the pathology underlying benign paroxysmal positional vertigo. J Int Med Res. 2020;48(4):300060519892370. https://doi.org/10.1177/0300060519892370.

Harmat K, Tamás LT, Schubert MC, Gerlinger I, Komoly S, Büki B. Prevalence of and theoretical explanation for type 2 benign paroxysmal positional vertigo. J Neurol Phys Ther. 2022;46(2):88-95. https://doi.org/10.1097/NPT.0000000000000383.

Johns P, Quinn J. Clinical diagnosis of benign paroxysmal positional vertigo and vestibular neuritis. CMAJ. 2020;192(8):E182-E186. https://doi.org/10.1503/cmaj.190334.

Cole SR, Honaker JA. Benign paroxysmal positional vertigo: Effective diagnosis and treatment. Cleve Clin J Med. 2022;89(11):653-662. https://doi.org/10.3949/ccjm.89a.21057.

Akula S, Reddy LS, Kiran AS, Suresh AM. Clinical study of BPPV and the effectiveness of canalolith repositioning manoeuvre in subjects of BPPV. Indian J Otolaryngol Head Neck Surg. 2022;74(1):96-102. https://doi.org/10.1007/s12070-021-02779-3.

Swain SK. Diagnostic criteria of benign paroxysmal positional vertigo. Matrix Sci Med. 2023;7(4):85-89. https://doi.org/10.4103/mtsm.mtsm_4_23.

Kabaya K, Katsumi S, Fukushima A, Esaki S, Minakata T, Iwasaki S. Assessment of semicircular canal function in benign paroxysmal positional vertigo using the video head impulse test and caloric test. Laryngoscope Investig Otolaryngol. 2023;8(2):525-531. https://doi.org/10.1002/lio2.1020.

Ping L, Yi-Fei Z, Shu-Zhi W, Yan-Yan Z, Xiao-Kai Y. Diagnosis and treatment of the short-arm type posterior semicircular canal BPPV. Braz J Otorhinolaryngol. 2022;88(5):733-739. https://doi.org/10.1016/j.bjorl.2020.10.012.

Saishoji Y, Yamamoto N, Fujiwara T, Mori H, Taito S. Epley manoeuvre's efficacy for benign paroxysmal positional vertigo (BPPV) in primary-care and subspecialty settings: a systematic review and meta-analysis. BMC Prim Care. 2023;24(1):262. https://doi.org/10.1186/s12875-023-02217-z.

Laurent G, Vereeck L, Verbecque E, Herssens N, Casters L, Spildooren J. Effect of age on treatment outcomes in benign paroxysmal positional vertigo: A systematic review. J Am Geriatr Soc. 2022;70(1):281-293. https://doi.org/10.1111/jgs.17485.

Lindell E, Kollén L, Johansson M, Karlsson T, Rydén L, Falk Erhag H, et al. Benign paroxysmal positional vertigo, dizziness, and health-related quality of life among older adults in a population-based setting. Eur Arch Otorhinolaryngol. 2021;278(5):1637-1644. https://doi.org/10.1007/s00405-020-06357-1.

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Liu DH, Kuo CH, Wang CT, Chiu CC, Chen TJ, Hwang DK, et al. Age-related increases in benign paroxysmal positional vertigo are reversed in women taking estrogen replacement therapy: a population-based study in Taiwan. Front Aging Neurosci. 2017;9:404. https://doi.org/10.3389/fnagi.2017.00404.

Jeong SH. Benign paroxysmal positional vertigo risk factors unique to perimenopausal women. Front Neurol. 2020;11:589605. https://doi.org/10.3389/fneur.2020.589605.

Zamyslowska-Szmytke E, Politanski P, Jozefowicz-Korczynska M. Dizziness handicap inventory in clinical evaluation of dizzy patients. Int J Environ Res Public Health. 2021;18(5):2210. https://doi.org/10.3390/ijerph18052210.

Ghosh A, Dorasala S. Epidemiology of benign paroxysomal positional vertigo (BPPV) and risk factors for secondary BPPV: a population-based study. Egypt J Otolaryngol. 2023;39:93. https://doi.org/10.1186/s43163-023-00456-6.

Ling X, Zhao DH, Shen B, Si LH, Li KZ, Hong Y, et al. Clinical characteristics of patients with benign paroxysmal positional vertigo diagnosed based on the diagnostic criteria of the Bárány Society. Front Neurol. 2020;11:602. https://doi.org/10.3389/fneur.2020.00602.

Ali M, Tanveer, Awan AS, Khan A, Zaki A, Mudassir M. Epley's maneuver alone vs. Epley's maneuver with betahistine for mild "paroxysmal positional vertigo" a tertiary care hospital study. Pak J Med Health Sci. 2022;16(12):313-314. https://doi.org/10.53350/pjmhs20221612313.

Altaf M, Riaz N, Rehman AU, Aslam N, Latif S, Ali R. Efficacy positional vertigo of particle repositioning manoeuvres in benign paroxysmal vertigo. Pak J Med Health Sci. 2020;14(3):565-570. https://pjmhsonline.com/2020/july-sep/565.pdf.

Abdel Kader HA, Abdel Halim FN, Abdel Rehman TT. A comparative study on effectiveness of the rolling-over maneuver in rehabilitation of patients with posterior semicircular canal benign paroxysmal positional vertigo. Egypt J Otolaryngol. 2014;30:88-93. https://doi.org/10.4103/1012-5574.133193