

ORIGINAL ARTICLE

Effect of Canalith Repositioning Procedures (CRP) in Management of Subjective Benign Paroxysmal Positional Vertigo

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Objective: Canalith repositioning procedure (CRP) provides rapid and long-lasting relief of symptoms in most patients with benign paroxysmal positional vertigo. However, some patients express BPPV without nystagmus in Dix-Hallpike positioning or in other word subjective vertigo. The purpose of this study was to evaluate the efficacy of CRP in management of those particular type of patients.

Materials and Methods: CRP was performed in eight hundred and fifty patients, diagnosed as having BPPV (450 male, 400 female, mean age 56.4 years) of whom 697 (82%) were diagnosed as having posterior PSC BPPV, 140 (16.4%) diagnosed as having Subjective BPPV, 11 (1.3%) diagnosed as having LSC BPPV and 2 (0.23%) diagnosed as having ASC BPPV. Outcome of CRP for patients complaining of BPPV with apparent nystagmus were compared to outcomes of the CRP for patients complaining of BPPV without apparent nystagmus.

Results: There was a significant improvement in patients complaining of BPPV without apparent nystagmus when treated by CRP. The results were comparable to the outcome when using CRP in patients complaining of BPPV with apparent nystagmus

Conclusion: Even without having detected the pathognomonic nystagmus in patients complaining of BPPV, one can obtain acceptable results in treatment of supposed canalithiasis. And the use of CRP maneuvers can provide a relief of vertigo.

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Introduction

Benign Paroxysmal Positional Vertigo (BPPV), first described by Bárány in 1921, and better defined by Dix and Hallpike^[1] in 1952, is of great clinical and pathophysiological interest not only on account of its frequency but also the interpretation of queries that it presents. Two main theories are widely accepted now as an explanation behind the occurrence of Benign Paroxysmal Positional vertigo, cupulolithiasis and canalolithiasis theories. According to the cupulolithiasis theory^[2], vertigo is caused by the utricular stimulation of the cupula of the semicircular canal by calcium carbonate crystals detached from the macula utriculi that come to rest on the cupula during certain movements of the head. Conversely, the canalolithiasis theory interprets vertigo as due to the deflexion of the crista ampullaris caused by the endolymphatic current induced by the movement of

abnormal ear dust debris and cell derivatives in the canal itself^[3,4]. These phenomena may occur within the posterior semicircular canal (PSC), more rarely within the lateral semicircular canal (LSC) or within the superior canal; rarely bilateral or multichannel forms have been seen in a small number of cases^[5,6]. There are several therapeutic proposals, all inspired by physical-rehabilitation principles, based on the pathogenetic hypotheses of cupulolithiasis and canalolithiasis^[7]. The most favored and widely accepted protocol is the Epley maneuver it is also called the particle repositioning or canalith repositioning procedure. The goal of canalith repositioning procedure (CRP) is to move the displaced debris out of the involved semicircular canals so that they do not send false signals to the brain about spatial movement. Although CRP is very effective, with an approximate cure rate of 80% and

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the recurrence rate for BPPV after these maneuvers is low ^[8]. Use of a canalith repositioning procedures (CRPs), such as the Epley and Semont's maneuvers, depends on accurate localization of particles. Examining physicians must determine the affected ear and canal and also whether the material is free-floating or adherent to the cupula .

One might ask a question whether CRP has the same efficacy in patients complaining BPPV without nystagmus in Dix-Hallpike positioning (in other words patients with subjective vertigo). The rationale behind this study was to find out an efficient management for patients suffering from subjective BPPV which is defined here as an attack of transient-sudden onset vertigo triggered by head motion but without concomitant nystagmus in Dix-Hall positioning. The goal of this study is to evaluate the efficacy of CRP in management of subjective BPPV.

Materials and Methods

From January 2003 to August 2007, 920 patients (500 Males-420 Females), (age range 23-70 years) with positional vertigo came to the Hearing & Balance disorders Unit in Faculty of Medicine Cairo & Fayoum Universities. All had undergone otoneurological evaluation including Dix Hallpike maneuver guided by infrared goggles, clinical evaluation of the vestibulo-spinal system together with coordination tests, the study of cranial nerves as well as a complete Videonystagmography (VNG) recording with pursuit, saccades, optokinetic and bithermal water caloric tests.

In Dix Hallpike's diagnostic maneuver, onset of a vertical-rotatory geotropic nystagmus (mainly of the torsional type) with a few seconds latency, a rapid phase towards the affected side and a duration < 2 minutes (30-40 sec in most cases) has always been considered characteristic of posterior semicircular (PSC) BPPV. Subjective type BPPV (sBPPV) was diagnosed when a subjective symptomatology similar to that of typical BPPV was noted without concomitant nystagmus during or after Dix Hallpike's diagnostic maneuver guided by the infrared goggles. Latency of the attack was 4.42 +/- 2.02 sec (delayed

relative to the head placed in the hanging position) and its duration was 8.67 +/- 4.31 sec ^[9].

For the diagnosis of lateral semicircular canal (LSC) BPPV, Roll Test was performed. In this test, the patient was made to lie on a couch with the head position raised to 300 (caloric position). The head was then rolled quickly from one side to the other. LSC BPPV was diagnosed when bilateral horizontal paroxysmal nystagmus with short latency, geotropic and more intense in the affected side was noted.

In presence of geotropic torsional nystagmus with downbeat component, the patient was made to lie supine with the head extended in the primary position i.e. straight back or 'Rose' position. Torsional nystagmus with a major downbeat component is seen. The side is indicated by the torsional element beating towards the affected side Anterior Semicircular Canal (ASC) BPPV was diagnosed.

All the other variations were excluded. Management of PSC BPPV was done using the Epley's maneuver. Management of ASC BPPV was done using the Kim maneuver ^[10], which resembles Epley's CRP for posterior canal BPPV, but it omits the nose-down position, which would be expected to worsen ASC BPPV. Management of LSC BPPV was done using the "log roll" exercises, where the patient was rolled in steps of 90 deg, starting supine/affected ear down, to supine, to affected ear up, to nose-down, and then to sitting at intervals of 30 seconds or one minute. ^[11]. All the maneuvers described above were done under Infrared (IR) video goggles monitoring. The maneuver was done only one time per session. There were no post-treatment instructions ^[12]. For patients who did not respond to CRP satisfactory after three trials with a time span of three days, other treatment modality was chosen. After the successful management of BPPV all patients were followed up for a period of two years.

Results

Eight hundred and fifty patients diagnosed as having BPPV were included in this study (450 male, 400 female, mean age 56.4 years). Of whom 697 (82%) were diagnosed as having posterior PSC BPPV,

140(16.4%) diagnosed as having Subjective BPPV (Tables 1 and 2). Of the 140 patients diagnosed as subjective BPPV, 136 (97%) were suspected to have posterior canal benign paroxysmal positional vertigo (PSC sBPPV) (Table 3) and 4 subjects (3%) were suspected to have lateral canal (LSC sBPPV) benign paroxysmal positional vertigo. None of the subjects was suspected to have anterior canal BPPV (ASC sBPPV). Eleven patients (1.3%) were diagnosed as having LSC BPPV (Table 4) and 2 (0.23%) diagnosed with ASC BPPV (Table 5). Tables (2, 4 and 5) shows the management outcome of patients complaining of BPPV while Table 3 shows the management outcome of patients complaining of sBPPV.

Table 1. Distribution of the patients complaining of positional vertigo

Total Number	PSC BPPV	Subjective BPPV	LSC BPPV	ASC BPPV	Excluded patients
850	697	140	11	2	70

Two years follow-up revealed almost equal recurrent rate percentage in patients complaining of subjective and objective BPPV when they were treated by the same maneuvers (Table 6).

Discussion

A certain subset of patients 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. Proposed theories to explain the lack of nystagmus in patients with BPPV during the Dix-Hallpike maneuver include the following: subtle nystagmus missed by the observer, fatigued nystagmus from repeat testing before the maneuver and a less noxious form of BPPV that elicits vertigo but with an inadequate neural signal to stimulate the vestibulo-ocular pathway^[13]. Another explanation can be that the observations did not coincide with the occurrence of the nystagmus or that the entity of otoconia particles adhering to the cupula of the posterior semicircular canal or free-floating in the canal itself, was minimal. In these patients certain positions led the cupula to deflect sufficiently enough to trigger symptoms of vertigo, but not the appearance of a nystagmus.^[14]

Positional and positioning nystagmus is not always present in BPPV. Appearance of a nystagmus is probably related to the amount of cupula or canal otoconia particles, Indeed, in clinical practice there are other cases of vertigo or dizziness without nystagmus, as observed in the final stage of electro/videonystagmography recordings following caloric stimulation when some patients report persistence of vertigo or dizziness although a nystagmus is no longer present, or in the clinical evolution of vestibular neuronitis in which disappearance of the nystagmus does not always

Table 2. Management outcome of the patients complaining of PSC BPPV

Total Number	Cured after 1 st trial	Cured after 2 nd trial	Cured after 3 rd trial	Total Number Cured	Shifted to other modality
697	550 (78.9%)	39 (5.6%)	11 (1.6%)	600(86%)	97(14%)

Table 3. Management outcome of the patients complaining of Subjective BPPV

Total Number	Cured after 1 st trial	Cured after 2 nd trial	Cured after 3 rd trial	Total Number Cured	Shifted to other modality (All were suspected to have PSC sBPPV)
140	94 (67%)	6 (4.3%)	3(2.1%)	103(73.6%)	37(26.4%)

Table 4. Management outcome of the patients complaining of LSC BPPV

Total Number	Cured after 1 st trial	Cured after 2 nd trial	Cured after 3 rd trial	Total Number Cured	Shifted to other modality
11	7 (63.6%)	2 (18%)	1(9%)	10(90.9%)	1(9%)

Table 5. Management outcome of the patients complaining of ASC BPPV

Total Number	Cured after 1 st trial	Cured after 2 nd trial	Cured after 3 rd trial	Total Number Cured	Shifted to other modality
2	2 (100%)	–	–	–	–

Table 6. Recurrence rates of Objective and Subjective BPPV after two years follow-up

	Total Number Cured	Number of recurrence after 2 years follow-up
Objective BPPV	612(72%)	53(8.7%)
Subjective BPPV	103(73.6)	9 (8.7%)
p	> More than (what is that sign?) 0.05	
	>(what is that sign) 0.05	

correspond to disappearance of symptoms of vertigo. Although CRP's are becoming widely accepted as a managing tool in objective BPPV ^[8], we can hardly say the same about using CRP in management of subjective BPPV. Haynes and colleagues, Tirelli and colleagues and Weider and colleagues found that patients with subjective BPPV who were treated with various repositioning maneuvers had response rates of 76%-93% overall ^[13-15]. Still it is difficult to compare studies that use the CRP in management of subjective BPPV, because they vary considerably in the length of follow-up, number of treatment sessions, number of maneuvers per session, the type of BPPV (e.g. posterior canal in the study of Tirelli and colleagues) and the number of patients, actually most of them were having a small number of patients.

In the current study an overall number of 140 patients met the criteria for diagnosis of subjective BPPV were treated by CRP. Choice of the side to begin the maneuver was based on the intensity and or duration of the nystagmus ^[14]. Differentiation between the posterior and lateral canal subjective BPPV was based on the following clinical criteria: in lateral canal affection; 1- the duration of the vertigo is longer than 60s 2- sensation of vertigo is not provoked by Dix-Hall- pike maneuver, it is usually provoked by putting the body in the supine position and the head inclined forward 30 degrees, and then turns the head to either side. People with lateral canal BPPV are also generally more disturbed by ordinary sideways rotational head-movements than people with posterior canal BPPV. Anterior canal subjective BPPV was not suspected in

the current study group of patients. The presence of anterior canal BPPV is rare. Some authors doubt its existence. The anterior canal is normally the highest part of the inner ear and getting debris into the anterior canal would not be easy. From the geometry of the ear, it would seem likely that anterior canal BPPV might occasionally result as a complication of the Epley maneuver. The otoconial debris in BPPV would naturally tend to fall into the posterior canal and, therefore, the PSSC BPPV is the most common variant of BPPV. In rare cases, the horizontal canal may be involved in BPPV ^[16]. In the current study there was no statistically significant difference between cure rates of objective and subjective BPPV after using CRP. Two years follow-up did not also show any statistically significant difference between the recurrence rate of objective and subjective BPPV (These results might lead us to the assumption that for the treatment of BPPV with CRP , whether the cause was posterior or lateral canal affection, it is not essential to observe detectable nystagmus; symptoms of vertigo with clinical judgment are sufficient to get satisfactory outcomes .

Conclusion

What is attempted by this work is to confirm that through clinical evaluation based on history and positioning tests alone, one can obtain acceptable results in treatment of supposed canalithiasis without having detected the pathognomonic nystagmus. And the use of canal repositioning maneuvers can provide a relief of vertigo in patients with positional vertigo, even without objective nystagmus.

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