

## Original Research Article

# Effect of vitamin D levels in benign paroxysmal positional vertigo

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## ABSTRACT

**Background:** Benign paroxysmal positional vertigo (BPPV) is a common cause of disabling vertigo with a high rate of recurrence. BPPV is the most common cause of neurotological disorder. It is caused by dislodged otoconia which fall from the utricular macula and float into the semicircular canals there by making them sensitive to gravity. It has been shown that elderly people may suffer from unrecognized, chronic BPPV. Patients with unrecognized BPPV were more likely to have reduced activity of daily living scores, to have sustained a fall in the previous 3 months and to have depression.

**Methods:** A prospective study of 100 patients with clinical diagnosis of BPPV visiting Navodaya medical college and hospital between June 2019 to May 2020 were included in the study.

**Results:** Patients taking both vitamin D supplementation and rehabilitation therapy improved better than patients taking rehabilitation therapy alone.

**Conclusions:** Both rehabilitation therapy and supplementation of vitamin D is helpful in patients with vitamin D deficient BPPV patients.

**Keywords:** BPPV, Vitamin D, Otolith disease, Rehabilitation therapy

## INTRODUCTION

BPPV is most commonly clinically encountered as 1 of 2 variants, BPPV of posterior semicircular canal (posterior canal BPPV) and BPPV of lateral semicircular canal (also known as horizontal canal BPPV).<sup>1-3</sup> Back in 2003 Vibert et al suggested a connection between BPPV, osteoporosis and osteopenia.<sup>4</sup> Even a beneficial therapeutic effect could be observed between BPPV and osteoporosis when treated with bisphosphonates in women.<sup>5</sup> As a hypothesis, we suggested that there is a relation between insufficient vitamin D level and benign paroxysmal positional vertigo. We raised the possibility that patients with BPPV who had low vitamin D levels may benefit from supplementation and suggest further epidemiological investigations to determine the effect of correcting vitamin D deficiency on the recurrence of vertigo.<sup>6</sup>

It is well established that vitamin D and calcium are necessary for bone health. Bone mineralization and strength suffers in their absence. Vitamin D assists in the absorption of calcium. The ear crystals, which are made of calcium carbonate primarily, likewise, require adequate calcium and vitamin D for proper health.

BPPV diagnosis-otolith disease in the posterior semicircular canal typically occurs during the process of getting up or lying down.<sup>7</sup> Diagnosis of lateral canal BPPV was based on medical history and the presence of geotropic or apogeotropic nystagmus (bidirectional, horizontal) during head roll maneuver. Affected side for lateral canal BPPV was determined according to the severity of nystagmus which was severe on the affected side in patients with geotropic nystagmus and was severe on the healthy side in patients with apogeotropic

nystagmus. Patients with geotropic nystagmus during head roll maneuver were defined as LC-canalolithiasis and patients with apogeotropic nystagmus during head roll maneuver were defined as LC-cupulolithiasis at initial diagnosis for the aim of classification although patients with debris very close to the cupula are also known to present apogeotropic nystagmus. Diagnosis of PC-BPPV was based on medical history and the presence of clockwise or counter clockwise wise rotatory torsional and upbeat nystagmus during head hanging maneuver (Dix/Hallpike) when the affected ear is down. Diagnosis of SC-BPPV was based on medical history and the presence of ipsilateral torsional downbeating rotatory nystagmus when the affected ear is down or counter lateral torsional down beating rotatory nystagmus when the affected ear is up during the head hanging maneuver with the prevalence of the vertical component.<sup>8</sup>

Treatment of the posterior canal canalolithiasis (PC-BPPV) posterior canal canalolithiasis is the most frequent variant of BPPV, accounting for 80-90% cases. It is diagnosed when a Dix-Hallpike or a side-lying test elicits a torsional nystagmus with the upper pole of the eyes beating toward the lower ear combined with the vertical nystagmus beating upward, that lasts less than a minute and is precluded by a short latency (von-Brevern et al 2015). It has been extensively proved that Epley (1992) and Semont et al (1988) are both suitable for treating PC-BPPV. Brandt Daroff exercises cannot be considered as first choice treatment because it has been proved to be significantly less effective than Epley and Semont procedures (Amor-Dorado et al 2012, Varela et al 2001). Brandt Daroff exercises are designed to disperse the canaloliths and to increase the patient's tolerances for the BPPV symptoms, thus, they cannot be classified as a repositioning procedure.

Treatment of the horizontal canal BPPV-horizontal canal canalolithiasis (HC-BPPV) is diagnosed when the supine roll test elicits a horizontal nystagmus beating towards the undermost ear (geotropic direction changing nystagmus), after a brief latency or no latency and lasting less than a minute. Horizontal canal cupulolithiasis (HC-BPPV-cu) is diagnosed when the supine roll test provokes a horizontal nystagmus beating to the uppermost ear (apogeotropic direction changing nystagmus), after a brief latency or no latency and lasting more than a minute (Brevern et al 2015).<sup>9</sup>

### **Objectives**

The objectives of this study were to measure vitamin D levels in patients with BPPV and to study the response of BPPV patients to vitamin D supplementation therapy.

## **METHODS**

A prospective study of 100 patients with clinical diagnosis of BPPV visiting Navodaya medical college and hospital between June 2019 to May 2020 were

included in the study. Intensity of BPPV was assessed based on VAS score (0-10). Serum 25-hydroxyvitamin (25-OHD) was measured using ELISA method and levels <20 ng/ml was considered a deficiency. Serum 25-OHD deficient patients were classified as treated and non-treated group (rehabilitation with or without 50000 IU cholecalciferol weekly for 2 months). The results of treatment were compared with vitamin D sufficient group as control. All patients were followed up for 6 months. All patients were subjected to otologic tests. Dix-Hall pike and supine roll tests were conducted to identify the location of lesions and the patients were treated using Epley's maneuver for posterior semicircular canalolith and barbecue rotation maneuver for horizontal semicircular canalolith. As treatment otoconia replacement was conducted one to two times per day and the patients were instructed to visit the hospitals at intervals of 2-3 days. The disappearance of symptoms and of nystagmus identified in otological tests were regarded as the criteria for complete cures.

A total of 100 patients with clinically diagnosed BPPV were evaluated during the time period June 2019 and May 2020. The data was collected in Navodaya medical college hospital and research centre. Patients were analyzed according to the age, gender, canal involvement, duration of symptoms, duration of nystagmus and recurrence. All patients received the definitive diagnosis and canalolith repositioning maneuvers treatment and finally accomplished follow-up. Patients were followed up 1 year after the treatment to record the recurrence data. Written informed consent obtained from all participants.

### **Inclusion criteria**

Patients age group between 18-60 years, patients who signed informed consent and who agreed to follow-up were included in the study.

### **Exclusion criteria**

Patients younger than 18 years and older than 60 years and patients who did not complete follow-up were excluded from the study.

### **Treatment and follow-up**

In some studies the metabolism of calcium carbonate and glycoprotein which are the main components of otoconia findings indicated that vitamin D is involved in calcium metabolic processes and vitamin D deficiency affects BPPV development.<sup>14,15</sup>

### **Data analysis**

The data was summarized using tables. Statistical analysis of the data was done by using student's t test, Chi square test. Statistics was analyzed with SPSS version 17.0. P<0.05 was considered statistically significant.

## RESULTS

100 patients were entered in the study. Vitamin D deficient patients were classified as treated group taking rehabilitation therapy and supplemental vitamin D and non-treated group taking rehabilitation therapy alone.

Vitamin D deficient patients were classified as treated group A (N=33) taking rehabilitation therapy and supplemental vitamin D and non-treated group B (N=33) taking rehabilitation therapy alone. Patients with sufficient serum 25-OHD (N=34) were considered as control group.

Patients taking both vitamin D supplementation and rehabilitation therapy improved better than patients taking rehabilitation therapy alone.

Serum 25 OHD <20 ng/ml was considered as deficient and levels >30 ng/ml was considered as sufficient.

**Table 1: Comparison of vitamin D deficient patients with mode of treatment.**

Comparison	Group A	Group B
Rehabilitation	+	+
Vitamin D	-	+

**Table 2: Comparison of serum 25 OHD status in patients with BPPV with number of recurrences of BPPV (N=100).**

BPPV groups	Number of recurrences over period of 6 months
Vitamin D deficient(N=66)	>3
Vitamin D sufficient(N=34)	<2

100 patients were entered in the study.

## DISCUSSION

In our study we found that Epley's manouvre helps in reduction of symptoms. Correction of vitamin D levels in those patients with vitamin D deficiency helps in improvement of symptoms better than rehabilitation therapy which is similar to study conducted by Sheikhzadeh et al.<sup>10</sup> We found that serum vitamin D levels were low in two third of patients with BPPV which is similar to study conducted by Ding et al.<sup>11</sup> Talaat et al in a follow-up study of vitamin D deficient patients demonstrated that raising serum 25-OHD >10 ng/ml increase in serum 25-OHD by treatment significantly decreased the recurrences as well as the number of BPPV attacks as compared with those who had less than 10 ng/ml increment which is similar to our study.<sup>12</sup>

In our study BPPV is more common in middle aged females which is similar to study conducted by Brevern et al.<sup>13</sup>

Patients with BPPV have lower bone mineral density than controls in our study, which is comparable to study conducted by Talaat et al.<sup>14</sup>

Talaat et al in a follow-up study of vitamin D deficient patients demonstrated that raising serum 25-OHD >10 ng/ml increase in serum 25-OHD by treatment significantly decreased the recurrences as well as the number of BPPV attacks as compared with those who had less than 10 ng/ml increment which is similar to our study.<sup>15</sup> We found that raising serum 25-OHD >10 ng/ml by treatment significantly decreased the recurrences as well as the number of attacks which is comparable to study conducted by Parham et al.<sup>16</sup>

## CONCLUSION

We conclude that Epley's manouvre is effective rehabilitation therapy for reduction of BPPV symptoms. In patients with vitamin D deficiency with BPPV, both rehabilitation therapy and supplementation of vitamin D is more helpful than rehabilitation therapy alone. It also benefits by reducing the number of recurrences.

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