



EFFICACY OF CANALITH REPOSITIONING PROCEDURES AMONG BENIGN PAROXYSMAL POSITIONAL VERTIGO CASES

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ABSTRACT

Introduction: The Canalith Repositioning Procedures (CRP) are said to be the most effective tool to treat the patients with Benign Paroxysmal Positional Vertigo (BPPV), which is manifested through vertigo/dizziness. These procedures represent the set of certain gravity dependent positions which displace the otoconia from free floating canal to the saccule. This study was done to determine the efficacy of canal specific CRP in BPPV. **Methods:** A total of 55 patients (both male and female) of mean age 46.4 years with chief complaint vertigo/dizziness has been taken. Of those, 42 subjects were diagnosed with BPPV. The treatment was conducted through maneuvers i.e Epley's, lempert, modified gufoni, yacovino and skull vibration. **Results:** All treated patients benefitted from the therapy. The efficacy of 1st treatment session was 65.46% and of 2nd treatment session was 76.36%. The percentages of subject treated with maneuver were 61.85% (34) while those with maneuver plus vibration were 76.36%. **Conclusion:** The study showed that CRP and skull vibration efficacy in BPPV was very high. Repetitions of maneuvers are required regardless of affect sides or multiple canals involved.

KEYWORDS: Benign Paroxysmal Positional Vertigo., Canalith Repositioning Procedures, Epley's. Vibration.

INTRODUCTION

Benign Paroxysmal Positional Vertigo (BPPV) is the most common cause of peripheral vertigo. As the term describes, it is a non-harmful (benign) sudden increase/occurrence (paroxysmal) of sensation of swaying, spinning, feeling of unbalanced in the absence of motion (vertigo) in different/specific position (positional). As vertigo is multisensory and sensory-motor syndrome with various etiologies and pathologies, this study would outline non-surgical management comprising specific maneuvers, vestibular exercises and yogic asana for BPPV patients. The typical presentation of BPPV consists of recurrent, brief attack of vertigo generally provoked by change in head position, such as lying down, rolling over bed, looking up, bending down associated with nausea, vomiting, nystagmus [Baloh et al., 1987; Furman and Cass, 1999; Gazbare and Preeti, 2021]. In elderly patients, alternative presentation like complaint of prolonged unsteadiness instead of the typical brief vertigo sensation can be found [Batuecas-Caletrio et al., 2013]. BPPV is diagnosed by provoking vertigo by position testing and via observation of typical nystagmus [Gazbare and Preeti, 2021].

The gold standard of which is Dix Hallpike for vertical canal and supine roll for horizontal canal [Gazbare and Preeti, 2021]. TiTrATE is a novel diagnostic approach to determine the probable etiology of dizziness or vertigo [Newman-Toker and Titrate, 2015]. This approach uses the Timing of the symptom, the trigger that provokes the symptom and a targeted examination. One study suggesting Two symptoms which strongly suggested BPPV in a dizzy patient are specific trigger of rolling in bed and a dizzy spell with a duration of >1min [Hertbert et al., 2017].

Once correct diagnosis is made, management of BPPV is based on theory of canalithiasis/cupulolithiasis. Canalithiasis describes free floating particles within a semicircular canal. The concept was first described in 1979 by Hall, Ruby and McClure. and the phenomenon was first demonstrated in vitro by Panes (1992). Cupulolithiasis (1969) described particle adherent to the cupula of a semicircular canal. this term was coined by Schuknecht.

Various canalith repositioning maneuvers or particle repositioning maneuvers and skull vibration are given to relieve the symptom of vertigo. Some vestibular

exercises and yogic asanas restore the balance function by three different physiological mechanisms are linked to each other viz. 1) Enhancing and expediting the vestibular compensatory mechanism by exercise like standing and walking on uneven surface/soft surface with eyes open close, 2) Improving general balance function by exposing the patient to different types of challenging situation like catching ball, standing on apliable surface like trampoline, gym ball etc and 3) Specifically and individually stimulating the defective sensors in the vestibular labyrinth in the ears like utricle/sacculle/semicircular canal like moving the head in the plane of semicircular canal [Biswas et al., 2017].

METHODS AND METHODOLOGY

All patients are subjected to undergo examination i.e.

1. Blood pressure
2. Heart rate
3. Gaze evoked nystagmus.
4. Questionnaire regarding Timming, triggers of vertigo/ dizziness
5. Hospital anxiety and depression questionnaire
6. Rhomberg test
7. Positional test including : Dix hall pik, supine roll test, head hanging test

The diagnosis of definite BPPV is based on the criteria of the 'consensus document of the committee for the classification of vestibular disorder of the Barany society'. Only patients with BPPV are included in this study.

With the help of positional test specification of affected semicircular canal and the pathophysiology is seen together with the identification of latency, direction, time course and duration of positional nystagmus as well as duration and intensity of vertigo. A canal specific response is diagnosed when a rotation of head in the plane of a semicircular canal evokes positional nystagmus of maximal intensity (in terms of slow phase velocity). As a rule positional nystagmus in BPPV always beats in the plane of affected canal and in the expected direction for canal excitation or inhibition. Subjective BPPV cases are also included in this study which did not demonstrate typical nystagmus but still experienced classical vertigo during positional test [Biswas et al., 2017]. Nystagmus is noted with the help of Samsung high resolution mobile camera.

All the patients have undergone repositioning procedure CRP with in 1hr of diagnosis of BPPV and before the start of any medicinal management while the physical exercise and yoga asana have been prescribed for Residual dizziness together with medicinal management for 10-15 days.

CRP procedure includes

1. Epley
2. Quick liberatory
3. Lempert/ barbeque roll

4. Modified Gufoni
5. Yacovino
6. Mastoid vibration (freq.100hz, amplitude. 8mm, 30-60 seconds).

To treat PC-BPPV, we used the Epley maneuver. To treat geotropic HC-BPPV we used either the Gufoni or Barbecue roll maneuver. Details of the Epley, Gufoni, and Barbecue maneuvers are described in the AAO-HNSF guidelines (<https://www.frontiersin.org>, 2021). To treat apogeotropic HC-BPPV, we used the Gufoni maneuver for the apogeotropic variant described by Appiani et al. and added ipsilesional mastoid oscillation at the first step of the side-lying position to facilitate particle movement into the posterior limb of the HC. To treat AC-BPPV, we used either the reverse Yacovino maneuver [Yacovino et al., 2009].

The physical therapies and yoga asana were designed as

1. Gaze stability ex – X1 paradigm
2. Brandt Daroff exercise
3. Balance exercise i.e. (standing, walking, derived postures, moving head in plane specific semicircular canal) with the Stability trainer from theraband of different grade foams, Gym ball from theraband, Trampoline for high frequency linear vertical movement [Biswas et al., 2017].
4. Shaawasana, Trikonasana, Balasana, Paravakonasana, Ustarasana, Virbhadrasana, Padahustasana, Ardha chakarasana, Ardhakati chakasana [Gazbare, Preeti S et al., 2021].

RESULT

Total fifty five were included in study out of which 42 subjects diagnosed as having BPPV either due to positive diagnostic test or having symptoms strongly suggesting BPPV while others 13 subjects were not (Table 1). Table 1 also showed 24 subjects having canal specific nystagmus which was the combination of torsion, vertical, and horizontal component so canal specific maneuvers are given.

In Table 2, the 42 subjects treated are positively correlated with treatment maneuvers with p-value 0.0001, while other 13 subjects are positively correlated with exercise and asana.

42 BPPV diagnosed subjects treated have efficacy percentage of 65.46% after 1st treatment while 76.36% after 2nd treatment. The percentage of subject successful treated with maneuver were 61.8% while with maneuver and vibration were 76.36% (Table 3,4).

Total 12 subjects shown both in table 3 and 4 have given vibration together with maneuvers, those subjects had also shown signs of truncal retropulsion, apogeotropic nystagmus in the study.

Table 1: Distribution of subjects with diagnostic test and symptoms suggesting BPPV.

	Positional test positive	Vertigo <min	Vertigo >min	Nystagmus
BPPV cases	39	42	0	24
Other vertigo	0	0	13	0

Table 2: Correlation of treatment with BPPV and other vertigo subjects.

Subjects	maneuver	Maneuver+vibration	Exercise+asana	Total	Chi- square test	p-value
BPPV positive	34(100%)	8(100%)	0	42(76.4%)	55	0.001(sig)
Other vertigo	0	0	13	13(23.6%)		
Total	34(100%)	8(100%)	13(100%)	55(100%)		

Table 3: Effectiveness of treatment protocol on study group.

1 st treatment	Negative subjects	Positive subjects
Maneuvers	34	14
Maneuvers+ vibration	8	5
Vestibular ex.+ yoga asana	13	0
Total	55 (100%)	19 (34.54%)

Efficacy after 1st treatment 65.46%

Table 4: Effectiveness of successive treatment protocol on study group.

2 nd treatment (19 subject)	Negative	Positive
Maneuver	14	0
Maneuver+ vibration	4	0
Vestibular ex.	1	0

Maneuver efficacy = $34/55 = 61.8\%$, Maneuver +vibration efficacy = $34+8=42/55 = 76.36\%$

Out of 42 subjects, 18 subjects require repetition of treatment comprises of both maneuvers and vibration.

DISCUSSION

Approximately 35 subjects of posterior canal involvement is found, which is the most commonly involved canal in bppv cases, also supported by various researchers (Titus et al., 2012). Some of the subjects may not demonstrate the typical nystagmus during the Positioning testing, but they still experience the classic vertigo during positioning. This has been termed “subjective” BPPV [Lorne et al., 2003]. About in 24 cases nystagmus is seen while in 18 cases isn't. The occurrence of canalolithiasis without positional nystagmus is controversial but improvement of positional maneuver in such patient with a typical history of BPPV has been reported [Lorne et al., 2003].

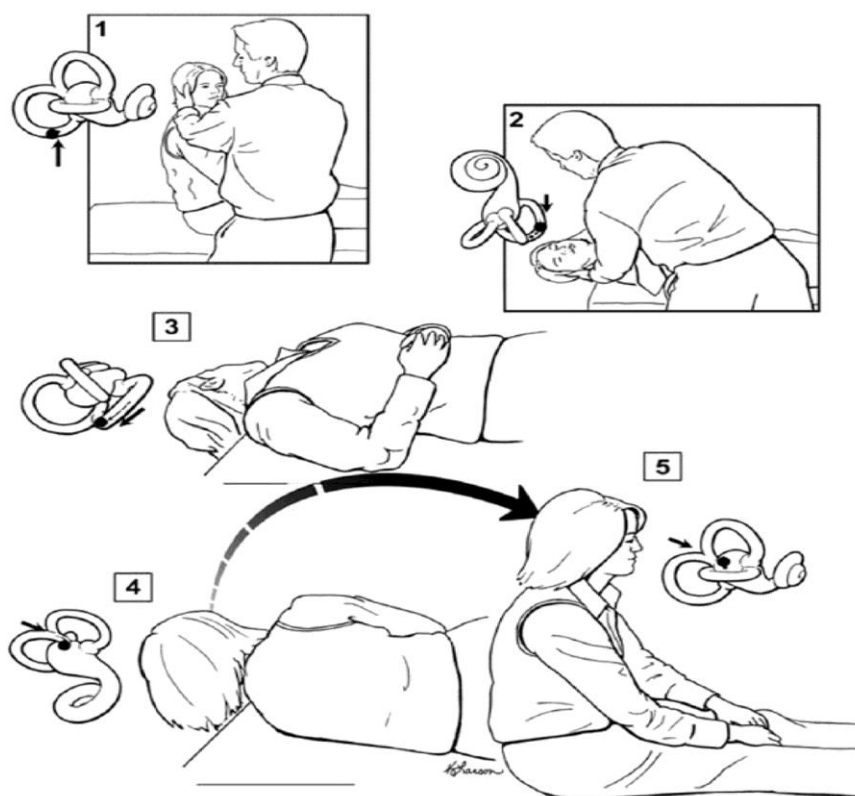
In a study by Muneeb et al. (2020) efficacy of particle repositioning maneuver in benign positional paroxysmal vertigo was found in 60/63.8 patient out of 94 patients. The epley's maneuver showed an efficacy of 74.6 and 100% at first attempt for posterior and superior canal, the efficacy of the lempart maneuver for horizontal canal was 72.72% in patients with canalolithiasis and 58.33% in cupulolithiasis patients.

Barbara maciejewska et al. in 2016 studied effectiveness of canalith repositioning procedure in 50 people with bppv aged 22-78 divides into 2 groups of 25 subject each suffering from post traumatic (group-A) and idiopathic (group-B) vertigo they found in group B a complete

regression of ailments in 72% (18) of the patients was observed as early as after the first manoeuvre, and in another 20% (5) of the patients the regression of vertigo was obtained after the second manoeuvre; two more subjects recovered after the performance of successive treatments. In group A only 12% (3 subjects) benefited from the first manoeuvre, and 40% (10 subjects) from the second one. The percentage of patients recovered up to the second medical manoeuvre was 52% (13) for group A and 92% (23) for group B, which is a statistically significant difference ($p = 0.0016$).

Epley's maneuver for treating posterior canal canalolithiasis (right-sided posterior canal-BPPV).

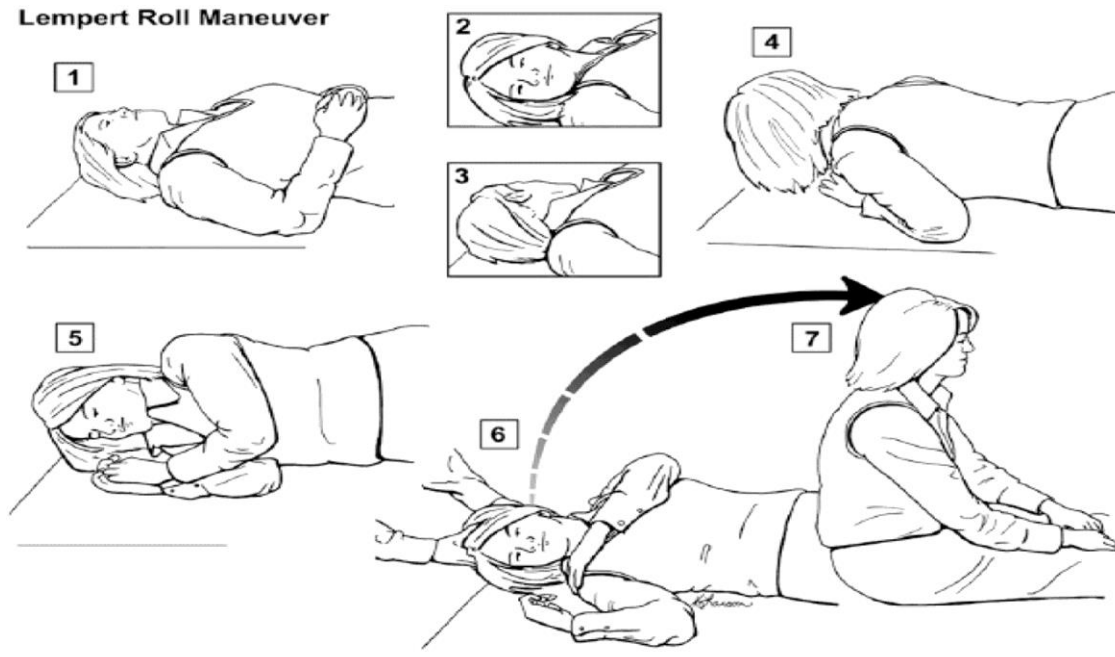
1. The patient is seated with the head turned 45° to the affected side (right in this case).
2. The patient is tilted back with the neck in slight extension.
3. The head is turned 90° to the healthy (left in this example) side.
4. The entire body is rotated 90° until the patient is lying on the healthy side, while keeping the head position against the trunk.
5. The patient is raised to the initial position. Then the head is turned towards the front. Each position is maintained 1 min or until the induced nystagmus has extinguished.



Lempert or barbeque (BBQ) roll, involves having the individual remain in the supine position with their cervical spine flexed to about 30 degrees with their head in a neutral, centered position then rotating the

individual's head 90 degrees toward the affected side with each change in head position being held for 30 seconds after the nystagmus and vertigo symptoms stop.

Lempert Roll Maneuver

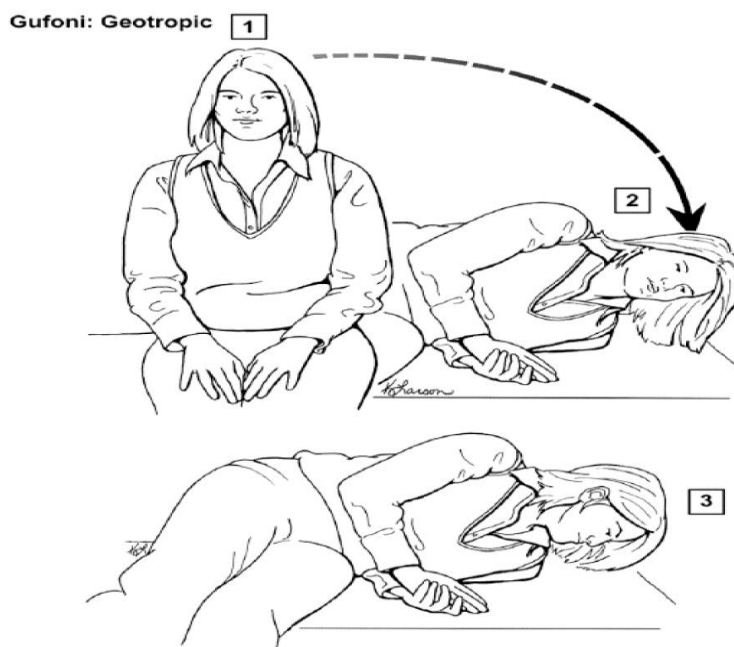


Modified Gufoni maneuver used for lateral canal applied through following ways.

- Patient taken from sitting to side-lying on affected or unaffected side
- Geotropic nystagmus: unaffected

Apogeotropic: affected

- Turn patient head quickly towards ground (45-60 degrees), hold in this position for 2 minutes.
- Patient returns to sitting with head maintained in that position.



The Yacovino maneuver involves taking the patient to the supine head-hanging position, followed by flexing the neck to the chin-to-chest position and then bringing the patient up to the sitting position, finally bending the neck.

Mastoid vibration are used for repositioning of canalith in cupulolithiasis. vibration was described as most effective stimulus for detaching the otoconia from the cupula in cupulolithiasis models [Abdelghaffar, 2010; Faralli et.al. 2008; Bhattacharyya et.al., 2017].

About 19 cases of horizontal canal involvement is found which comprises of both geotropic, apogeotropic, combination and associated with vertical and torsion component. Geotropic variant is believed to be caused by canalolithiasis while apogeotropic manifest by cupulolithiasis.

In a randomized controlled study of 209 consecutive patients with apogeotropic HC-BPPV was done. The patients were randomly assigned to receive single application of Gufoni n-72, mastoid vibration (n-67) or sham manoeuvre (n-72). Therapeutic efficacy did not differ between the gufoni and mastoid oscillation group in terms of both immediate and short term outcomes ($p=0.94$, 0.57). Both gufoni maneuver and mastoid oscillation are valid method for treating apogeotropic HC-BPPV with success rate 70% for single manoeuvre during the short term follow-up [Lee and Kim, 2017].

CONCLUSION

This study shows that CRP and skull vibration efficacy in BPPV is very high. Repetitions of maneuvers are required regardless of affect sides or multiple canals involved. Posterior canal is most commonly involved canal among bppv cases both as an independently or with multiple canals. More research with large sample size is

needed to correctly demarcate treatment of multiple canal involved cases. Limitations regarding treatment of subjective BPPV cases with more one positive positional test are found in various research articles.

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