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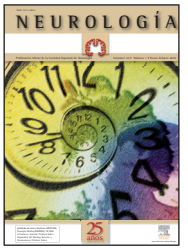

ORIGINAL ARTICLE

Meta-analysis on the efficacy of Epley's manoeuvre in benign paroxysmal positional vertigo

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KEYWORDS
Meta-analysis;
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Benign paroxysmal positional vertigo;
BPPV;
Particle repositioning manoeuvre;
Epley manoeuvre

Abstract
Introduction: Benign paroxysmal positional vertigo (BPPV) is one of the most common conditions that cause the physiognomy of peripheral vertigo.
Objective: To evaluate the effectiveness of Epley manoeuvre (EM) in the treatment of BPPV using a critical review of the medical literature and a meta-analysis.
Methods: Searches were made in the databases of MEDLINE (PubMed), in the Cochrane collection (Cochrane Register of controlled studies), BIREME and LILACS (all of them up to December 2008). The search words used were: canalith repositioning procedure, canalith repositioning manoeuvre, Epley manoeuvre, Dix-Hallpike, benign vertigo, benign positional vertigo, benign paroxysmal positional vertigo and BPPV. The meta-analysis was performed using the program RevMan 5.0.
Results: The patients on whom an EM was performed had a six and half times more chance of their clinical symptoms improving compared to the control group of patients (OR=6.52; 95% CI, 4.17-10.20). Similarly, the likelihood of having a negative Dix-Hallpike (DH) test are 5 times greater in patients had the EM performed than in those who did not (OR=5.19; 95% CI, 2.41-11,17).
Conclusions: The EM is effective in controlling BPPV.

PALABRAS CLAVE
Metaanálisis;
Vértigo posicional;
Vértigo posicional paroxístico benigno;

Estudio metaanalítico de la eficacia de la maniobra de Epley en el vértigo posicional paroxístico benigno

Resumen
Introducción: El vértigo posicional paroxístico benigno (VPPB) es una de las enfermedades que más habitualmente producen vértigo de fisionomía periférica.

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VPPB;
Maniobras de reposición de partículas;
Maniobra de Epley

Objetivo: Evaluar la efectividad de la maniobra de Epley (ME) en el tratamiento del VPPB mediante una revisión crítica de la literatura médica y el empleo del metaanálisis.
Métodos: Se realizaron búsquedas en la base de datos MEDLINE (PubMed), en la colección Cochrane (Cochrane Register of controlled studies), BIREME y LILACS (todas ellas hasta diciembre de 2008). Las entradas empleadas incluyeron: *canalith repositioning procedure, canalith repositioning maneuver, Epley maneuver, Dix-Hallpike, benign vertigo, benign positional vertigo, benign paroxysmal positional vertigo* y BPPV. El metaanálisis se realizó con el programa RevMan 5.0.
Resultados: Los pacientes a quienes se realiza la ME tienen 6 veces y media más posibilidades de mejorar su cuadro clínico sintomático en comparación con los grupos de control (*odds ratio* [OR]=6,52; intervalo de confianza [IC] del 95%, 4,17-10,20). Igualmente, los pacientes a quienes se efectuó la ME tienen 5 veces más oportunidades de tener un resultado negativo en el test de Dix-Hallpike que aquellos sin ME (OR=5,19; IC del 95%, 2,41-11,17).
Conclusiones: La ME es efectiva en el control del VPPB.

Introduction

Benign paroxysmal positional vertigo (BPPV) is a relatively frequent entity in otolaryngology, and its impact increases as age progresses.[1] Its rate of occurrence ranges between 10.7 and 64 cases / 100,000 population per year, and increases by approximately 38% per decade of life.[2] Its clinical manifestation is very characteristic, consisting of episodes of vertigo lasting seconds, which occur shortly after adopting a specific head position.[3]

There are two classical theories about the pathophysiology of this disease. The first was cupulolithiasis (Schuknecht, 1969), according to which fragments of otoliths, typically found in the utricle and saccule, moved into the posterior semicircular duct (PSD).[4] Later, in the early nineties, it was postulated that at other times the otoliths could become "trapped" within the PSD and would be the source of symptoms (canalithiasis).[5] Once the main pathophysiological bases of BPPV were established, various repositioning methods of the otolithic particles emerged, such as those of Semont et al[6] and Epley.[7]

Meta-analysis is a statistical method used to analyse data from a series of specific studies on a subject to integrate their results.[8] It is considered the ideal tool for interpreting the findings of several small-sample studies and obtaining a more accurate, valid estimate of the effect of a given treatment.[3]

The aim of this study was to evaluate the effectiveness of the Epley manoeuvre (EM) in the treatment of BPPV through a critical review of the medical literature and the use of meta-analysis.

Material and methods

Two of the authors of this study (MPPE and JIDS) conducted two separate searches in the MEDLINE database (PubMed), which were completed with another conducted in the Cochrane Library (Cochrane Register of controlled studies), BIREME and LILACS (all of them until December 2008). The inputs used included: *canalith repositioning procedure, canalith repositioning maneuver, Epley maneuver, Dix-Hallpike, benign vertigo, benign positional vertigo, benign paroxysmal positional vertigo* and *BPPV*. For each of the searches, the following limits were set: "*meta-analysis*", "*clinical trial*", "*randomized controlled trial*". No language restrictions were set.

Inclusion criteria were a clinical case of typical BPPV with a positive Dix-Hallpike (DH) test at the beginning of the study, study subject age over 18 years, the use of randomized controls, the use of the manoeuvre described by Epley to attempt to eliminate the condition[7] and at least one control after the implementation of the EM within a maximum period of one month. The works in which other physical therapies were used were excluded. The selection of this time period was intended to minimise a confounding factor: that the condition can tend to improve and/or spontaneously resolve over several months. To measure the effectiveness of treatment, the resolution of symptoms or the negativity of the DH test were considered.

Due to variations in the methodology used by different authors, the data from each article were separated and analysed in several categories as shown in table 1. When the studies collected several follow-up periods (within the same month), we used the shortest of them because it enabled a better estimation of the temporal association between treatment and results.[3]

The meta-analysis was performed using the RevMan 5.0 program.[9] It was used to investigate the following null hypotheses: *a*) there are no differences in the resolution of vertigo between patients treated with EM and controls, and *b*) there are no differences in the negativity percentage of the DH test between those treated with EM and the control group. The effect of treatment was estimated by calculating the odds ratio (OR), with the respective 95% confidence intervals (CI). To study the heterogeneity of the selected works, our null hypothesis was that these articles were homogeneous. It was not possible to reject the null hypotheses if p was > 0.05 for each of them.

Table 1 Characteristics of the studies included in this meta-analysis

Study	Year	Measurement of results	Epley — success/total	Controls — success/total
Von Brevern et al[16]	2006	DH	33/35	22/31
Yimtae et al[14]	2003	Symptoms	12/29	1/27
Sridhar et al[15]	2003	Symptoms	19/20	3/20
Sridhar et al[15]	2003	DH	19/20	3/20
Sherman et al[11]	2001	Symptoms	27/33	17/38
Sherman et al[11]	2001	DH	19/20	17/38
Asawavichianginda et al[12]	2000	Symptoms	31/35	22/39
Asawavichianginda et al[12]	2000	DH	24/35	20/39
Froelhing et al[10]	2000	Symptoms	12/24	5/26
Froelhing et al[10]	2000	DH	16/24	10/26
Wolf et al[17]	1999	DH	23/31	5/10
Li[13]	1995	Symptoms	31/37	9/23
Li[13]	1995	DH	19/37	0/10

DH: Dix-Hallpike.

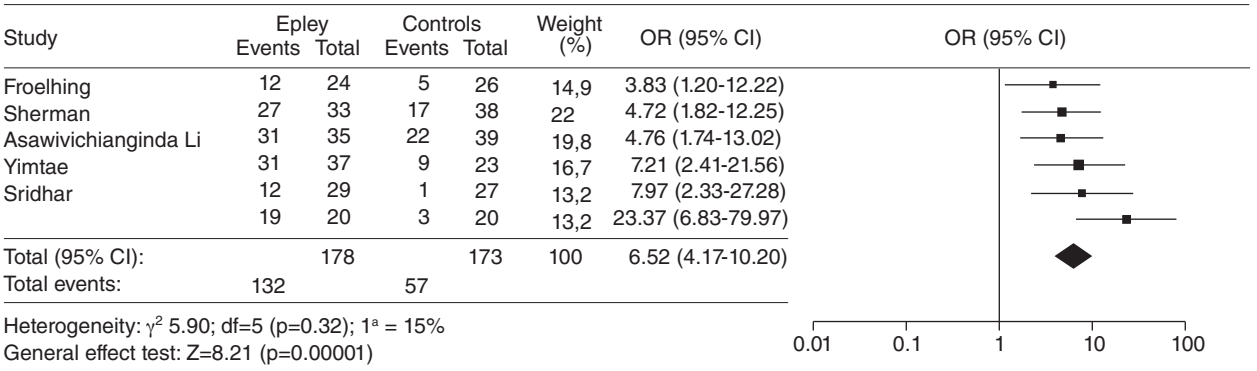

Figure 1 Meta-analysis of clinical efficacy of the Epley manoeuvre.

Results

We found 6 studies that evaluated the EM according to clinical resolution of symptoms, with a total of 351 individuals participating in them.[10-15] In the group that carried out the EM, the success rate was 74.15% (132/178), compared with 32.94% for the controls (57/173) (p<0.00001) (fig. 1). Thus, those patients who underwent the EM were about 6.5 times more likely to improve their clinical symptoms than patients in the control groups (OR=6.52; 95% CI, 4.17-10.20) (fig. 1). There does not appear to be heterogeneity in the selected articles (that is, variance in the observed effect of a treatment) because both the OR and its CI values are between 1 and 100. This is confirmed by the calculated probability of being heterogeneous, which is not statistically significant (p=0.32) (fig. 1); they are thus homogeneous studies. Similarly, on the funnel plot graph generated by RevMan 5.0[9] to that end, no publication bias can be observed in the series of publications reviewed.

Likewise, DH test negativity was more common in people treated by EM than in controls (7 studies with 389 participants).[10-17] We found a resolution rate for the condition (measured with the DH test) of 74.88% (161/215) in individuals

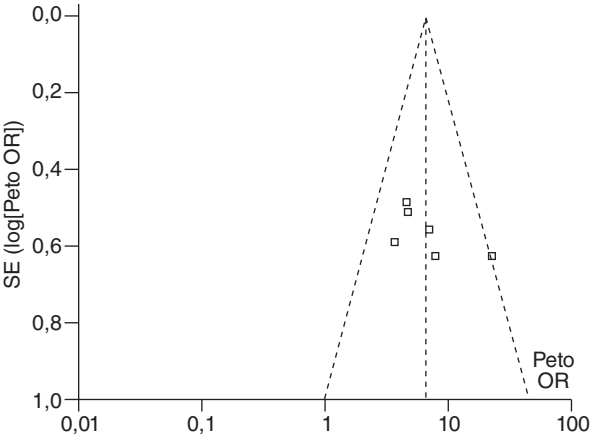

Figure 2 Clinical efficacy of the Epley manoeuvre. There seems to be no publication bias because studies are contained within the "funnel" defined by the dotted line and on both sides of the vertical line.

Study	Epley Events	Epley Total	Controls Events	Controls Total	Weight (%)	OR (95% CI)
Asawivichianginda	24	35	21	39	21.3	2.07 (0.80-5.36)
Froelhing	16	24	10	26	18.3	3.20 (1-10.20)
Li	19	37	0	10	5.7	22.14 (1.21-405.31)
Sherman	27	33	17	38	19.2	5.56 (1.87-16.56)
Sridhar	19	20	3	20	7.9	107.67 (10.21-1,135.59)
von Brevern	33	35	22	31	13	6.75 (1.33-34.26)
Wolf	23	31	5	10	14.5	2.88 (0.66-12.60)
Total (95% CI):		215		174	100	5,19 (2.41-11.17)
Total events:	161		77			

Heterogeneity: Tau^2=0.48; γ^2 11.70; df=6 (p=0.07); 1^a = 49%
General effect test: Z=4.22 (p=0.0001)

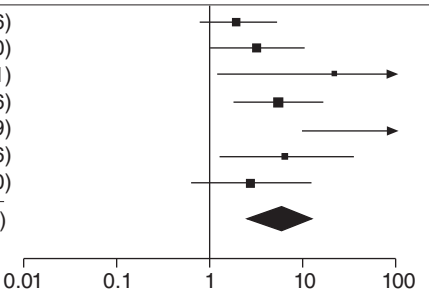

Figure 3 Meta-analytic study of Dix-Hallpike test negativity after the use of the Epley manoeuvre.

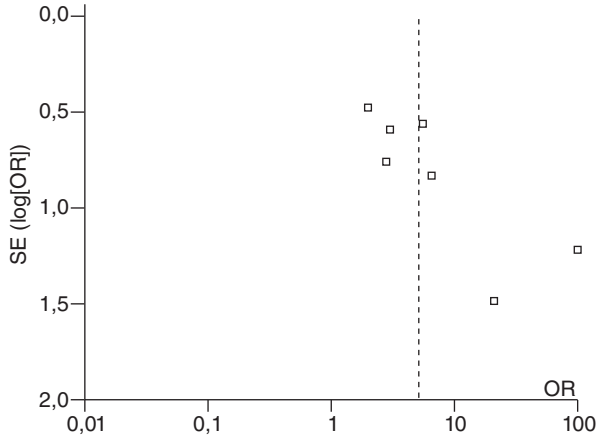

Figure 4 Greater bias can be observed in studies evaluating the efficacy of the Epley manoeuvre through the Dix-Hallpike test; the statistical program thus fails to generate the "funnel" plot.

who underwent EM, as opposed to 44.25% (77/174) for the controls (p<0.0001) (fig. 2). In this case, the chances of DH test negativity are slightly over 5 times higher in patients receiving EM (OR=5.19; 95% CI, 2.41-11.17). Heterogeneity was slightly higher, but still without reaching statistical significance (p=0.07) (fig. 3). This effect was due to the studies of Li1[3] and Sridhar et al,[15] whose CI upper limits were 405.31 and 1,135.59, respectively (that is, 4 times and slightly over 11 times the maximum limit of 100). This can be observed better in the funnel plot shown in figure 4.

Similarly, those articles in which the EM was tested depending on the outcome of the DH test were also homogeneous (p=0.07) (fig. 2). However, they were homogeneous to a lesser extent, mainly due to the study by Sridhar et al.[15]

Discussion

In 1952, Dix and Hallpike at the National Hospital Queen Square in London observed patients in whom a finite nystagmus (usually rotatory) was induced after adopting a critical head position and after a period of latency.[18] From this first description of the condition until the early nineties, patients generally received no treatment or else performed habituation exercises (for example, Brandt-Daroff).[4] In the seventies and eighties, some surgical modalities (such as singular nerve neurectomy or the occlusion of posterior semicircular canal) arose, all aimed at trying to resolve those cases that evolved towards chronicity.[4]

All this range of therapeutic resources fell mostly into disuse after the description of particle repositioning manoeuvres, such as those of Epley or Semont.[6,7] In the case of the EM (the most widely used by Anglo-Saxon doctors), the rates of condition resolution reported range between 60% (in studies in which the DH test was used as measurement) and 80% (in series in which evaluation was only clinical).[4,19] In addition to its effectiveness, the widespread use of the EM in those latitudes represents a time saving compared with other techniques such as that of Semont, because in the EM it is not necessary to wait after the diagnosis to obtain a positive DH test. In general, both the EM and any of the other manoeuvres described for the particle repositioning (for example, the Semont manoeuvre) have in common their non-invasiveness, their ease of performance in consultation without the need for special equipment, their potential to resolve the vertigo with relative speed and the possibility of being repeated as many times as necessary.[4]

Meta-analysis is a very valuable tool for integrating the results of various studies on the effectiveness of a particular treatment.[3,19] However, it has a number of limitations that we attempted to minimise in this study. It was not possible to avoid (as in no case in the reviewed literature on the subject) the fact that we could not include data from unpublished studies, especially knowing that many of them collected series whose results were the absence of beneficial effects.[8] The reason is that these series have difficulties in being published, either because the reviewers of the journals are unwilling to accept them, or because this constraint appears directly in the publication conditions of the journal.[8] In addition, we did not consider that potential conflicts of interest and/or economic conflicts about the therapies (for example, with chemotherapy) presented a bias in the case of BPPV and the EM, This was because, apart from the cervical collar employed after the manoeuvre

(of scant economic cost and paid for by the health system in our environment), they are not burdensome procedures. On another note, the present study was not affected by other biases related to meta-analysis, such as restrictions based on languages or databases employed.[8]

We found two previous meta-analysis on the effectiveness of the EM in the treatment of BPPV.[3,19] Although the general conclusions coincide with ours (that the EM is effective in treating BPPV), we have tried to improve some of their methodological aspects. In the study by Teixeira et al,[19] the authors placed a language limitation on the search, selecting only articles in English, Portuguese and Spanish. As for the study by Woodworth et al,[3] their search for articles was carried out exclusively in the MEDLINE database, which, although one of the most widely used in medical literature, is not the only one or exclusive. There are some other useful ones, particularly in the case of meta-analysis (for example, Cochrane).

All studies selected and included in the present meta-analysis were Phase I clinical trials. They utilised only the EM (that is, there was no use of mastoid vibration or medications) and post-manoeuvre movement was restricted through the use of a cervical collar. However, it is curious to note that a few of them described the side effects of the procedure. Two examples are the study by Froehling et al,[10] which collected vomiting during the EM and intolerance to it by neck problems, and also the study by Yimtae et al,[14] with fainting, sweating, pale skin and hypotension.

Conclusions

There is solid scientific evidence showing that the EM is effective for the treatment of BPPV. Patients who undergo the EM are 6.5 times more likely to solve their acute clinical symptoms compared with controls and 5 times more if we evaluate DH test negativity.

Conflict of interests

The authors declare no conflict of interests.

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