



Evaluation and treatment of Benign Positional Paroxysmal Vertigo: what has been done in the last years

Avaliação e tratamento da Vertigem Postural Paroxística Benigna: o que tem sido realizado nos últimos anos

Evaluación y tratamiento del Vértigo Posicional Paroxístico Benigno: qué se ha hecho en los últimos años

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Abstract

Benign Paroxysmal Positional Vertigo is a disorder of the peripheral vestibular system, characterized by sudden vertigo of short duration, triggered by head movements in different positions. Taking into consideration the large number of patients with this pathophysiology, the present study aimed to present a review of the literature on this subject. The literature survey was conducted in LILACS, Medline and SciELO databases, focusing on the scientific papers published between 2004 and 2014. It was found in this review that studies on Benign Paroxysmal Positional Vertigo have been made in recent years, addressing the methods of evaluation and treatment. It was observed that the onset of side canals or more than one canal, as well as the positive subjective postural vertigo, and instructing the patient, need to be further explored.

Keywords: labyrinth diseases; ear, inner; vestibule, labyrinth; vertigo.

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Conflict of interests: No

Authors' contributions: ACCAS study design and delimitation, analysis and interpretation of data, article writing. RS study design and delimitation, analysis and interpretation of data, revision and final approval of the version to be published.

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Received: 05/12/2013; **Accepted:** 28/06/2014



Resumo

A Vertigem Postural Paroxística benigna é uma afecção do sistema vestibular periférico, caracterizada por crise vertiginosa súbita, de curta duração, desencadeada por movimentações cefálicas em diferentes posições. Levando em consideração o grande número de pacientes com essa fisiopatologia, o presente estudo objetivou apresentar uma revisão da literatura sobre esse assunto. O levantamento bibliográfico foi conduzido nas bases de dados LILACS, Medline e SciELO, focando-se nos artigos científicos publicados entre os anos de 2004 e 2014. Verificou-se nesta revisão que estudos sobre a Vertigem Postural Paroxística Benigna foram realizados nos últimos anos, abordando os métodos de avaliação e tratamento. Foi possível observar que o acometimento dos canais laterais ou de mais de um canal, assim como a vertigem postural positiva subjetiva e as orientações ao paciente, precisam ser mais explorados.

Palavras-chave: doenças do labirinto; orelha interna; sistema vestibular; vertigem.

Resumen

El vértigo posicional paroxístico benigno es un trastorno del sistema vestibular periférico, que se caracteriza por crisis vertiginosa súbita, de corta duración, provocada por movimientos de la cabeza en diferentes posiciones. Teniendo en cuenta el gran número de pacientes con esta fisiopatología, el presente estudio tuvo como objetivo presentar una revisión de la literatura sobre este tema. El estudio de la literatura se realizó en las bases de datos LILACS, Medline y SciELO, centrándose en los trabajos científicos publicados entre 2004 y 2014. Se encontró en esta revisión que estudios sobre el Vértigo Posicional Paroxístico Benigno se han hecho en los últimos años, con foco en los métodos de evaluación y tratamiento. Se observó que la acometida de los canales secundarios o de más de un canal, así como el vértigo postural positivo subjetivo, e las instrucciones al paciente, necesitan ser mas explorados..

Palabras clave: enfermedades del laberinto; oído interno; vestíbulo del laberinto; vértigo.

Introduction

Benign Paroxysmal Positional Vertigo (BPPV) is one of the most frequent disorders of the peripheral vestibular system and its typical clinical feature is a sudden vertigo of short duration, sometimes severe, with total disappearing of the symptoms in less than 45 seconds, although the case can remain for weeks and months and, occasionally, for years. These crises are triggered by head movements such as lie down and get up from the bed, turn for one side when lying down and look up and down¹⁻⁵.

BPPV is predominant in elders⁶⁻⁸, although it is related in all ages. It is prevalent in women and its etiology is varied, it can be aroused from trauma, other vestibular disorders such as vestibular neuritis, vascular or metabolic dysfunction and Meniere's disease as well as unknown causes⁷.

The pathophysiological theory of the origin of BPPV is that calcium carbonate crystals (otoliths) move from the utricle to the semicircular posterior canal, superior or lateral (canalolithiasis) or adhere

to the dome of these canals (cupulolithiasis). This abnormal displacement of otoliths can be generated by any precipitating factor and the symptomatology is characterized by vertigo^{1-3,9-11}.

Canalolithiasis is the most common form of BPPV, where otoliths float freely in the endolymph of semicircular canal, usually the posteriors. Another form of BPPV is cupulolithiasis, where debris are adhered to the dome of the canals, being this rarely found^{1,2,10}.

In the theory of canalolithiasis, when the head is placed in the provocative position of vertigo, the debris of calcium carbonate move with endolymph, moving the dome and increasing the rate of shooting of neurons stimulated SCC. The latency of the answers is associated with the time needed for the dome to be deflected by the attraction of the endolymph, leading to a reduction of symptoms as the position is maintained because there is cessation of the endolymphatic movement¹¹.

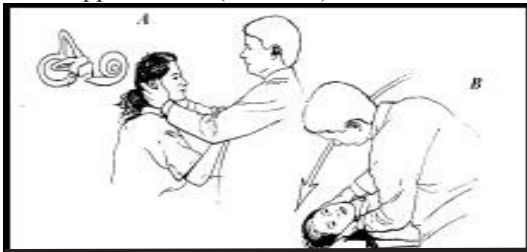
In cupulolithiasis, since the crystals are adhered to the dome, it remains deflected throughout

the time that the patient remains in the position that causes dizziness, persisting this way nystagmus and vertigo, only symptom reduction occurring due to the central adaptation¹¹.

Evaluation of Benign Paroxysmal Positional Vertigo

The evaluation of BPPV can be performed with provocative maneuvers of vertigo, arising from the movement of debris in the endolymphatic circulation¹.

To evaluate the presence of debris in the anterior and posterior SCC, it is used the Dix-Hallpike maneuver, in which the patient is placed sitting on a barrow with head turned 45 degrees to the side to be evaluated and then quickly lying the patient to this side, so that the head is pending in the barrow for 20-30 seconds. During this period, the patient's eye must remain open and fixed on a target, so that the examiner can observe the presence or absence of involuntary eye movement (nystagmus) that will be associated with the reported symptoms. The patient then returns to the sitting position, keeping the head turned to the same side and nystagmus should be analyzed for length and direction. The same maneuver is performed with the head turned to the opposite side (Picture 1)^{1,9}.



Picture 1 - Dix and Hallpike Maneuver

Source: Baloh, 1996, p.3.

The results of the Dix-Hallpike maneuver may be negative (absence of vertigo and nystagmus), positive goal (presence of nystagmus associated with vertigo) or positive subjective (absence of nystagmus and presence of vertigo)¹.

Although rare, the presence of debris in the lateral or horizontal SCC may occur. To evaluate these canals it can be used the maneuver called Mc Clure or test spin that moves the patient's head in the line of these canals¹.

In the evaluate maneuver of horizontal SCC called Mc Clure, the patient should lie supine with

the head flexed at 20 degrees and his head should be turned to one side, remaining held for a minute to check possible episode of vertigo. Afterwards, the head is slowly turned back to the starting position and there will be a quick turn to the opposite side, so that both horizontal SCC are evaluated³.

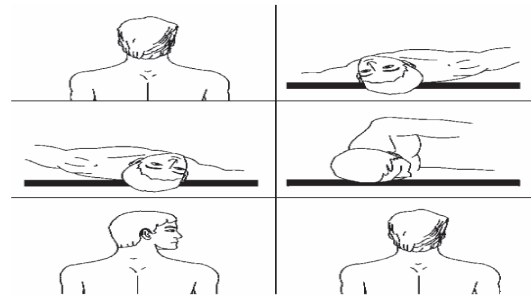
The results of these maneuvers are fundamental to the conduct of treatment.

Treatment of Benign Paroxysmal Positional Vertigo

The results presented in the assessment of BPPV maneuvers draw up the therapeutic process, which may be composed of canalith repositioning exercises, release and habituation exercises. In most cases we use the treatment of canalith repositioning followed or not by the liberatory maneuver, and habituation exercises are applied only for residual complaints after intervention^{3,9}.

To changes detected in the anterior and posterior SCC, the treatment is basically therapeutic. It is indicated maneuvers of canalith repositioning, the most widespread being Epley, internationally recognized, highly effective and aiming to reposition the free debris in the anterior or posterior SCC to the otolith organ from origin^{1,3,9,12-16}.

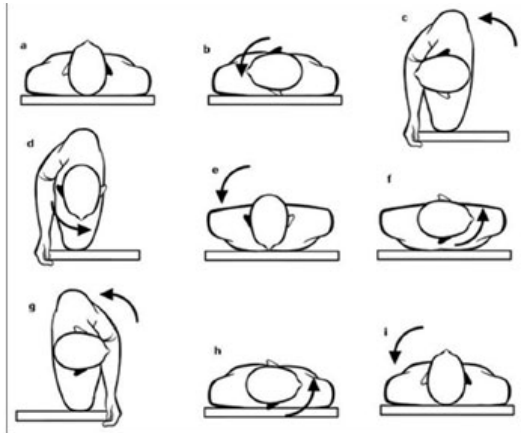
To perform the Epley maneuver (Picture 2), the patient is placed in the position of performing Dix - Hallpike, with head turned 45 degrees to the affected side. Lie down slowly the patient with the head in the barrow slightly pending, remaining in that position for one or two minutes. Later, turn the head slowly to the opposite side, which should be kept in that position for a brief period. Then the patient is asked to rotate the body to the side where the head is turned, so that the head is 45 degrees down and the nose toward the ground, and to remain in this position for a few more minutes. Finally, the patient can sit down slowly. This maneuver is effective, inexpensive and results in practically insignificant cases of side effects^{6,12}.



Picture 2 -Epley Maneuver

Source: Maia, Diniz, Carlesse, 2001, p.614.

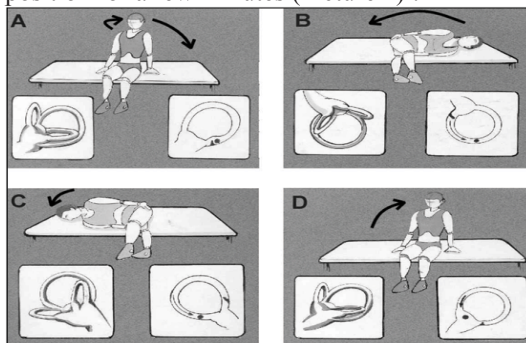
In case of presence of debris on the side SCC, the therapeutic maneuver used is called Lempert, where the patient lies supine with the affected ear down. Then it is performed the following sequence: rotate the head so that the nose stays up, intact ear down, nose down, and finally the affected ear down again. Each position (Picture 3) should be maintained for 15 seconds¹.



Picture 3 –Lempert Maneuver
Source: Bittar, Mezzalira, Furtado, Venosa, Sampaio, Oliveira, 2011, p.141.

In cupulolithiasis it is necessary to accomplish the release of debris for SCC and subsequently to apply the maneuver of canalith repositioning.

For a liberation maneuver, the literature makes use of Semont maneuver. The examiner instructs the patient to sit on the barrow so that it is in front of the examiner, lie down quickly to the affected side, staying for two to four minutes in this position. Then lie down quickly to the opposite side, always staying with the ear down, keeping in this second position for a few minutes (Picture 4)⁷.



Picture 4 – Semont Maneuver
Source: Pereira, Scaff, 2001, p.468.

The Brandt-Daroff maneuver (Picture 5) is indicated when the patient is still complaining of dizziness after performing the Epley maneuver. It

is performed by changing the patient's sitting position to the lateral decubitus corresponding to the affected labyrinth, keeping him in this position for 30 seconds. Then, the patient quickly turns back to the seated position, remaining for 30 seconds, and finally turning into the opposite lateral decubitus, also maintaining this position for 30 seconds³.



Picture 5 –Brandt – Daroff Maneuver.
Source: Bittar, Mezzalira, Furtado, Venosa, Sampaio, Oliveira, 2011, p.141.

Differently from Epley Maneuver and Semont Maneuver originally described to be applied once, Brandt-Daroff must be performed repeatedly for consecutive days until the improvement of the vertigo¹.

Beyond the proposed maneuvers, BPPV can be treated with labyrinthine sedative drugs that alleviate symptoms, while waiting for a natural regression of the condition. Surgery to block the posterior CSC can also be done⁸.

The virtual reality technology provides a wide variety of stimulus that generates sensory conflicts at different levels of difficulty and in safe environment¹⁷. This technique has been used in vestibular rehabilitation as a useful strategy for patients with peripheral vestibular dysfunction, or even vertigo of visual source¹⁸.

An accurate assessment of BPPV leads to a delineation of the therapeutic process. From this, it is clear the importance of knowing the different resources or methods of evaluation, as well as the therapeutic processes to be used in each case.

Considering the significant number of cases of BPPV patients in clinical routine, the objective of this study was to review the literature in order to verify the methods of assessment and treatment of this pathophysiology, in the last 10 years.

Method

It was conducted a literature research using electronic databases LILACS, Medline and SciELO. The descriptors used were extracted from the Medical Subject Headings (MeSH) and their counterparts in Portuguese, were consulted in DSH (Descriptors in Health Sciences). The search was limited between January 2004 and May 2014, being selected the materials of Portuguese, English and Spanish.

The descriptors used were: “labyrinth diseases”, “inner ear”, “vestibular system” and “vertigo”. After the selection of abstracts of the studies found, relevant to the proposed question, the articles were recovered in full text.

Inclusion Criteria

There were included original and literature review articles, as well as reports of found cases with the intersection of keywords “diseases of the labyrinth, the inner ear, vestibular system and vertigo”, published in the last 10 years.

Exclusion Criteria

Items that are not added to the stated purpose were excluded. Those that were repeated in the databases, were counted only once in this study.

Results

Through the aleatory crossing of keywords in English and Portuguese: “inner ear”, “labyrinth disease,” “vertigo” and “vestibular system” - from Medline and Lilacs databases and in the SciELO database, a total of 123 items were found, 70 in Medline, 35 in Lilacs and 18 articles in SciELO.

Of the total number of articles found, 101 were excluded for not meeting the proposed goal, were not written in the languages pre – established, techniques did not involve evaluation or treatment of BPPV, or even have been published in the years before 2004. Only 22 articles met the inclusion criteria and were potentially relevant for the present study.

Chart 1 records the methods of assessment and treatment of BPPV found on selected items, as well as the original title, authors, year of publication and related journals.

Article title	Authors	Year of publication	Journals	Evaluation Method of BPPV ¹	Treatment Method of BPPV
Otolith organ function according to subtype of benign paroxysmal positional vertigo.	Lee SK, Kim SJ, Park MS et al	2013	Lryngoscope	*Dix - Hallpike *VENG ² *Posturography	*Epley *Semont
Benign paroxysmal positional vertigo.	Von Brevern M	2013	Semin Neurol	*Dix e Hallpike *Mc Clure	*Epley *Semont *Lempert *Brandt Daroff
Reabilitação vestibular com realidade virtual na doença de Ménière.	Garcia AP, Ganança MM, Cusin FS, Tomaz A, Ganança FF, Caovilla HH.	2013	Rev Bras Otorrinolaringol	*DHI ³ *EVA ⁴ *Posturography with virtual reality	*Virtual reality

Chart 1 - Methods of evaluation and treatment of Benign Paroxysmal Positional Vertigo



Treatment of objective and subjective benign paroxysmal positional vertigo.	Huebner AC, Lytle SR, Doettl SM et al	2013	J Am Acad Audiol.	*Dix e Hallpike *DHI	*Epley
Benign paroxysmal positional vertigo.	Zappia JJ	2013	Curr Opin Otolaryngol Head Neck Surg.	*Dix e Hallpike *Mc Clure	*Epley *Semont *Lempert *Brandt Daroff
Vestibular rehabilitation.	Herdman SJ	2013	Curr Opin Neurol.	*Dix e Hallpike *Mc Clure	*Epley *Semont *Lempert *Brandt Daroff
The effect of virtual reality on visual vertigo symptoms in patients with peripheral vestibular dysfunction: a pilot study.	Pavlou M, Kanegaonkar RG, Swapp D, Bamiou DE, Slater M, Luxon LMJ	2012	Vestib Res.	*Unidentified	*Virtual reality
Posturografia do Balance Rehabilitation Unit (BRU) na vertigem posicional paroxística benigna	Monteiro SRG, Ganança MM, Ganança FF et al	2012	Braz J Otorhinolaryngol.	*Dix e Hallpike *Mc Clure	*Epley *Lempert *Posturography
Reabilitação Vestibular em portadores de Vertigem Posicional Paroxística Benigna	Melo Neto JS, Stroppa AEZ, Parrera CA et al	2012	Rev. CEFAC	*Dix e Hallpike *DHI	*Epley
Comparison of three types of self-treatments for posterior canal benign paroxysmal positional vertigo: modified Epley maneuver, modified Semont maneuver and Brandt-Daroff maneuver	Zhang YX, Wu CL, Xiao GR, Zhong FF.	2012	Zhonghua Er Bi Yan Hou Tou Jing Wai Ke Za Zhi	*Unidentified	*Epley *Semont *Brandt-Daroff
Condutas pós-manobra de Epley em idosos com VPPB de canal posterior	André APR, Moriguti JC, Moreno NS	2010	Braz J Otorhinolaryngol.	*Dix e Hallpike	*Epley

Continuation Chart 1 - Methods of evaluation and treatment of Benign Paroxysmal Positional Vertigo





Aspectos clínicos e terapêuticos da Vertigem Postural Paroxística Benigna (VPPB): um estudo de revisão	Aguiar AI, Silva RM, Bittencourt J, Silva ALM et al	2010	Ciência em Movimento	*Dix e Hallpike	*Epley *Drug *Surgery
Resultados do Balance Rehabilitation Unit na Vertigem Posicional Paroxística Benigna	Kasse CA, Santana GG, Scharlach RC et al	2010	Braz J Otorhinolaryngol.	*Dix e Hallpike *DHI	*Epley *Posturografia
Avaliação da manobra de posicionamento de Epley em indivíduos com Vertigem Posicional Paroxística Benigna	Costa VSP, Marchiori LLM, Melo JJ et al	Costa VSP, Marchiori LLM, Melo JJ et al	Rev. CEFAC	*Dix e Hallpike	*Epley *Posturography
Evaluation of vestibular exercises in the management of benign paroxysmal positional vertigo	Karanjai S, Saha AK.	2010	Otolaryngol Head Neck Surg.	*Dix e Hallpike	*Epley *Semont *Brandt-Daroff
Analysis of residual symptoms after treatment in benign paroxysmal positional vertigo using questionnaire.	Lee NH, Kwon HJ, Ban JH	2009	Otolaryngol Head Neck Surg.	*DHI *Dix e Hallpike	*Epley
Avaliação Vestibular na Vertigem Posicional Paroxística Benigna Típica e Atípica	Munaro G, Silveira AF	2009	Rev. CEFAC	*Dix e Hallpike *Mc Clure *vectoeletronistagmografia	*Epley *Lempert

Continuation Chart 1 - Methods of evaluation and treatment of Benign Paroxysmal Positional Vertigo

Vertigem posicional paroxística benigna: caracterização clínica	Caldas MA, Ganança CF, Ganança FF et al	2009	Braz J Otorhinolaryngol	*Dix e Hallpike *Vídeo Frenzel	*Epley
A virtual-reality approach for the treatment of benign paroxysmal positional vertigo	Steiner KV, Teixeira M, Kung B, Sorensen M, Forstrom R, Collier P.	2007	Stud Health Technol Inform.	*Unidentified	*Virtual reality
Prognosis of patients with benign paroxysmal positional vertigo treated with repositioning manoeuvres	Korres S, Balatsouras DG, Ferekidis E.	2006	J Laryngol Otol	*VENG *Dix e Hallpike	*Epley
Restrições posturais não interferem nos resultados da manobra de reposição canalicular	Simoceli L, Bittar RSM, Greters ME.	2005	Rev Bras Otorrinolaringol	*Dix e Hallpike	*Epley
É importante restringir a movimentação cefálica após a manobra de Epley?	Ganança FF, Simas R, Ganança MM, Korn GP, Dorigueto RS.	2005	Rev Bras Otorrinolaringol	*Dix e Hallpike	*Epley

Continuation Chart 1 - Methods of evaluation and treatment of Benign Paroxysmal Positional Vertigo

Legend: 1: Benign Paroxysmal Positional Vertigo; 2: Vectoelectronystagmography; 3 :Dizziness Handicap Inventory 4 :Visual Analogic Scale

Discussion

It is observed that there is currently a growing interest in the subject since the 22 selected articles; six were published during the year of 2013.

The literature is agreeing on female predominance in VPPB, as well as the condition in the right labyrinth¹⁹.

Regarding methods of evaluation of BPPV, it was observed the Dix - Hallpike maneuver as gold standard for such process^{2-5,11,13-16,20-27}, but studies show the importance of the research of side SCC as Mc Clure maneuver^{3,11,15,21,23}, because BPPV may result from impairment of side canals, not just the posterior or anterior, which are evaluated with Dix - Hallpike. The literature also makes use of vectoelectronystagmography as complementary examination for the diagnosis of BPPV because it can observe the vestibular system function, something important to the process of rehabilitation^{8,15}.

The lens of Frenzel may be used as a facilitator of visualization of nystagmus during the maneuvers of evaluation of BPPV⁴.

Examination of posturography has been used as an evaluating method of BPPV by allowing the identification of abnormalities of postural control in these patients^{16,23,24}, and can also be applied to monitor the evolution of this pathophysiology²⁸.

Regarding the treatment of BPPV, the literature indicates the maneuvers of head movement as the major methods^{2-5,11,13-16,20-24}. This treatment is widely accepted by patients because these maneuvers are easy to perform, noninvasive, inexpensive and often free of complications^{6,12}.

The knowledge of the affected SCC, as well as the location where the debris is located (the handles of SCC or dome), are key factors for the therapeutic treatment^{3,15,20,21}.

In cases of canalolithiasis the most used maneuver is Epley^{2-5,11,13-16,20-24}. This maneuver shows effective results in terms of the particle repositioning of otoliths, with consequent abolition of nystagmus of positioning^{6,9,12,23,25}.

When the evaluation detects cupulolithiasis, literature puts Semont as liberatory maneuver of debris and sequence applies Epley for the canalith repositioning^{3,15,20,21}.

The literature shows that each maneuver treatment of BPPV presents their value as effective, but Epley is adopted as the most efficient in terms of

relief of symptoms and prevention of recurrence, followed by Semont^{26,27}.

The use of cervical collar after the Epley maneuver for the purpose of head stabilization is somewhat into disuse because the literature shows no statistical difference between the population that uses the collar and that who does not, because once done canalith repositioning it is believed that there is no need of this establishment^{1,13,19,29}.

Despite little indication of drug treatment in VPPB, the literature does not provide sufficient information to support such assertion. Studies show the efficiency of drug use in conjunction with vestibular rehabilitation and not as an isolated way, in order to improve vertiginous symptoms^{3,15}.

The surgical procedure is only indicated when there is not any improvement with canalith repositioning, being rarely performed because the canalith repositioning is an efficient procedure, and besides, surgery can damage the cochlea due to the anatomical proximity between the auditory and vestibular system².

The Dizziness Handicap Inventory (DHI) has been applied as an evaluating method of the impact of dizziness on quality of life, and may also be used after treatment as a way of monitoring^{5,14,22,24}.

Habituation exercises Brandt - Daroff continue to be used in cases where some symptoms occur after the canalith repositioning or even as the evaluator of posterior and anterior SCC^{3,15,21}. The literature shows that these exercises are less effective compared with the Epley and Semont maneuvers^{26,27}.

In the literature of these last 10 years, little is said about the side SCC, as well as subjective BPPV, with cases that need evaluation and treatment to improve the quality of life of these patients. Furthermore, there are no reports of involvement of more than one SCC as well as the therapeutic process in these cases, in the articles consulted. Guidance offered to the patient at the end of rehabilitation, is also something that literature does not describe as being critical to eventual recurrences.

Studies show that virtual reality as a strategy in the vestibular rehabilitation is effective in improving dizziness, quality of life and limit of stability of patients with vestibular dysfunction^{17,30}. More studies need to be performed with this technique, even in a specific population of BPPV cases, to support the assertion of its efficiency.

The importance of further studies on BPPV is something relevant for neurology and especially for patients who are affected by it.

Conclusion

Maneuvers with head movement for evaluation of horizontal and vertical semicircular canals, as well as treatment of BPPV with canalolithiasis repositioning are effective ways and accepted in international literature.

Further details on the assessment and rehab of BPPV which affect the posterior semicircular canals, the subjective BPPV, or tills, with involvement of the side canals or more than one canal, need to be more studied in the academic area, as well as the use of virtual reality as a therapeutic strategy.

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