Comparison of Repetitive Modified Epley's manoeuvre in single sitting vs thrice daily In Refractory Benign Paroxysmal Positional Vertigo.

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Abstract:

Introduction: Benign paroxysmal positional vertigo (BPPV) was recognized by Robert Barany in 1921. It is the commonest cause of peripheral vertigo presenting to vertigo clinics. Among several treatment modalities, Epley manoeuvre carries a 90.7-96% cure rate. The modified Epley manoeuvre, a more convenient version and when conducted in the office by a skilled clinician, carries a greater chance of rapid recovery. It may be self-performed at home with a layman assistant.

Objective: To compare the efficacy of modified Epley's manoeuvre performed thrice daily with repetitive single sitting, till resolution of symptoms, in posterior canal benign paroxysmal positional vertigo (BPPV) patients.

Methodology: This prospective comparative clinical study was conducted at Niazi welfare foundation teaching hospital, Sargodha from 1st February 2022 to 31st July 2022. 86 patients with refractory unilateral BPPV were included in the study and divided into two groups. Group A (n=44) patients had modified Epley manoeuvre performed repeatedly at intervals in a single sitting till the resolution of nystagmus. For group B (n=42) patients, Modified Epley manoeuvre was performed once in the clinic, followed by thrice daily manoeuvre done at home till the resolution of symptoms. The time to recovery, the improvement in vertigo (no nystagmus) after a week and recurrence rate among the two groups were evaluated.

Result: For group A, 61.36% (n=27) patients became symptom-free after 2 attempts, while 100% (n=44) got relief after 5 attempts. For group B the earliest response was seen in 4 patients (9.52%) after 2 days (6 attempts) while 100% improvement (n=42) was seen after 4 days (12 attempts).

Conclusion: Repeated modified Epley's manoeuvre in a single sitting promptly reliev vertigo compared to thrice daily manoeuvres.

Keywords: Benign paroxysmal positional vertigo, Nystagmus, Dix-Hallpike manoeuvre, Particle repositioning manoeuvre, Canalith, Modified Epley manoeuvre.

Introduction:

Benign paroxysmal positional vertigo (BPPV) was recognised by Robert Barany in 1921.[1] It is the commonest cause of peripheral vertigo presenting to vertigo clinics.[2] It is characterized by short episodes of severe vertigo, accompanied by nystagmus when patients assume a certain head position. Detachment of otoconial debris causes its deposition either in semi-circular canals (canalolithiasis) or in the cupula (cupulolithiasis) leading to the pathogenesis of the disease.[3] Involvement of the posterior canal is reported in approximately 90% of the cases, because of its anatomical relation, lying inferior to the utricle.[4] The Dix-Halpike manoeuvre is the gold standard test to establish diagnosis.[5,6] In this procedure, the patient sits on a couch and is asked to move the neck to 45° to one side in the vertical plane. He or she is then rapidly made to lie down with the head hanging 30° below the horizontal plane. Nystagmus is noted and recorded. The patient is then made to sit up with the neck still 45° to the ipsilateral side[7] and nystagmus if any is observed again. The test is then repeated on the other side also. In cases of a posterior semicircular canal involvement, the direction of nystagmus is towards the under most and affected ear, with a torsional component clockwise when following leftward movement, or counter clockwise, when following rightward movement. Typically an up beating nystagmus component is superimposed, resulting in a mixed torsional-vertical eye movement. Dix Hallpike test carries a higher reliability score in terms of diagnosing posterior canal BPPV as well as following its treatment efficacy.[8] BPPV significantly limits the

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movements of the patients and poses a negative impact on the quality of life. According to an estimate, the healthcare burden due to BPPV reaches up to 2 billion dollars in the USA per year.[9] Patients with BPPV have higher depression scores. Their routine activities are limited and they are prone to suffer from accidental trauma like fall incidents, moreover, lost office days translate into decreased productivity of a person.[10]

There are several treatment modalities to date, including advice to assume a specific neck position, vestibular rehabilitation exercises, physiotherapy, wearing a soft neck collar, and different canalolith repositioning manoeuvres either alone or in combination. One of the globally accepted distinct treatment options is Epley manoeuvre. Alone it carries 86-100% cure rate in posterior canal benign paroxysmal positional vertigo (Pc-BPPV) depending on the repetition of the procedure.[11] There is a range of modified versions of Epley manoeuvre.[12] Usually, no other exercises or combined treatment is required along with Epley manoeuvre. It is a relatively safe procedure despite up to a 12% chance of temporary neck pain and stiffness.[13] The modified Epley manoeuvre, performed by placing a pillow under the patient's shoulder is a more convenient version for the clinicians as well as for the patients. It is quickly reproducible and can be self-performed by a patient at home. When conducted in the office by a skilled clinician, the patient is directly observed; thus, chances of error are minimal and it carries a greater chance of rapid recovery.

The idea that repetitive modified Epley manoeuvre done in a single sitting offer professional and technical supervision and the patient is free from the worries of reproducing the manoeuvre at home with a layman assistant at best, prompted our study.

Objective:

This study was conducted to compare the effectiveness and promptness of treating posterior canal BPPV self-performed by patients thrice daily with single office sitting performed repeatedly by skilled clinicians till the resolution of symptoms.

Methodology:

This prospective observational study conducted at the department of Ear, Nose, and Throat (E.N.T), Niazi welfare foundation teaching hospital (NWFTH), Sargodha. The research proposal was discussed in a meeting with the ethical committee review board and approval was obtained. The duration of the study was from 1st February 2022 to 31st July 2022. Adult patients of either gender, diagnosed with refractory and unilateral posterior canal BPPV via positive Dix Hallpike test, were included in the study through convenience sampling. Informed consent was taken from all patients and the treatment options were explained. Exclusion criteria included patients with reduced neck movements, cervical spondylosis, carotid artery stenosis, and refusal to give consent.

Two proformas were developed, separately for both groups of patients, by the department to keep a record of each and every patient including age, gender, contact details, history of trauma, diagnosis (mentioning laterality of disease), number of attempts for successful treatment response and all the relevant information regarding the study proposal. A detailed history was elicited followed by an elaborate clinical examination and an audiological assessment.

A total of 86 patients were enrolled on this study and were divided into two groups. Group "A" comprised 44 patients. Modified Epley manoeuvre was performed over them at an interval of 8-10 minutes in the office setting in a single sitting. In this manoeuvre, the patient was kept in the supine position and a pillow of 10cm thickness was placed under his shoulders, thus neck remained on the surface of the bed, mimicking the head hanging at an angle of 30° as shown in fig 1.

Fig No 1:

Group "B" included 42 patients on whom the Modified Epley manoeuvre was performed once in the office. The procedure was explained to them in detail and they were provided with a free online video link explaining the manoeuvre. All the patients were asked to perform the procedure independently once in front of the clinician, to gain confidence and memorize the steps of the procedure, then they were sent home with advise to perform the procedure thrice daily till the resolution of symptoms, at least for a total of 3-5 days at home.

Data Analysis: - Statistical Package for Social Sciences (SPSS) version 25.0 (IBM SPSS Statistics, Armonk, NY) was used for data entry and statistical analysis. The non-probability sampling technique was used. The mean age with standard deviation, for each group of the patients, was calculated separately. Data presented as mean/percentage.

Gender, history of trauma, laterality of disease (involved ear), and the number of treatment sessions with successful responses were among the qualitative factors provided in the form of frequencies and percentages.

Ethical principles were followed according to the Declaration of Helsinki

Results:

A total of 86 patients participated in the study. Majority (92%) of the cases were non-traumatic, out of which 50% gave a history of straining due to constipation and/or severe bouts of coughing. Only 8% of the patients gave a history of trauma to the head, like road traffic accidents or head bumps.

During the study period, all the patients were divided into two groups. In group "A"; a total of 44 patients participated; aged between 32 to 60 years (49.36 ± 7.87), including 11 (25%) males and 33 (75%) females.

The right ear was involved in 81.81% of the cases.

In group "B"; there were 42 participants involving 16 (38.09%) males and 26 (61.90%) females; aged between 30 to 68 years (49.78±8.50). The right-sided ear involvement is evidenced at 80.95%.

Table No1: Treatment Response, Group 'A', n=44 (Repetitive Modified Epley's Manoeuvre performed in Single Sitting)

Number of attempts	Number of symptoms free patients per attempt	Percentage of fully recovered patients
5 attempts	3 (6.81%)	100%
4 attempts	2 (4.54%)	93.18%
3 attempts	12 (27.27%)	88.63%
2 attempts	27 (61.36%)	61.36%

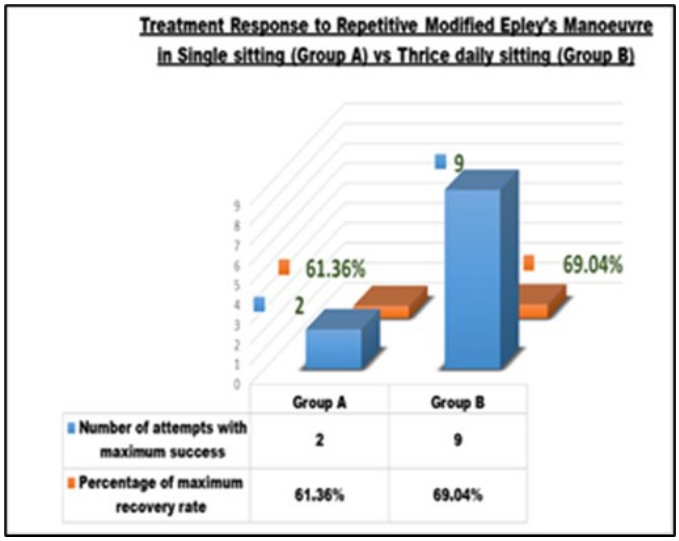
In Group 'A', the successful treatment response is recorded along with the number of attempts repeated, in a single sitting. The total number of the patients recovered in per attempt and the number of fully recovered patients were noted and the percentages were calculated. Most of the patients (n=27; 61.36%) fully recovered after 2 attempts, while only 03 (6.81%) patients responded after the 5th attempt (Table I).

Table No 2: Treatment Response; Group 'B', n=42 (Repetitive Modified Epley's Manoeuvre performed thrice daily for a number of days)

Number of days	Total attempts	n= 42	Percentage of fully recovered patients
4 days	12 attempts	9 (21.42%)	100%
3 days	9 attempts	29 (69.04%)	78.57%
2 days	6 attempts	4 (9.52%)	9.52%

The result for the group 'B' was recorded as the number of days; number of attempts of the repetitive manoeuvre (3 times per day) and the success rate of treatment, proved on the follow up visit of the patient. In this group, the majority (n=29; 69.04%) successfully recovered on the 3rd day of the treatment after 09 attempts. The percentages were calculated for total number of the patients recovered on each day and the number of fully recovered patients as shown in table no 2. Maximum benefit was gained quickly while the manoeuvre was repeated in the single sitting by a trained-specialist (Graph I). Reassessment was done after 1-week and all the patients were found disease free.

Graph No 1. Treatment response Group A vs Group B.



Discussion:

The Posterior canal BPPV is mostly idiopathic or non-traumatic in origin, while several cases present with a history of trauma as well. A retrospective study conducted by Alexander et al[14] found 8% cases of traumatic BPPV among a total of 1378 patients. In our study, the proportion of patients with a history of trauma was also 8%, whilst motorbike accidents were found to be the leading cause. Along with various risk factors, the female gender is more prone to suffer from this condition, due to multiple reasons like widespread osteoporosis and oestradiol deficiency in the postmenopausal stage.[15] Calcium carbonate crystals of otoconial debris tend to demineralise and their detachment may occur with advancing age,[16] therefore the condition worsens in the setting of deficient Vitamin D which is required to maintain the calcium homeostasis in the body. Right-sided labyrinths are more often involved; the probable cause may be that, most people sleep on their right side. Helminski et al[17] proposed the theory that freely floating otoconial debris has a higher density compared to endolymph and thus it settles due to gravity; it is hypothesized that sleep also plays some role in the

pathogenesis of the disease as many patients acknowledge their first incidence when they move in bed after awakening.[18] Epley manoeuvre is considered to be the gold standard treatment of this condition. It is a simple, non-invasive, and office-based procedure. Sushil et al[19] evidenced the resolution of BPPV in 72% of cases after a single treatment with Epley manoeuvre. Mian et.al[20] studied the effects of repetitive Epley manoeuvre with a maximum of 6 cycles in a single office sitting; the recovery rate was noted as complete resolution of symptoms in 68% of cases on 1st day, 74% on 3rd day, 80% on the 7th day; and 82% of cases were fully recovered on 30th day follow up. Modification of Epley manoeuvre, by placing a pillow under the patient's shoulders, has several advantages over the traditional method. Hyun et al[21] found it convenient for clinicians as well as patients. It is comfortable for those patients who become anxious about head-hanging, and whose neck movements are limited. Moreover, it also releases a burden from the clinician's arms and shoulders. What's more, a person can easily perform it independently at home. Zhuangqin et al[22] compared the effectiveness of Epley manoeuvre conducted in the office vs. modified Epley with a pillow under the shoulder performed by patients thrice a day at home. Patients who performed modified Epley at home responded better (89.75% vs. 75.32%) on the first day. Repeated sessions carry a higher rate of successful treatment response. Hendrik et.al[23] in his systematic review of previously conducted studies concluded that those patients who did not respond to treatment after 1st session managed better after the second session of treatment with an improvement range of 40~100% . Successive treatment sessions reported successful response ranging between 67% and 98% after the third session, 87% to 100% after the fourth session and 100% in the studies that performed five treatment sessions.

In our study, we found that repetition of the procedure is favourable for the patient in the office setting; however, it caused occupancy of the space for a prolonged period. Multiple attempts of the modified Epley manoeuvre in a single sitting may provoke anxiety in some patients due to the hospital environment as well as repeated onset of vertigo.

Home-based treatment with Epley manoeuvre has an additional advantage in terms of the independence of the patient in addition to its quick effects and reproducibility. It saves patient's time and office occupancy of clinicians. In addition to educating our patients, we provided them with a free video link, which made it convenient for them to watch it repeatedly, thus emulating the correct method. It is economical as travel expenses reduce too. The home-based treatment brings positive changes in the quality of life of patients especially the elderly, who are already harbouring multiple co morbidities [24] and prevents potential accidents like a fall, a fire hazard in the kitchen, etc., which may happen due to the imbalance.

Chiheon et al[25] studied the factors leading to the failure of home-based Epley treatment; and found out the maximum error in the head position of step 4 i.e., turning to one side. Educating the patient as well as giving him immediate feedback on head positions, and rotational movements are mandatory for the successful treatment outcome. The procedure done at home cannot be observed by an expert. More studies with prolong follow-up should be carried out in this regard. To be brief, depending on the results of our study, repetitive Epley manoeuvre in the office setting is the preferred treatment of choice if performed by a skilled specialist and the patient is directly observed on the spot. Thus, it prevents the hassle of performing it thrice daily for several days at home.

Conclusion:

Repeated modified Epley manoeuvre in a single sitting proved effective in relieving vertigo compared to thrice daily manoeuvres with the advantage of being performed by a skilled specialist and providing immediate relief.

References:

1. Rabbitt RD. Semicircular canal biomechanics in health and disease. J Neurophysiol. 2019; 121 (3):732-55. https://doi.org/10.1152/jn.00708.2018
2. Picciotti PM, Passali GC, Sergi B, Corso E. De, Benign Paroxysmal Positional Vertigo (BPPV) in COVID-19. Audiol. Res. 2021; 11(3):418-22. https://doi.org/10.3390/audiolres11030039.
3. Imai T, Inohara H. Benign paroxysmal positional vertigo. Auris Nasus Larynx. 2022 ;49(5):737-47. doi: 10.1016/j.anl.2022.03.012.
4. Lee CJ, Lee CY, Wu PH, Wang CH, Chen HC, Shih CP. Efficacy of combined canalith-repositioning procedure and supine to prolonged lateral position in treating posterior canal benign paroxysmal positional vertigo. Auris Nasus Larynx. 2021 ;48(5):834-40. https://doi.org/10.1016/j.anl.2021.01.009.
5. García-Muñoz C, Cortés-Vega MD, Hernández-Rodríguez JC, Palomo-Carrión R, Martín-Valero R, Casuso-Holgado MJ. Epley manoeuvre for posterior semicircular canal benign paroxysmal positional vertigo in people with multiple sclerosis: protocol of a randomised controlled trial. BMJ open. 202 ;11 (3):e046510. doi: 10.1136/bmjopen-2020-046510.
6. Konno Y. Insights into Benign Paroxysmal Positional Vertigo in the Elderly. Science Insights. 2022 Oct 30;41(5):681-6.
7. Talmud JD, Coffey R, Edemekong PF. Dix Hallpike Maneuver. In StatPearls [Internet] 2022 May 22. StatPearls Publishing.
8. Imai T, Uno A, Yamato A, Takimoto Y, Sato G, Matsuda K, et al. Comparison of the efficacy of the

Epley maneuver and repeated Dix-Hallpike tests for eliminating positional nystagmus: A multicenter randomized study. Front. Neurol. 2023;14. doi: 10.3389/fneur.2023.1095041

9. Kim HJ, Park J, Kim JS. Update on benign paroxysmal positional vertigo. J neurol. 2021; 268:1995-2000. https://doi.org/10.1007/s00415-020-10314-7
10. Carrillo MR, Ballve MJL, Villar BI, Rando MY, Cunillera PO, Almeda O J, et.al. Disability perceived by primary care patients with posterior canal benign paroxysmal positional vertigo. BMC Fam. Pract. 2019; 20(1):1-11. https://doi.org/10.1186/s12875-019-1035-3.
11. Kher SP. Treatment o benign positional paroxysmal vertigo at tertiary care teaching hospital. Int J Acad Med Pharm. 2023;5(2):831-4. doi: 10.47009/jamp.2023.5.2.175
12. Hunt WT, Zimmermann EF, Hilton MP. Modifications of the Epley (canalith repositioning) manoeuvre for posterior canal benign paroxysmal positional vertigo (BPPV). Cochrane Database Syst Rev. 2012(4):CD008675. doi: 10.1002/14651858.
13. Yaqoob N, Herekar A. Application of epley maneuver in treating Benign paroxysmal positional vertigo (bppv). PJNS. 2019; 14(1):28-31.
14. Luryi AL, LaRouere M, Babu S, Bojrab DI, Zappia J, Sargent EW et al. Traumatic versus Idiopathic Benign Positional Vertigo: Analysis of Disease, Treatment, and Outcome Characteristics. Otolaryngol Head Neck Surg. 2019; 160(1):131-36. doi:10.1177/0194599818797892
15. Sfakianaki I, Binos P, Karkos P, Dimas GG, Psillas G. Risk Factors for Recurrence of Benign Paroxysmal Positional Vertigo. A Clinical Review. J Clin Med. 2021; 10(19):4372. doi: 10.3390/jcm10194372.
16. Abdelmaksoud AA, Fahim DFM, Bazeed SES, Alemam MF, Aref ZF. Relation between vitamin D deficiency and benign paroxysmal positional vertigo. Sci Rep. 2021; 11(1):16855. doi: 10.1038/s41598-021-96445-x.
17. Helminski JO. Peripheral downbeat positional nystagmus: apogeotropic posterior canal or anterior canal BPPV. J Neurol Phys Ther. 2019 Apr 1; 43:S8-13.
18. Krieger J, Frackowiak M, Berger M, Heneka MT, Jacobs AH. Falls at advanced age-The importance to search for benign paroxysmal positional vertigo (BPPV). Exp. Gerontol. 2022; 165:111868.
19. Gaur S, Awasthi SK, Bhadouriya SKS, Saxena R, Pathak VK, Bisht M. "Efficacy of Epley's Maneuver in Treating BPPV Patients: A Prospective Observational Study", Int. J. Otolaryngol. 2015; 487160. https://doi.org/10.1155/2015/487160
20. Majeed MA, Haq AU, Shabbir SM, Raza SN. Clinical comparative study of efficacy of Epley manoeuvre and Semont manoeuvre in benign paroxysmal positional vertigo. PAFMJ. 2015 (1):42.
21. Lee HJ, Jeon EJ, Lee DH, Seo JH. Therapeutic Efficacy of the Modified Epley Maneuver with a Pillow under the Shoulders. Clin Exp Otorhinolaryngol. 2020; 13(4): 376-380.doi: 10.21053/ceo.2019.01830.
22. Gan Z, Zhou S, Yang H, He F, Wei D, Bai Y et. al. Self-Treatment of Posterior Canal Benign Paroxysmal Positional Vertigo: A Preliminary Study. Front. Med. 2021; 8:654637.
23. Reinink H, Wegner I, Stegeman I, Grolman W. Rapid systematic review of repeated application of the epley maneuver for treating posterior BPPV. Otolaryngol Head Neck Surg. 2014; 151(3):399-406. doi: 10.1177/0194599814536530
24. Uz U, Uz D, Akdal G, Çelik O. Efficacy of Epley Maneuver on Quality of Life of Elderly Patients with Subjective BPPV. J Int Adv Otol. 2019; 15(3):420-24.
25. Kwon C, Ku Y, Seo S, Jang E, Kong HJ, Suh MW et.al. Quantitative assessment of self-treated canalith repositioning procedures using inertial measurement unit sensors. J Vestib Res. 2021; 31 (5):423-31.