

Applicability of the Dix-Hallpike test on benign paroxysmal positional vertigo: literature review

Aplicabilidade do teste de Dix-Hallpike sobre vertigem posicional paroxística benigna: revisão de literatura

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Abstract

Objective; to analyze the applicability of the Dix-Hallpike maneuver on BPPV as a diagnostic method for the semicircular canals as well as its sensitivity. **Methods:** a literature review was performed using the following sourcing databases: LILACS, PubMed, SCIELO looking for papers published in Portuguese, English and Spanish. The following searching strategy descriptors were used: vertigo, vestibular diseases and respiratory therapy techniques, being included publications between the years 2000 and 2017. **Results:** the results of the work were presented through a synoptic table and flowchart. **Conclusion:** There is still controversy regarding its sensitivity to the anterior and lateral canals, even if the maneuver, does not present sensitivity of 100%, its level of closeness provides security in the diagnosis of BPPV.

Key words: Vertigo. Vestibular Diseases. Physical Therapy Modalities. Dix-Hallpike test.

Resumo

Objetivo: Analisar a aplicabilidade da manobra de Dix-Hallpike sobre a VPPB como método diagnóstico para os canais semicirculares, bem como sua sensibilidade. **Métodos:** realizou-se revisão bibliográfica utilizando as seguintes bases de dados de sourcing: LILACS, PubMed, SCIELO procurando por artigos publicados em português, inglês e espanhol. Foram utilizados os seguintes descritores da estratégia de busca: vertigem, vestibulopatias e técnicas de fisioterapia respiratória, sendo incluídas publicações entre os anos de 2000 e 2017. **Resultados:** os resultados do trabalho foram apresentados por meio de tabela e fluxograma sinóptico. **Conclusão:** Ainda há controvérsias quanto à sua sensibilidade aos canais anteriores e laterais, mesmo que a manobra, não apresente sensibilidade de 100%, seu grau de proximidade proporciona segurança no diagnóstico da VPPB.

Palavras-chave: Vertigem. Doenças vestibulares. Modalidades de Fisioterapia. Teste de Dix-Hallpike.

INTRODUCTION

Benign Paroxysmal Positional Vertigo (BPPV) is characterized by transient episodes of nausea and dizziness/vertigo due to the cephalic positioning change, with a recurring characteristic, it can affect the practice of professional, social and daily activities¹.

One of the illnesses that affect the peripheral vestibular system, BPPV is often idiopathic, but its occurrence according to age group can be triggered by traumatic brain injury, vestibular neuritis^{2,3}, vertebra basilar insufficiency and otologic surgery¹.

The BPPV is uncommon in childhood and most frequent¹ in adults and elderly^{4,5}. Around 70 years, 30% of the citizens manifested the disease at least once. However, its incidence varies in epidemiological studies⁶.

There are currents that underlie and support substantially two theories of Pathophysiology: cupulolithiasis and ductolithiasis^{6,7}

is triggered from calcium carbonate crystals, also called otoconias, that extricate the utriculus and adhere the dome of the posterior semicircular canal⁷ - upper or side - making the endolymph thick and prone to gravitational action⁸.

However, on ductolithiasis, it is proposed that fragments degenerates wouldn't be adhered the dome but floating in the endolymph of the posterior canal⁷, upper or side⁸. Then, during cephalic movement, dizziness would be caused by the presence of the utricular macula otoconias⁹.

In order to diagnose BPPV the Dix-Hallpike test is used¹⁰, in which the nystagmus research - that reports to rhythmic and repeated oscillation of the eyeball³ - enables the location of the side and the injured canal and the distinction between cupulolithiasis and ductolithiasis, being significantly meaningful for recommendation of maneuvers and exercises suggested for

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each case which will depend on the specific channel injured for treatment^{11, 12}.

Yet the capacity for feedback of the diagnostic maneuver Dix-Hallpike test (i.e. the ability of the test to provide a trustful and reliable answer) has been described in the literature¹³ that although its high prevalence, it has still been misdiagnosed^{14,12}. The diagnosis in advance and treatment to patients with BPPV may succeed in reducing anxiety, panic disorders, as well as reducing the number of hospitalizations and expenses related to laboratory tests¹⁵, the inclusion of the Dix-Hallpike test can provide immediate realization of a fast, simple and low cost method¹⁶.

In this context, the present study aimed to complement articles showing the applicability of the Dix-Hallpike test maneuver on the diagnostic method for BPPV semicircular canals as well as its sensitivity.

METHODS

A literature review was conducted with the following source integrative databases: LILACS, SCIELO and PubMed searching for works published in Portuguese, English and Spanish, and as search strategy the key words used were: dizziness, vestibular disease, physiotherapeutic techniques and Dix-Hallpike test,

using publications since the year 2000.

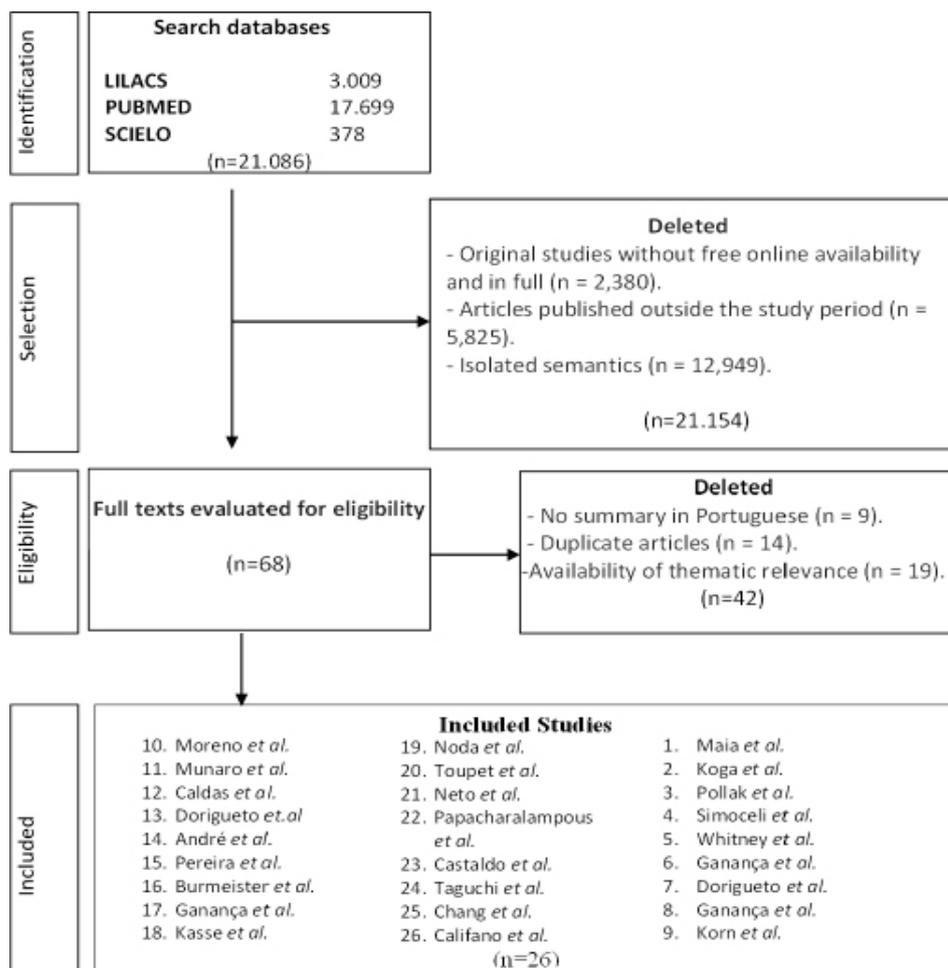
The research of articles was grouped according to each keyword; consequently articles that would contextualize benign paroxysmal positional vertigo were used, as well as its diagnosis to the semicircular canals. There was also a need for the inclusion of monograph, the magazine Science in Motion, Motion magazine and books in order to add a larger number of plausible information.

In order to defend the importance of this study the PEDro scale has been used for each article, being the scale designed to be performed in clinical trials¹⁷. Currently, this scale has a reputation as one of the most important for Physiotherapy allowing an analysis of the relevance of studies and assigning a score from zero to one point; however, the score shall be granted only if the criterion is objectively clear totaling 10 points¹⁸. This paper does not present a conflict of interest.

RESULTS

In the process of construction of this review, a vast collection of articles was found that contemplate the most varied types of study designs, being organized according to the flow chart below.

Figure 1. Flowchart of the article selection process.



In the evaluation through the PEDro scale items of clinical trial that obtained a score equal to or greater than 5 were considered of high methodological rigor. One of the diagnostic maneuvers used in clinical trials to test the Dix-Hallpike Test (DHT) was held for all the semicircular canals although Munaro et al., and Chang, besides the DHT, used a test Roll to the side canal.

Table 1. Descriptive approach of selected articles.

Year	Year	PEDro	Approach
2001	Maia et al.	4	Application of the Epley maneuver in seven patients with BPPV confirmed by DHT.
2004	Koga et al.	4	Verify the prevalence of dizziness and vertigo of patients with vestibular complaints for changing the position of the head.
2005	Pollak et al.	6	The Epley maneuver in the treatment of BPPV in elderly patients compared to the general population and DHT as a diagnostic maneuver.
2005	Simoceli et al.	6	Verify the importance of postural restrictions after the Epley maneuver in patients with posterior canal BPPV and DHT as diagnosis.
2005	Whitney et al.	4	Treatment with vestibular physiotherapy in a patient with agoraphobia and height phobia who underwent a battery of tests including DHT.
2005	Ganança et al.	6	Verify the importance of the cephalic restriction of the Epley maneuver in patients with posterior canal BPPV and DHT as diagnostic method.
2005	Dorigueto et al.	6	Verify how many maneuvers are necessary to cease nystagmus in patients with anterior, lateral or posterior canal BPPV and DHT as diagnostic method.
2007	Ganança et al.	5	Use of the Epley maneuver in patients with BPPV and Meniere's disease and DHT as diagnosis.
2007	Korn et al.	6	Epley maneuver repetition in patients with posterior canal BPPV in the same session and DHT as diagnosis.
2009	Moreno et al.	5	Number of Epley maneuvers in patients with posterior canal BPPV for DHT denudation.
2009	Munaro et al.	5	Assessment of typical and atypical BPPV and use of DHT for anterior and posterior canal and the Roll test for the horizontal canal when DHT does not reproduce the symptoms.
2009	Caldas et al.	5	Evaluation of patients with BPPV and the description and particularities of the disease.
2009	Dorigueto et.al	5	Recurrence assessment of patients with BPPV who were treated with a replacement maneuver after one year and use of DHT as a method of nystagmus evaluation.
2010	André et al.	6	The efficacy of Epley post-maneuver ducts in posterior channel BPPV using DHT as a diagnostic.
2010	Pereira et al.	5	Evaluate the patients' quality of life after the Epley maneuver and the applicability of DHT as a diagnosis.
2010	Burmeister et al.	3	Case report of a patient in the emergency department diagnosed by DHT and treated with the canalicular repositioning maneuver.
2010	Ganança et al.	5	Treatment of BPPV in the elderly with the purpose of verifying the occurrence of falls and DHT as diagnosis.
2010	Kasse et al.	6	To verify the results of posturography in patients with BPPV before and after the Epley maneuver and as a diagnostic test of Brandt-Daroff and DHT.
2011	Noda et al.	5	Diagnosis of BPPV from the clinical history and questions for suspected disease and confirmed DHT.
2012	Toupet et al.	8	To verify the after-restriction effect in patients with posterior canal BPPV undergoing Epley and Semont-Toupet maneuver and DHT as a diagnostic method.
2012	Neto et al.	5	Application of vestibular rehabilitation in patients with BPPV and use of DHT as a diagnostic method.

Year	Year	PEdro	Approach
2012	Papacharalampous et al.	6	The result of movement restrictions after treatment of patients with BPPV and use of DHT as a diagnosis for anterior or posterior canal.
2012	Castaldo et al.	6	Use of the Gufoni maneuver in the treatment of patients with horizontal canal BPPV and as diagnostic method VNG by DHT and Pagnini maneuver.
2013	Taguchi et al.	5	Vestibular evaluation of elderly patients to investigate the importance of nystagmus.
2014	Chang et al.	3	Case report of a patient with horizontal canal BPPV and DHT and Roll test as diagnosis, treated by the Lempert maneuver.
2014	Califano et al.	5	Treatment of two rare forms of patients with anterior and posterior canal BPPV.

Based on reviewed studies, a graph that expresses the estimated percentage of sensitivity across the Dix-Hallpike test maneuver was created. Among the articles that make up this study, only those which described the percentage of technique were delineated.

DISCUSSION

Typical rotational Vertigo episodes in patients with BPPV present short¹⁹ and strong intensity, often caused by quick movements of the head, and among the most common are the act of getting up, lie down and turn in bed, extend and flex the neck which may cause falls²⁰. Yet it turned out that almost half of all patients with BPPV presented acrophobia (fear of heights)²¹.

Establishing a positive diagnosis of BPPV includes the presence of vertigo and nystagmus - fundamental in the characterization for confirmation of the test²², however the characteristic nystagmus may not be detected by the maneuver and this subgroup of patients who may not present the typical nystagmus in the Dix-Hallpike test can be named subjective VPPB that is assigned about a quarter of individuals suspected of the disease²³.

It is called objective vertigo when the patient presents during positioning maneuver the characteristic nystagmus and dizziness, being considered objectively positive and when there is an absence of nystagmus is subjectively positive, professionals should be alert to the atypical form, because more patients may be favored with the correct diagnosis²⁴.

The patient must be informed about the possibility that the maneuver may cause nausea and dizziness and that the feeling will be momentary. The maneuver should start at the side that is not hypothetically affected. And after the discomfort caused by the symptoms of a positive maneuver it would be unpleasant to play them again to test the contralateral side²⁵.

The Dix-Hallpike Maneuver is also named Dix-Hallpike Test, in which the patient being evaluated is positioned between sitting and laying with his head below the horizontal plane with a 45° rotation of head to the side to be tested, with the assistance of the examiner, kept around for 30 seconds, being positive the presence of Vertigo and nystagmus or checking the nystagmus as the direction and duration^{26, 27, 28, 29, 30} with a fixed gaze and

eyeball open⁷.

The Dix-Hallpike test provides the nystagmus positioning characteristics identifying the affected semicircular canal (behind, upper or side) and the ailing labyrinth (right, left or both). In the posterior canal damage it is characterized by rotational positioning vertically upwards clockwise nystagmus in the left labyrinth and counterclockwise lesion in labyrinth injury²⁶. In the upper canal characteristic damage the vertical rotational clockwise down in left labyrinth and counterclockwise in the right labyrinth and in the side canal the positioning nystagmus is characterized by being only horizontal^{31,32}.

The duration of the vertigo is specifically important for the diagnosis of BPPV, on ductolithiasis characterized by nystagmus the time interval up to one minute and in cupulolithiasis the nystagmus has the duration of more than one minute²⁶. Despite reports about the duration of dizziness be supported in a minute, Kazutaka and his collaborators have suggested that typically it would last just 10-20 seconds²³; in agreement, Silva and collaborators in a review of two international guidelines presented a lag time of 1-5 seconds to ductolithiasis and 10-20 seconds to cupulolithiasis³³.

Some authors propose that if in the first Dix-hallpike maneuver the patient does not present the feeling of Vertigo or nystagmus, the test should be redone, because it is only the repetition that proves an increase in approximately 10% to 20% in the number of positive diagnoses for BPPV^{10,24}.

The Dix-Hallpike test may not be beneficial for some patients who have contraindications such as: Atlanto-axial subluxation and occipitoatlantal, because it may succeed to a compression of the brain stem and spinal cord, asking the patient a history in case they have neck and spine problems before the test is necessary, obese people or individuals with decreased mobility³⁴, severe kyphoscoliosis, severe rheumatoid arthritis, ankylosing spondylitis and spinal cord injury³⁵ may need assistance to support them.

The examiner must have caution with some symptoms that can occur during the application of the maneuver such as the dimming of vision and weakness; these symptoms may arise due to compression of the vertebral artery in elderly individuals

in the course of the extension of the cervical spine; if this kind of thing there happens the maneuver, it should be stopped²⁵.

Some factors may influence the test as the time of day, the angle of the occipital plane, the speed of movement during the maneuver. Another condition that can affect the result of the technique is the experience of the examiners, because it confirms that there are differences in effectiveness between the maneuver held between experts and non-experts in the area³³.

The implementation of diagnostic maneuver of Dix-Hallpike should be performed before any stimulation of the labyrinth because the influence of stimuli can modify the real clinical diagnosis³⁶.

In the patient's cephalic movement during the maneuver there is a displacement of the endolymph and consequently of the dome³⁷. As the head is hyperextended on the table, the clot of otoconias moves and displaces the dome, caused by an effect of piston moving the clot in the parking of the semicircular canal, the otoconias and the time are necessary to settle in the most dependent region of the canal, which explains the latency period for the appearance of signs and symptoms after the placement of Dix-Hallpike test, producing an excitatory feedback about the causes of vertigo and nystagmus³⁴.

There are possible explanations for the absence of nystagmus in head movement that would provide the extinction of ocular phenomenon at the time of the Dix-Hallpike test: repeating the position during the same maneuver the nystagmus might have been fatigued in an attempt to keep it, the neural signals could be insufficient to achieve the necessary threshold of ocular via vestibule²⁴ due to minimum particles of calcium carbonate floating or adhered to the affected semicircular canal and the conventional assessment would make the diagnosis in elderly patients, in which is as yet unknown in the nystagmus weak engine²².

The diagnosis through the positioning of Dix-Hallpike test also helps to distinguish the source of peripheral vertigo of the central vertigo, among other forms of vertigo³⁴, the criteria that should be used for central vertigo hypothesis are: presence of positional nystagmus in the absence of dizziness, presence of nystagmus that does not cease with the cephalic maintenance in the same position, the absence of fatigue in the repeated maneuvers and the direction of nystagmus that have to present compatibility with the stimulation of one of the semicircular canals³⁸.

The observation of the induced nystagmus to the diagnosis of BPPV by the Dix-Hallpike test does not always make a concise assessment of the movements of the eyeball for the simple visual analysis, because frequently this ocular episode is weak and has a short time interval. The nystagmus becomes more accurate when performed with the use of Frenzel lenses (lenses with 20 diopters) that prevent the suppression caused by ocular

fixation, thus enabling better interpretation of nystagmus^{20, 22, 36}. Usually, no additional tests are required to diagnose it, but currently, in the Dix-Hallpike test the videonistagmograph (VNG)³⁹ has also been used, in order to help the visualization of the nystagmus as well as the use of Frenzel safety glasses; the patient makes use of a pair of glasses attached to an infrared camera, which films the eye movement and the image is conducted to a computer, the VNG detects the precise movement of the eyeball²⁵.

The diagnosis using the Dix-Hallpike test is considered the main maneuver for posterior canal⁴¹ and also considered the gold standard for this canal³⁶. The superior canal BPPV is considered rare⁴⁰ and nystagmus may not be noticeable if compared to the posterior canal³⁸ and the Dix-Hallpike test is applied as^{33, 41} diagnosis, although Piltcher et al. describe that this maneuver is not very sensitive to the involvement of this canal⁴². While the side canal for induction of nystagmus by the Dix-Hallpike test, is not more sensitive than the Roll test⁴³.

In order to analyze the success of the treatment of BPPV, it is imperative that the Dix-Hallpike test be negative as it means that the absence of nystagmus occurs by designating the resolution for the semicircular canal treated¹³. Ganança et al., in a prospective clinical study proposes the repetition of the maneuver for negativity a week after the treatment¹⁴. On the other hand, Barreto states that although some authors defend the period of a week, the reevaluation can be made after 72 hours⁴⁴ and yet et al. analyzed the negative of the maneuver 1 to 24 hours after the repositioning maneuver treatment⁴⁵.

Despite the Dix-Hallpike test be considered a standard, it does not have a sensitivity of 100% as a result of clinical characteristics of BPPV which may take a silent stage³⁴. According to Burmeister, the test would provide a sensitivity of 88%¹⁵, Huynh estimates 44-88%³⁵ and Helminski presumes 79%¹³. Therefore, there is the necessity of research through the Dix-Hallpike test to close the diagnosis of peripheral vestibular system amendment⁴⁶.

CONCLUSION

It is possible to realize that the applicability of the Dix-Hallpike maneuver provides a positive response to stimulation of the anterior, posterior and lateral semicircular canals. Even with positive responses, there is still controversy about the sensitivity to the anterior and lateral channels, even though the maneuver does not have 100% sensitivity, it has a level of closeness that provides security for the diagnosis of BPPV.

Giving the patient a diagnosis that allows him/her to check the affected canal to an appropriate treatment, it is mandatory that the professionals search for qualification and know the maneuver, increasing the quality of life by present quickness and easiness on its efficiency.

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