

“TO EVALUATE THE EFFECT OF SERUM VITAMIN D3 ON THE TREATMENT OF BPPV”

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Abstract:

About- Benign paroxysmal positional vertigo (BPPV) is a clinical syndrome characterized by recurrent, brief episodes of severe vertigo and rotatory nystagmus, precipitated by specific positions of the head relative to gravity. Diagnosis of BPPV is usually based on history, clinical examination and the mechanism of vertigo has been attributed to calcium debris within the posterior semi-circular canal known as canalithiasis.

The aim of the present study was to evaluate the effect of serum Vitamin D3 on the treatment of BPPV, recurrences of BPPV and the relationship between serum Vitamin D3, serum calcium and recurrence of BPPV.

Method- The Prospective Randomized Single Blind Case Control Study was carried out. A total number of 80 patients were enrolled in the study. Out of this only 50 patients came for regular and complete follow up. The patients were divided randomly into two groups on the basis of a vitamin D level (ng/ml) and computer-based lottery system and each group had 25 patients.

Result- Out of 50 patients, group A with vit D and group B without vit D supplementation. The recurrence rate in our study of group A and group B was 8% and 12% respectively.

Conclusions- From our study we concluded that in the patients of BPPV, serum Vitamin D3 and Calcium was found to be deficient and BPPV has high tendency of recurrence and deficiency of Vitamin D3 is one of the causes of recurrences of BPPV.

Keywords- Vitamin D3, serum calcium, BPPV.

Introduction

Benign paroxysmal positional vertigo (BPPV) is a clinical syndrome characterized by recurrent, brief episodes of severe vertigo and rotatory nystagmus, precipitated by specific positions of the head relative to gravity.⁽¹⁾

The main symptom of BPPV is vertigo (spinning sensation) induced by a change in head position with respect to gravity. Patients typically develop vertigo when getting out of bed, rolling over in bed, tilting their head back, for example to look up shelves, or bending forward. However, the symptoms of BPPV may vary among patients and may manifest with nonspecific dizziness, postural instability, lightheadedness, and nausea.^(2,3) The vertigo in BPPV is typically intermittent and position dependent.

BPPV has adverse consequences, including reduced ability to perform activities of daily living, increased psychosocial impact, and medical costs.^(4, 5) Diagnosis of BPPV is usually based on history, clinical examination and the mechanism

of vertigo has been attributed to calcium debris within the posterior semicircular canal known as canalithiasis. Currently various types of vestibular rehabilitation therapy are used for treatment of BPPV. The calcium and phosphorus content of the woven bone of the otic capsule are much higher than other bones hence may be more affected by deficient Vitamin D levels. Again, demineralization of otic capsule, may lead to degenerative changes in the spiral ligament, stria vascularis and cochlear hair cells.⁽⁶⁾ Dislodged otoconia, which fall from the utricular macula and float into the semi-circular canals thereby making them sensitive to gravity.⁽⁷⁾

Osteoporosis which is characterized by reduced bone mass and increased bone turnover, occur more frequently in middle-aged and elderly women suffering from recurrent idiopathic BPPV.^(8,9)

The aim of the present study was to evaluate the effect of serum Vitamin D3 on the treatment of BPPV, recurrences of BPPV and the relationship between serum Vitamin D3, serum calcium and recurrence of BPPV.

Materials and Methods

The Prospective Randomized Single Blind Case Control Study was conducted in the Department of Otolaryngology MLN Medical College and SRN Hospital of Prayagraj on 50 patients of BPPV after due clearance from Institutional Ethics Committee for a period of 1 year from July 2017 to August 2018. Patients were properly informed regarding the nature of disease process, expected outcomes, potential complications and alternative treatment. Written informed consent was taken.

Inclusion criteria includes patients above 18 years, Proven Posterior Canal BPPV cases by history and Dix Hallpike Maneuver, availability of actual serum 25 hydroxy vitamin D and serum calcium value at the first visit or at the follow up examination, patient without any co-morbidity like diabetes mellitus, hypertension, renal

disease, neurological disease & thyroid disease.

Exclusion criteria includes patients having history of any ear diseases, middle ear and inner ear surgery, immuno-compromised patient like AIDS, patients taking antitubercular drugs. Patient having central causes of positional vertigo. Patients taking calcium supplements, vitamin D or drugs that affect calcium metabolism and patients with a history of head trauma, noise exposure, kidney disease.

METHOD

Patient attending ENT OPD and having complaints of dizziness or vertigo were properly examined by taking detailed clinical history. Clinical examination, General examination, Systemic examination or specific examination like Otological Examination, Neurological Examination (gait evaluation), Cerebellar Function Test, Epley's Test, Dix Hallpike Maneuver was done. Patients were also investigated for hearing assessment by Tuning Fork Test, Pure Tone Audiometry, and Hematological investigations like Serum Calcium, Serum Vitamin d3, Diabetic Profile.

Groups were formed by the new Croatian guidelines for the prevention, detection and treatment of vitamin D deficiency in adults. According to this guideline, the amount that marks the optimal serum level of 25 (OH) D should be above 30 ng/ml. Values between 20 and 30 ng/mL indicate insufficiency, and values equal to or lower than 20 ng/mL indicate a deficiency of 25 (OH) D.⁽¹⁰⁾

Serum calcium was also measured in each follow up. The amount that measures below 8.9mg/dl is deficient, 8.9-10.9mg/dl is normal while >10.9 mg/dl is hypercalcemia.

A total number of 80 patients were enrolled in the study. Out of this only 50 patients came for regular and complete follow up. The patients were

divided randomly into two groups on the basis of a vitamin D level (ng/ml) and computer-based lottery system and each group had 25 patients. Group A patients were given Epley's maneuver along with vitamin D3 and Calcium till 6 months or till vitamin D level normalizes. Group B patients were given Epley's maneuver. The vitamin D level was measured at 0, 1, 2, 6 months along with complaints of the patients.

FOLLOW UP

All the patients were followed for 6 months duration, during follow up all the patients were investigated for Vitamin D3 at 1, 2, 6 months duration. Number of episodes of vertigo was also recorded in the intervening period, recurrence, grading of vertigo in each episode, duration, severity which was evaluated by Dizziness Handicap Inventory (DHI) scoring.

A common tool used to assess perceived handicap of an individual's dizziness is the Dizziness Handicap Inventory (DHI).⁽¹¹⁾ The DHI includes three sub-scales the functional, emotional, and physical sub-scales. It is proposed that items within the DHI may be helpful in making the diagnosis of BPPV because the DHI contains important questions that may lead the clinician to suspect that the patient has BPPV. Scores greater than 10 points should be referred to balance specialists for further evaluation. 16-34 points (mild handicap), 36-52 points (moderate handicap), >54 points (severe handicap). On the five item BPPV sub-scale, the higher the score, the greater the probability that the patient will have a positive Dix- Hallpike test result. If the DHI sub-scores are high, a Dix-Hallpike test should always be performed to rule out BPPV.

We have used SPSS version 18 software for statistical analysis student unpaired t test for quantitative values, if P Value <0.05, then it is statistically significant.

In this study we found out the effects of

supplementation of Vitamin D3 on treatment and recurrence rate of BPPV.

Result

In the present study, 80 patients were enrolled. Out of 80, 30 patients didn't turn up for follow up. In 50 patients the clinical profile, treatment protocol was completed. Most of the patients suffering from BPPV were in the 5th decade (36%) followed by 6th decade (32%) in group A, while in group B 5th decade (44%) had highest numbers of patients, followed by 6th decade (36%). Overall most of the patients were in 5th decade (40%), followed by 6th decade (34%).

Mean age of male 63.14 ± 8.07 years, of female 53.5 ± 7.8 years, 57.8 ± 8.49 years as the total mean age in group A, while 57.16 ± 7.34 years was the total mean age of group B, and of male is 58.5 ± 7.32 years and of the female is 57.6 ± 7.9 years. Female to Male ratio of the patient suffering from BPPV was approximately 2:1. Males were 15 (30%) and females were 35 (70%).

PRE AND POST TREATMENT CHANGES IN LEVEL OF SERUM VITAMIN D3

VIT D3	PRE TREATMENT		POST TREATMENT					
			1 MONTH		2 MONTH		6 MONTH	
GROUPS	A	B	A	B	A	B	A	B
DEFICIENT(<20)	5	7	0	11	0	9	0	8
INSUFFICIENT(20-30)	20	18	18	14	10	16	2	17
NORMAL(>30)	0	0	7	0	15	0	23	0
TOTAL	25	25	25	25	25	25	25	25

TABLE 1: CHANGES IN LEVEL OF SERUM VITAMIN D3 IN GROUP A AND GROUP B;

Table 1 shows in group A 5 (20%) patients had Vitamin D3 value less than 20ng/ml, 20 (80%) patients had Vit D3 value in between 20-30ng/ml. After 1 month of supplementation of Vit D3, 18 (72%) patients had Vitamin D3 20 -30ng/ml, while only 7 (28%) patients had more than 30 (normal Vit D3 value) and growth. After 6 months only 2 (8%) patients Vit D3 had 20-30ng/ml, while 23 (92%) patients had more than

30 ng/ml. While in group B, 7 (28%) patients had Vit D3 value less than 20ng/ml, while 18(72%) patients were between 20-30ng/ml in pre-treatment.

After 1 month 11 (44%) patients had less than 20 ng/ml Vitamin D3 value, while 14(58%) had between 20 -30ng/ml and at 6 months 8 (32%) patients had less than 20 while 17 (58%) patients had between 20 -30ng/ml.

PRE AND POST TREATMENT VALUE OF SERUM VITAMIN D3 LEVEL TABLE 2: MEAN VALUE OF SERUM VITAMIN D3 LEVEL IN PRE AND POST TREATMENT IN GROUP A AND GROUP B PATIENTS;

		GROUP B (mean \pm S.D)	P value (<0.05 =statistically significant)
Pre treatment	---	21.944 \pm 2.7	0.56
Post treatment -1 month	27.02 \pm 2.89	21.584 \pm 3.08	<0.001
2 month	30.14 \pm .94	22.556 \pm 2.9	<0.001
6 month	31.98 \pm 1.18	22.592 \pm 2.9	<0.001

Table 2 shows values of serum vitamin D3 in each group during follow up period. In the group A, the level of 25-hydroxyvitamin D3 was 22.37 \pm 2.5 ng/ml before treatment and increased up to 31.98 \pm 1.18ng/ml after treatment. In group B, the level of 25-hydroxyvitamin D3 was 21.94 \pm 2.7 ng/ml before treatment and after treatment was 22.592 \pm 2.9 ng/ml. The P-value of group A and group B in pre- treatment was not significant, but it was statistically significant in post treatment.

PRE AND POST TREATMENT CHANGES IN LEVEL OF SERUM CALCIUM

TABLE 3; CHANGES IN SERUM CALCIUM LEVEL IN GROUP A AND B;

GROUPS	SERUM CALCIUM	PRE TREATMENT	POST TREATMENT		
			1 MONTH	2 MONTH	6 MONTH
A	<8.9 (deficient)	25	21	14	9
	8.9-10.1(normal)	0	4	11	16
	>10.1 (hyper)	0	0	0	0
B	<8.9 (deficient)	25	25	25	20
	8.9-10.1(normal)	0	0	0	5
	>10.1 (hyper)	0	0	0	0

Table 3 shows the distribution of patients according to serum calcium in group A and B. At baseline, in both groups all patients were deficient of serum calcium.

MEAN VALUES OF SERUM CALCIUM IN PRE AND POST TREATMENT

TABLE 4: MEAN VALUES OF SERUM CALCIUM IN PRE AND POST TREATMENT IN GROUP A AND GROUP B;

Groups	No. of episodes	Pre treatment	1 month	2 month	6 month
A	...	19	3	7	2
	>5	6	2	0	0
B	≤ 5	19	5	9	4
	>5	6	1	0	1

Table 5 shows episodes of BPPV of pretreatments in group A ≤ 5 episodes in 19(76%) patients, >5 episodes in 6(24%) and after treatment ≤ 5 episodes were shown by 3(12%) patients, >5 episodes by 2(8%) after 1 month of supplementation of Vit D3 and Calcium.

But after 2 months of Vitamin D3 supplementation of 7 patients had ≤ 5 episodes of BPPV while none had >5 .

At 6 months of Vitamin D3 supplementation, ≤ 5 episodes were seen in 2 (8%), none had >5 episodes.

In group B ≤ 5 episodes in 19(76%), >5 episodes in 6(24%). patients before treatment, at 1 month of treatment ≤ 5 episodes were shown by 5(20%) patients, >5 episodes by 1(4%) , at 2 months. ≤ 5 episodes in 9(36%), none had >5 episodes and at 6 months of treatment, ≤ 5 episodes in 4(20%), >5 episodes in 1(4%) patients.

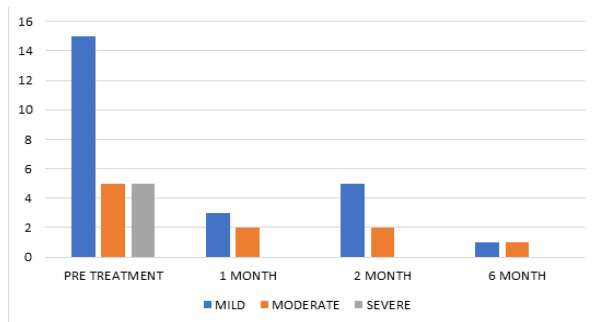
DIZZINESS HANDICAP INDEX (DHI) SCORE IN PRE AND POST TREATMENT

TABLE 6: DIZZINESS HANDICAP INDEX (DHI) SCORE IN PRE-TREATMENT AND POST TREATMENT IN GROUP A AND GROUP

Table 6 we have compared the Mean value of serum calcium at baseline and at 1,2 and 6 months. We have found out that DHI score decreases after initial treatment, but increases after 2 months of therapy in both the groups, comparatively more in group B.

GROUP	Pre treatment	1 month	2 month	6 month
GROUP A	---	6.96±14.35	9.126±15.69	2.72±9.4
GROUP B	32.8±9.6	8.32±15.29	11.68±16.18	6.48±13.29
P value	0.78	0.74	0.57	0.25

After 6 months of treatment, DHI score decreases overall in both groups.



Above figure 1, shows the grading and percentage wise distribution of BPPV patients in group A and effect of treatment on the DHI grading, in the pre -treatment 15(60%) were in mild group, 5(20%) were in moderate group, 5 (20%) were in severe group.

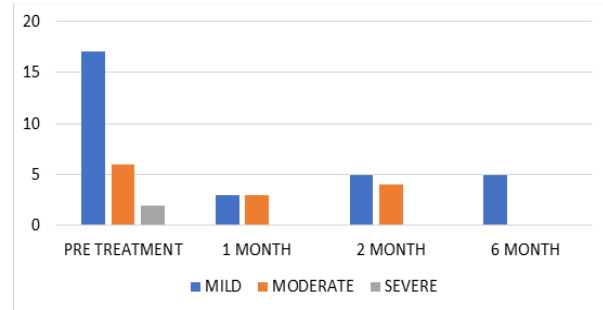
After 1 month of treatment, 3(12%) were in mild group and 2(8%) were in moderate group.

After 2 months of treatment 5 (20%) were in mild group, 2 (8%) were in moderate group.

After 6 months of treatment, 1(4%) patient was in mild group and 1 (4%) patient was in the moderate group.

GRADING OF BPPV IN GROUP B

FIGURE 2; GRADING OF BPPV IN GROUP B (ACCORDING TO DHI SCORING);



Above figure 2, shows the grading and percentage wise distribution of BPPV patients in group B and effect of treatment on the DHI grading. In the pre -treatment 17 (58%) were in mild group, 6 (24%) were moderate group, 2 (8%) were in the severe group. After 1 month of treatment, 3(12%) were in the mild group, 3 (12%) were in the moderate group, while 2 months after treatment 5 (20%) were in mild group and 4(16%) were in the moderate group. After 6 months of treatment, only 5 patients were in the mild group.

PRE AND POST TREATMENT RELATIONSHIP OF VITAMIN D3 WITH BPPV

TABLE 7; RELATIONSHIP OF VITAMIN D3 WITH BPPV IN GROUP A AND B PRE AND POST TREATMENT;

GROUPS	GROUP A		GROUP B	
		BPPV(no of patients)	VIT D3(Mean±S.D)	BPPV(no of patients)
Pre-treatment	22.37±2.5	25	21.944±2.7	25
Post treatment-1 month	27.02±2.89	5	21.584±3.08	6
2 month	30.14±0.94	7	22.556±2.9	9
6 month	31.98±1.18	2	22.59±2.9	5

Table 7 shows the relationship between serum vitamin D3 and BPPV in group A and group B. It shows that as serum Vitamin D3 increases, episodes of BPPV decreases in group A.

PRE AND POST TREATMENT RELATIONSHIP OF CALCIUM WITH BPPV

TABLE 8;RELATIONSHIP OF CALCIUM WITH BPPV IN GROUP A AND B PRE AND POSTTREATMENT;

GROUPS	GROUP A	GROUP B	GROUP A	GROUP B
	SERUM CALCIUM(Mean± S.D)	BPPV	SERUM CALCIUM(Mean ± S.D)	BPPV
Pre-treatment	6.08±1.06	25	6.24±1.04	25
Post-treatment-1 month	7.2±1.51	5	6.62±0.71	6
2 month	8.27±1.21	7	6.62±0.71	9
6 month	8.5±1.08	2	7.2±1.04	5

Table 8,shows the relationship between serum calcium and BPPV in group A and B.It also shows that with an increase in serum calcium, BPPV recurrence decreases.

BPPV is a common labyrinth disorder caused by the mechanical stimulation against the vestibular receptors in the semi-circular canal, whose typical features are positional vertigo and positional nystagmus, caused by changes in head position relative to the gravity.⁽¹²⁾

Our study was prospective type of study like other studies Talaat et al (2015),⁽¹³⁾ Sushil Gaur et al. (2015),⁽¹⁴⁾ Xiang Gu (2017),⁽¹⁵⁾ while it was retrospective in BelaBuki (2013).⁽¹⁶⁾

In our study, the sample size was small (25 cases and 25 controls) like other study Sushil Gaur et al (2015),⁽¹⁴⁾ BelaBuki (2013),⁽¹⁶⁾ Maslovara S et al. (2017).⁽¹⁷⁾

It was due to specific inclusion and exclusion criteria and limited time period. In other studies, Talaat et al (2015),⁽¹³⁾ Xiang Gu (2017),⁽¹⁵⁾ Youn- Kyoung Do (2011)⁽¹⁸⁾, the sample size was large as he didn't follow the specific inclusion and exclusion criteria.

Our study was done in 50 patients, it was observed that most of the patients were found to be in 51 – 60 (40%) years of age group, followed by patients in 61-70 (34%) years of age group. Youngest patient seen was 44 years old and oldest patient was 72 years old. The overall Mean age was 57.26±7.39 years. Similar results were seen in study done by Talaat et al (2015),⁽¹³⁾ Sushil Gaur et al. (2015)⁽¹⁴⁾ Xiang Gu (2017),⁽¹⁵⁾ Youn- Kyoung Do (2011),⁽¹⁸⁾ Gu Il Rhim (2016).⁽¹⁹⁾ Mean age of our study was younger than study done by BelaBuki (2013),⁽¹⁶⁾ Maslovara S

et al (2017).⁽¹⁷⁾

In our study male to female ratio is 1:2 showing female preponderance similar to Studies of Talaat et al (2015),⁽¹³⁾ BelaBuki (2013),⁽¹⁶⁾ Sushil Gaur et al. (2015),⁽¹⁴⁾ Youn- Kyoung Do (2011),⁽¹⁸⁾ Gu Il Rhim (2016).⁽¹⁹⁾

In our study, among 50 cases of BPPV 27 (54%) patients have BPPV of Right side and 23 (46%) have BPPV of Left side, depicting right side BPPV was more common than left side BPPV. Studies of Xiang Gu (2017),⁽¹⁵⁾ BelaBuki (2013),⁽¹⁶⁾ Guneri E.A (2012)⁽²⁰⁾ also show right side dominance. While in Sushil Gaur et al. (2015)⁽¹⁴⁾ study left side BPPV was common than right side.

In our study serum Vitamin D3 level before treatment was approximately same in both the groups A and B which was 22.37±2.5 and 21.944±2.7 ng/ml respectively. There was no statistical difference seen in pretreatment level of serum Vitamin D3 in group A and group B. But after treatment the serum Vitamin D3 level was increased in group A 31.98±1.18 but serum Vitamin D3 level was nearly same 22.592±2.9 as before treatment in group B. There was significant statistical difference in the post treatment (1,2 and 6 month) serum Vitamin D3 value of group A and group B. In other studies, also serum Vitamin D3 level increased. Similar results were observed in studies of Talaat et al (2015),⁽¹³⁾ Xiang Gu (2017),⁽¹⁵⁾ Maslovara S et al (2017),⁽¹⁷⁾ Gu Il Rhim (2016),⁽¹⁹⁾ Mahboobeh Sheikhzadeh (2016).⁽²¹⁾

In our study serum calcium before treatment was same in both groups A and B 6.08±1.06 and 6.24±1.04 respectively. There was no statistical difference observed in serum calcium level in group A and group B pre-treatment. But after treatment the serum calcium level was increased in treatment group (group A) up to 8.32±1.08. There was significant statistical difference was seen in the post treatment (1,2 and 6 month) serum calcium value of group A and group B. Similar results were seen in study of Maslovara S et al (2017).⁽¹⁷⁾

Our study we found that the number of episodes of BPPV were more before the treatment, while

after 6 months of treatment the number of episodes decreased significantly in both the groups. But there was slight increase in the episodes of BPPV after 2 months due to recurrences. The decrease rate of frequency of episodes of BPPV in treatment group A was found to be significant. The recurrence rate in our study of group A and group B was 8% and 12% respectively. The overall recurrence rate was 20%. Recurrence rate was less in our study because of small sample size and limited time period of study.

The DHI is easy to complete quickly, and one can visually scan the items that the patient has checked on the questionnaire. We have found the pre-treatment DHI score in group A is 31.84 ± 14.57 and in group B is 31.2 ± 7.30 . While after treatment it was found to be 2.72 ± 9.4 in group A and 6.48 ± 13.29 in group B. It clearly shows decrease in vertigo in both groups but more decrease rate in group A as compared to group B. This decrease in DHI score in both the groups are statistically significant during the follow up of 1, 2, 6 months. Our study was in accordance with Guneri E.A (2012)⁽²⁰⁾ which also showed decrease in DHI scoring after treatment.

In the pre-treatment of group A, a greater number of patients 15 (60%) patients were in mild group, 5 (20%) patients were in the moderate group and 5 (20%) patients were in the severe group in group A. While after treatment the number of patients in mild group was 1 (4%) and 1 (4%) in the moderate group. The decrease rate in DHI score and grading is significant in the post treatment (1, 2 and 6 months) of group A is markedly significant.

In the pre-treatment of group B, a greater number of patients 17 (58%) patients were in the mild group, 6 (24%) patients were in the moderate group and 2 (8%) patients were in the severe group. While after treatment the number of patients in mild group was 5 (20%). In group B also there was significant decrease in the DHI score and grading in the post treatment (1, 2 and 6 months).

After 1 month of Epley's maneuver and Vitamin D

3, 20 patients (80%) were asymptomatic and cured in group A while 19 patients (76%) showed improvement in group B (Epley alone). 2 months of treatment in both the groups there was recurrences in 2 patients (8%) in group A and in 3 patients (12%) in group B and at 6 months of treatment 23 patients (92%) and 20 patients (80%) were asymptomatic and cured in group A and B respectively. Similar results were seen in the study of Sushil Gaur et al. (2015),⁽¹⁴⁾ reported 92% success rate of Epley after the first follow up, Talaat et al. (2015),⁽¹³⁾ found out 82% cure rate after the first therapeutic session. In a recent study by Sushil Gaur et al. (2015),⁽¹⁴⁾ 92% of the BPPV subjects either improved or were cured of symptoms after a single session with either Semont's or Epley's maneuver.

In our study, we found that although there was decrease rate in BPPV in both the groups but we also found that the decrease rate for BPPV was more in group A. This clearly states the superiority of Epley maneuver and Vitamin D3 supplementation over Epley maneuver alone. According to study of Talaat et al. (2015)⁽¹³⁾ and Mahboobeh Sheikhzadeh (2016),⁽²¹⁾

the supplementation of Vitamin D3 in patients with severe vitamin D deficiency helps in preventing the recurrence rates of BPPV.

Conclusion

From our study we concluded that in the patients of BPPV, serum Vitamin D3 and Calcium was found to be deficient and BPPV has high tendency of recurrence and deficiency of Vitamin D3 is one of the causes of recurrences of BPPV. Increase in serum Vitamin D3 in BPPV patients after Vitamin D3 supplementation helps in preventing the recurrences in BPPV patients. Supplementation of Calcium in BPPV patients and the increase in serum Calcium helps in preventing the recurrences in BPPV.

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