Evaluation of vestibular exercises in the management of benign paroxysmal positional vertigo

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Abstract

Aim (1) To evaluate the role of vestibular exercises in the management of benign paroxysmal positional vertigo (BPPV). (2) To compare the three vestibular exercises (Semont's manoeuvre, Epley's manoeuvre or Brandt-Daroff exercises) in the treatment of BPPV.

Settings and Design Prospective randomised study

Methods and Material Forty-eight patients diagnosed as BPPV in the study period November 2005–2006 were included in the study. They were randomly assigned to one of three groups, and the corresponding manoeuvre was done on them. Follow-up were at 2 weeks and 3 months.

Results Thirty-five of the 48 patients (72.91%) reported relief of symptoms at 2 weeks and no recurrence of symptoms at 3 months. Result was best for the group which was subjected to the Epley manoeuvre (87.5%).

Conclusions Performance of any of the three manoeuvres can be expected to give good results in the management of BPPV. The Epley manoeuvre appears to be better than the other two in terms of relief of symptoms and prevention of recurrence.

Keywords BPPV · Vertigo · Particle repositioning manoeuvre · Semont's manoeuvre · Brandt-Daroff exercises

Introduction

Of all the inner ear disorders that can cause dizziness or vertigo, benign paroxysmal positional vertigo (BPPV) is by far the most common. It is a condition that is usually easily diagnosed, and more importantly, most cases are readily treatable with a simple office-based procedure.

A number of treatment modalities are available to physicians in the management of BPPV, which have their own advantages and disadvantages. These include habituation exercises and office-based or domiciliary manoeuvres. Vestibular sedative drugs are of questionable benefit.

In this study of 48 patients of BPPV, conducted in Medical College Kolkata over a period of 1 year, we attempt to evaluate the role of the various manoeuvres in the management of BPPV, and also compare the three most widely used manoeuvres, namely Semont's manoeuvre, Epley's manoeuvre and Brandt-Daroff exercises.

Relevant pathophysiology

The function of the three semicircular canals of the inner ear is to detect angular acceleration. Each canal is filled with endolymph and has a swelling at the base, the ampulla. The ampulla contains the cupula, which in turn is attached to polarised hair cells. Movement of the cupula by endolymph can cause either a stimulatory or an inhibitory response, depending on the direction of motion and the particular semicircular canal (SCC).

Canalolithiasis (Hall, Ruby and McClure 1979) describes free-floating particles within a SCC. Cupulolithiasis (Schuknecht 1969) describes particles attached to the cupula. BPPV can be caused either by canalolithiasis or by cupulolithiasis, and can affect any of the three SCCs, although superior canal involvement is exceedingly rare.

The vast majority of all BPPV cases are of the posterior canal variant. The pathophysiology underlying posterior

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canal BPPV is thought to be canalolithiasis. The mechanism by which canalolithiasis causes nystagmus in the posterior SCC was described by Epley. Particles must accumulate to a critical mass in the dependent portion of the posterior SCC. The canalith mass moves to a more dependent position when the orientation of the SCC is modified in the gravitational plane. The drag thus created must overcome the resistance of the endolymph and the elasticity of the cupular barrier to deflect the cupula. In the head hanging position, the canalith mass would move away from the cupula to induce ampullofugal cupular deflection, which would produce an excitatory response. This would cause an abrupt onset of vertigo and the typical torsional nystagmus in the plane of the posterior canal. The nystagmus profiles correlate well with the known neuromuscular pathways that arise from stimulation of the posterior canal ampullary nerves.

Patients of BPPV describe sudden, severe attacks of horizontal and/or vertical vertigo precipitated by certain head positions or movements. The attacks typically last <30 sec. In addition, many patients complain of light-headedness, nausea and imbalance. The history, added with the typical eye-findings during the Dix-Hallpike manoeuvre, is sufficient for the diagnosis of BPPV.

A number of manoeuvres are advocated in the treatment of BPPV. The Epley's manoeuvre (Figs. Epley 1–6) is probably the best known. The patient is made to sit on the table and brought down with the head turned by 45° to the affected side. The head is then turned 90° to the opposite side. This is followed by rotating the head and body through 90° facing downwards, and the patient is brought to the sitting position with the head turned 45° to the unaffected side. It finishes with the patient in the sitting position and the head turned forward 20°.

Semont's manoeuvre (Figs. Semont 1–3) consists of lying the patient on the affected side with the face turned upwards by 45°, quickly swinging the patient through the

Epley 2

Epley 3

Epley 1

Epley 4

Epley 5 **Semont 2** **Epley 6** **Semont 3****Fig. 1** Epley's manoeuvre**Fig. 2** Semont's manoeuvre **Semont 1**

sitting position to the opposite side, face turned downwards by 45°. The patient is then brought slowly up to the sitting position.

The Brandt-Daroff exercises (Figs. brandt 1–3) start from the sitting position, and then the patient is made to lie on the affected side, nose 45° up, and remains in this position for at least 45 sec. The patient then sits up for 30 sec and then repeats the manoeuvre in the opposite side.

Subjects and methods

This prospective study was conducted on 48 patients who were diagnosed with posterior canal BPPV through history and clinical examination (Dix-Hallpike manoeuvre induced vertical-torsional nystagmus upwards and towards the affected ear, Romberg and tandem walking were

Brandt-Daroff-1

Brandt-Daroff-2

Brandt-Daroff-3

Fig. 3 Brandt-Daroff exercises

negative). They were patients attending the OPD of the ENT Department, Medical College Kolkata, in the period November 2005–2006 (1 year). During this period, 3 patients were diagnosed with lateral canal SCC. They were excluded from the study. All of the studied patients had no history of external or middle ear problems, ototoxic drug use or previous neurological disorders. None of the patients had bilateral disease.

The patients were randomly assigned to three groups of 16 patients each.

In group 1, patients underwent the Semont's manoeuvre once, followed by post-treatment instruction (sleep in sitting position for 2 nights, then on the normal side for next five nights).

Patients in group 2 underwent the Epley's manoeuvre once, followed by post-treatment instruction.

In group 3, patients underwent the Brandt-Daroff exercises 3 times a day for 2 weeks.

Follow-up visits were arranged at 2 weeks, 1 month and 3 months.

End-point was selected as relief of symptoms at 2 weeks with no recurrence of symptoms at 3 months.

Results

The mean age of the patients was 41 years with a range of 23–52 years. There were 20 males (41.6%) and 28 females (58.33%) in the study group (total 48).

Of the 48 patients, 35 patients (72.91%) reported resolution of symptoms with no recurrence of symptoms at 3 months follow-up. Five patients reported relief of symptoms at 2 weeks, but there symptoms recurred at 3 months. Eight patients reported no relief from symptoms at 2 weeks (Table 1).

Twelve patients (75%) in group 1 and 14 patients (87.5%) in group 2 and 9 patients (56.25%) in group 3 reported resolution of symptoms at 2 weeks with no recurrence of symptoms at 3 months.

The results are shown graphically in Table 2.

Table 1 Results at 3 months

Table 2 Group-wise break-up of results at 3 months

Discussion

BPPV is a disorder which is characterized by brief attacks of vertigo, with associated nystagmus, precipitated by changes in head position. The condition affects all age groups, though it appears to be more common in the elderly. It has a lifetime prevalence of 2.4% [1]. The majority of the patients have posterior canal BPPV, while lateral canal BPPV is rare. In one study involving 204 patients [2], 163 had posterior SCC BPPV, while only 19 had the lateral SCC variant and 6 patients had the anterior canal variant (Korres et al, 2007).

Patients of BPPV usually present with a typical history of short-lasting episodes of vertigo, which is characteristically precipitated by sudden changes in head position, like rolling over in bed, lying down or getting up from bed, suddenly looking up, etc. each episode of vertigo typically lasts about 10–20 sec. It may be accompanied by nausea and/or vomiting. Some patients have an associated migraine [3].

The characteristic clinical sign of BPPV is nystagmus following certain manoeuvres, most notably, the Dix-Hallpike manoeuvre. Lesser known diagnostic manoeuvres are, among others, those of Pagnini-McClure and Rose [4]. In a patient of posterior canal BPPV, the Dix-Hallpike manoeuvre will result in the appearance of a vertical or torsional nystagmus after a latent period of a few seconds. The nystagmus will be directed towards the affected ear, and will last for about 30 sec. It is generally associated with intense vertigo and/or nausea.

The diagnosis of BPPV is made in the light of the history and the clinical findings, most notably a positive result in the Dix-Hallpike manoeuvre. Electrophysiological and imaging tests have no role in the diagnosis of BPPV [1, 5–8].

The theories of canalolithiasis and cupulolithiasis logically lead to the conclusion that BPPV may effectively be treated by manoeuvres which result in the relocation of otoconia from the SCC to the vestibule. Drugs have little or no role in the management of BPPV, and may even be detrimental [9]. There are numerous studies in the literature that demonstrate the efficacy of simple, home-based or office-based manoeuvres in the management of BPPV [10–14]. The most widely used manoeuvres are the Epley

manoeuvre, the Semont's manoeuvre and the Brandt-Daroff exercises.

A review of the literature revealed the extremely good results of the Epley manoeuvre. In one study, the success rate after 1 week was 63.6%, which increased to 72.7% after 2 weeks (Waleem et al, 2008) [11]. One Brazilian study [12] also revealed similar results (Teixeira et al, 2006). But whether it gives long-term good result is open to question [13, 14].

The Semont's manoeuvre has also been shown to give good results. In a study [15] involving 160 patients of BPPV, only eight needed another type of rehabilitation after one session of Semont's manoeuvre (Serafini et al, 1996). One study [16] has compared the results of Semont's manoeuvre with posterior ampullary nerve section, and has shown clear advantage of the former over surgical therapy in the management of BPPV (Hausler et al, 1989).

The results of the Brandt-Daroff exercises are not so encouraging. In a study involving 116 subjects [17], 37% experienced recurrence of symptoms after performance of the exercises, compared to 47% in the control group. There was also no significant difference in the frequency of recurrence or time to recurrence between the case and control groups (Helminski et al, 2005).

There are very few studies in the literature comparing the above three modes of treatment. One study [18] conducted in Texas, USA, failed to show any significant difference between the three, but showed that any of the interventions was better than placebo in the management of BPPV (Cohen et al, 2005). Further research, with analysis of data from the various studies involving the three interventions, is required to provide insight into the comparability between the three techniques.

Our study had three main limitations

1. Small study population
2. We did not test against a sham manoeuvre i.e., we had no control group
3. Short follow-up time
4. Could not rule out post BPPV syndrome.

Nevertheless, our study has shown that any of the three methods may be applied in the management of BPPV with good results. To comment on which of the three techniques is better, we need to have a large study population. Also, following-up the patients for at least 1 year would have revealed the long-term results of the manoeuvres.

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