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Benign paroxysmal positional vertigo: A review of the particle repositioning manoeuvres

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ABSTRACT

Benign paroxysmal positional vertigo is the most common cause of peripheral vertigo. Different treatments are used to alleviate the symptoms of vertigo and nystagmus. These are based on an attempt to reposition the particles in the semi-circular canals that is believed to be the cause of this pathology. In this review we compare the different manoeuvres used depending on the type of BPPV in an attempt to identify which therapy is more effective in symptomatic resolution. Epley and Semont manoeuvres have been found to be effective in symptom resolution of posterior BPPV with high repositioning success rates.

Attempted comparisons between the 2 manoeuvres showed a tendency towards superiority of Epley manoeuvre but this is not supported by large RCTs. Similarly, the barbeque roll and Gufoni manoeuvres found to have increase effectiveness in treated horizontal BPPV but there is not enough evidence to suggest that the one manoeuvre is superior to the other. The 'reverse Epley' or 'reverse Semont' manoeuvre are proposed for treatment of superior BPPV but there is lack of good evidence to verify their effectiveness.

Introduction:

Benign paroxysmal positional vertigo (BPPV) is a condition of the peripheral vestibular system. The patient experiences a sensation of rotatory movement associated with nystagmus when the head is taking a specific position.[1] It is attributed to the presence and movement of otoconia from the utricle of the inner ear inside the semi-circular canals (SCC), when the head is turned on the affected side. Commonly the posterior SCC (90%) is affected followed by the lateral SCC and very rarely the superior SCC. Episodes might last from second to minutes. [2]

BPPV is the most common cause of peripheral vertigo. It can occur following head trauma; inner ear infection; ear surgery or an inner ear disorder. The basis of treatment of posterior BPPV is the reposition of the canalith particles in the utricle. This is accomplished by a variety of different particle repositioning manoeuvres and exercises: Epley manoeuvre; Semont manoeuvre and Brandt and Daroff exercises. These techniques are used slightly altered to treat the lateral and superior BPPV. Surgery has also been proposed for treatment of intractable BPPV. [3] Roberts et al. introduced the Gans manoeuvre for canalith repositioning in posterior BPPV to accommodate problems with neck hyperextension for patient who couldn't tolerate it. [4]

The purpose of this review is to assess and critically analyse the effectiveness of the different canalith repositioning manoeuvres in the treatment of BPPV using the available evidence based resources. As we are interested in evaluating the effectiveness of different treatment options in the management of a disease, in our case benign paroxysmal positional vertigo, systematic reviews of Randomised Control Trials (RCTs) and individual RCTs are considered the best evidence based resources.

This is because they are rigorously designed to be bias free with small likelihood of systematic errors thus providing more reliable results. [5] Well-designed prospective cohort studies will be also discussed when RCTs are not available, as they can provide us with recall bias free results without the inaccuracies of retrospective data collection studies. [6]

Treatment of posterior SCC benign paroxysmal positional vertigo:

Epley's manoeuvre for canalith repositioning was introduced in 1992. It is a series of head and body movements that aim to disperse the otoconia from the posterior semi-circular canal back to the utricle, thus stopping the symptoms of rotatory vertigo and nystagmus on particular head movements [7]. Since its first description in literature, Epley's manoeuvre became a popular therapy for treatment of posterior BPPV. [8]

A different approach in the canalith repositioning for posterior BPPV is the Semond manoeuvre. [9] Both Epley and Semont manoeuvres involve hyperextension of neck which is contraindicated in patients with progressive rheumatoid arthritis, cervical spine trauma or other pathologies affecting the cervical vertebrae. In 2006, the Gant manoeuvre was introduced to overcome this problem and it is used since in patients who cannot tolerate the Epley or Semont manoeuvre. [4]

There is a plethora of RCTs and prospective cohort studies that compare the effectiveness of the above mentioned canalith repositioning manoeuvres in treating the symptoms of posterior BPPV.

Even though the results are based on small sample sizes and the outcome characteristics are not directly comparable in all RCTs, it is evident that particles repositioning manoeuvres are effective in controlling vertigo in patients with posterior BPPV. 10-14 Gold et al. summarised the evidence in canal repositioning manoeuvre for BPPV, concluding that Epley and modified Epley manoeuvres as well as Semont and modified Semont manoeuvres are equally effective in treating symptoms of posterior BPPV comparing to placebo treatment with medication or sham manoeuvres. [5] Recruitment of a larger number of patients would have increased the validity of these studies by allowing a more precise evaluation of the treatment effects. Large sample sizes which are more representative of the general population are of paramount importance in obtaining reliable results, especially when we are dealing with an outcome with variable characteristics. [6]

A recent Cochrane systematic review and meta-analysis showed that Epley's manoeuvre has a higher chance of achieving resolution of vertigo in posterior BPPV comparing to placebo manoeuvre with a highly statistical significant effect ($p<0.000001$). Patients who underwent an Epley manoeuvre were 9.6 times more likely to have a conversion of the Dix-Hallpike test to negative from positive comparing to patient who had a placebo manoeuvre ($p=<0.00001$). The authors also concluded that there was no statistically significant difference between the Epley and the Semont manoeuvres in the likelihood of achieving resolution of nystagmus ($p=0.58$) based on 2 randomised control trials and a total of 117 participants.

They also concluded that there was no difference in symptoms' resolution between the Epley and Gant manoeuvre ($p=0.56$) but this was based only on one randomised control trial with a small number of participants. This, as we discussed earlier on, reduces the validity of the outcomes providing less accurate estimates of the differences between the arms of the study. The Epley manoeuvre was also found to be superior in managing symptoms and nystagmus on Dix-Hallpike test comparing to Brandt-Daroff exercises ($p=<0.00001$). No comparisons were attempted between the Epley manoeuvre and medical treatments or surgical solutions. The results of the review were based on short-term patient follow up. [16]

The authors of a review published later in 2014, also stated that there was no difference between the Epley and Semont manoeuvre but they mentioned that Semont technique was easier to perform and easier to remember compared to Epley. It was also noted that if one manoeuvre fails to achieve symptomatic relief, the other manoeuvre can be also performed. [8] Bruintjes et al. randomised control trial, also revealed a higher rate of symptomatic resolution with Epleys manoeuvre when compared with a dummy manoeuvre which was statistically significant. This study had a long follow up period up to 51 months, with a mean of 12 months, giving an insight to the long terms results of Epley manoeuvre in posterior BPPV treatment. [17]

The superiority of Epley manoeuvre comparing to a control group was confirmed by a later dated rapid systematic review. [18]

Another systematic review yielded a high rate of vertigo and nystagmus resolution after multiple sessions of Epley manoeuvre for patients with ongoing symptoms following first treatment with Epley. [19]

On the other hand, subsequent to the Cochrane's review search date, a multicentre RCT published in late 2014 showed that Epley manoeuvre had a statistically significant higher resolution rate of nystagmus comparing to Semont and Sham (dummy) manoeuvres which remained the same for a day after and a week after treatment. Semont manoeuvre was also better than Sham manoeuvre in symptoms' resolution but the difference was not statistically significant. [20] Even though this was a multicentre study the sample size was very small in all arms of the interventions, which could be a limitation as it was previously discussed. In addition to the above, 5 out of the 14 participating institutions had no prior experience in performing the Semont manoeuvre. This adds a potential performance bias in the results of this RCT thus reducing the validity of its results. Another RCT published at the end of 2014, showed that symptomatic resolution after Epley manoeuvre was not different from a medication only treatment. [21] The results of this study though are questionable as Epley manoeuvre was performed by emergency department doctors who were non-specialist in performing canalith repositioning manoeuvres, thus possible performance bias is also evident. It would be better, these manoeuvres to be performed by specialist doctors adequately trained in performing them correctly. Ear nose and throat (ENT) specialists get trained in BPPV recognition and management as part of their educational programme.

It has been reported that they are more likely to correctly diagnose BPPV and appropriately manage it by effectively performing canalith repositioning manoeuvres. [22]

Finally, a meta-analysis attempted to compare the modified Epley and modified Semont manoeuvre. Even though short-term results were in favour of the modified Epley manoeuvre, long-term outcomes revealed no difference between the two techniques. [23]

Treatment of lateral and superior SCC benign paroxysmal positional vertigo:

The lateral semi-circular canal BPPV accounts for 5-15% of patients presenting benign paroxysmal positional vertigo symptoms. [3] The canalith repositioning manoeuvre for this type of BPPV involves log rolling the patient (BBQ role manoeuvre) or the Gufoni manoeuvre which is performed from a seated position. [15] Barbeque roll and Gufoni manoeuvres have been found more effective than dummy manoeuvres for treating lateral canal geotropic and apogeotropic BPPV. [24-26] A recent systematic review by van den Broek et al. verified the effectiveness of Gufoni's manoeuvre in treatment of lateral canal BPPV. [27] No RCTs were found to directly compare the effects of the two manoeuvres thus the relative effectiveness of Gufoni manoeuvre compared to BBQ role manoeuvre was not established. Chu et al., on the other hand, questioned the need for the above particle repositioning manoeuvre in the treatment of lateral canal BPPV. They demonstrated that forced prolonged positioning (FPP) manoeuvre was adequate to treat patients' symptoms with geotropic nystagmus with no need of the BBQ roll manoeuvre.

Gufoni manoeuvre for treatment of persistent apogeotropic nystagmus was required only in the cases of 3 patients. In their cohort, an excellent symptomatic control rate was achieved with the FPP manoeuvre. [28]

BPPV due to presence of otoconia in the superior semi-circular canal is a very rare entity due to its anatomical position. [3] There are a few case-control and retrospective cohort studies describing different treatment options for controlling the symptoms of this type of BPPV but they are all low level of evidence studies. These studies run the increased risk of selection of control and case bias without controlling for possible confounding factors. 5-6 A 'reverse Epley' or 'reverse Semont' manoeuvre have been proposed as well as a ' deep head hanging manoeuvre showing good rate of symptoms' resolution. [15] There are neither RCTs nor systematic review in the literature to support the effectiveness of these manoeuvres in resolution of superior canal BPPV. A recent prospective cohort study revealed 94% treatment success immediately after a 'reverse Epley' manoeuvre was performed which was increased to 97% one week after treatment. [29]

Conclusion:

BPPV vertigo is the commonest cause of vertigo. It is attributed to presence of otoconia most likely in the posterior semi-circular canal followed by the horizontal canal and in rare occasions in the superior semi-circular canal. Current modality of treatment is the performance of particle repositioning manoeuvres to re-insert the otoliths in the utricle. Epley and Semont manoeuvres have been found to be effective in symptom resolution with high repositioning success rates. Attempted comparisons between the 2 manoeuvres showed a tendency towards superiority of Epley manoeuvre but this is not supported by large RCTs.

Treatment of horizontal canal BPPV is achieved with the barbeque roll or the Gufoni manoeuvre. Few RCTs and a systematic review showed increased effectiveness of these methods as opposed to dummy manoeuvres. The population and primary outcomes of these studies were not directly comparable so there is no evidence assessing the effectiveness of one manoeuvre over the other. Finally, many different manoeuvres have been proposed to treat the very rare superior canal BPPV. Due to the rarity of these disorders only few prospective cohort studies exist in literature that support the performance of the 'reverse Epley' or 'reverse Semont' manoeuvre in patients' symptomatic relief. Other manoeuvres have been proposed but they have not been externally validated since initially introduced.

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