Epley's Maneuver in Primary Care: A Quality Improvement Project

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Abstract

Almost all health systems of the world are burning out of budgets, hence, activities need to be developed to save as much money as possible for health services. We chose a simple, effective and proven by research method ''Epley's maneuvre (EM)'' as a diagnosis and treatment of ''Benign Parosxysmal Positional Vertigo (BPPV)''. We delivered training to primary care physicians and studied the effectiveness of the the treatment and the cost saved in this project. It was found that EM proved both highly effective treatment as well as saved a good sum of money along with other benefits, such as better job satisfaction, convenience for the patients, etc.

Key Words:Epley's maneuvre, primary care, cost-effectiveness, ENT in primary care

Introduction

Dizziness is a common presentation in primary as well as secondary care all over the world. The most common cause of dizziness in all types of vestibular vertigo is ''Benign Paroxysmal Positional Vertigo (BPPV)'' (von Brevern et al, 2007). The most effective and non-invasive treatment for BPPV is Epley's Maneuver which is usually performed by trained ENT specialists or consultants in secondary care settings. This causes a significant amount of clinical workload and financial burden on secondary care (Kovacs et al, 2019). We planned to train the primary care physicians to perform Epley's maneuver in primary care settings to see if this change of practice can reduce some financial burden on secondary care as well as reducing the unnecessary costs of consultations and investigations.

Background

BPPV is a common vestibular disorder leading to significant comorbidity, psychological impact and medical costs (von Brevern et al, 2007). This phenomenon is prevalent throughout the world. An estimated incidence of BPPV is 107/100,000 per year (Froehling et al, 1991) with overall lifetime prevalence of 2.4% (von Brevern et al, 2007). This significantly increases the financial burden on secondary care for the cost of the treatment. Not only that, it also causes absenteeism from work on medical grounds and that inflicts extra economic burden on any country's economy (Kovacs et al, 2019).

In the UK, BPPV, is most often is diagnosed in secondary care in ENT clinics and is treated by ENT consultants and associate specialists. Once a patient is referred by his/her GP (General Practitioner or Family Doctor) to ENT, patients will have to wait for several weeks before they see the doctor. Followed by the initial consultation, often patients end up going through further investigations, such as imaging, audiometry and blood analysis, etc. This further increases the cost of the overall treatment. Many patients would require follow up appointments also. It has been proven by several studies all over the world that the most effective treatment of BPPV is Epley's manoeuvre (Mujeeb & Khan 2000, Moreno et al 2019). A meta-analysis of the studies on effectiveness of Epley's maneuver have been published by Prim-Epsada et al in 2010 showing the evidence of effectiveness of Epley's maneuver in treating BPPV in all age groups. As the incidence of BPPV increases in the elderly (around 50% of all vestibular vertigos), still Epley's maneuver remains the most effective treatment with positive outcome of around 70% or more (Balatsouras et al, 2018).

Based on the above facts, it was thought that if we train the primary care physicians to perform Dix-Hallpike (the first part of Epley's maneuver to diagnose BPPV) and Epley's maneuver in primary care settings, this might save a significant number of referrals to secondary care, which in turn will help reduce workload and financial costs (Kovacs et al 2019) on secondary care providers, i.e, NHS UK. Moreover, if this project proves successful, it will be a great convenience as well for the patients as they will get the best treatment at their local family doctor, instead of waiting a long time to see an ENT specialist. The procedure improves the quality of life (Uz et al, 2019) in all age groups including the elderly, if performed according to the right technique (Woodhouse 2015).

Materials and Methods

A general invitation was sent to all the primary care physicians (GPs) and to the trainee GPs working in all the GP Surgeries (primary healthcare centres) in the whole region of the area of local CCG (clinical commissioning group) in Nottinghamshire, UK to participate in the project.

A face to face training session was arranged for the volunteers. This session included a theory lecture, explaining the pathophysiology of BPPV and the mechanism of Epley's maneuver. Then in the practical part of the training session, one to one training was delivered to all the participating physicians. We used our weekly half-day release time in our deanery (East Midlands, Mansfield rotation) to train the GPs and the GP registrars for this. So, no extra money was spent for this training.

Data was collected from all the participating GP surgeries and the results were compared with the other studies.

An estimated savings of the cost of the treatment of BPPV was calculated based on the treatment tariffs in the private sector. It is assumed that the cost on NHS would be significantly high as compared to the private sector.

We gave ''Prochlorperazine'' 5mg three times daily along with ''Betahistidine'' 16mg three times daily, orally, to all patients 14 days prior to the planned Epley's manoeuvre. This reduced the discomfort to all the patients during the procedure, to a great degree.

Training

Out of around 41 surgeries, 12 agreed to participate in the study. Out of all the volunteers 31 doctors were recruited into the training session. One of the monthly ''half day local training sessions'' was chosen to deliver this training to all the participants. In the assessment after training 25 doctors were found to be competent enough to perform Dix-Hallpike and Epley's manoeuvre confidently and accurately.

As mentioned above, the training was divided into two parts. Firstly, a lecture was delivered by the main author explaining the anatomy of the internal ear, pathophysiology of BPPV and the mechanics and dynamics of both Dix-Hallpike as well as Epley's manoeuvre were explained. Secondly, one to one practical training was delivered to each and every participant using real subjects. Every

participant was critically assessed both on theory as well as practical aspects of the procedure and the 25 best participants were selected.

Below, we will briefly go through the anatomy of the internal ear, pathophysiology of BPPV and the method of Epley's manoeuvre:

Anatomy of Internal Ear and Pathophysiology of BPPV:

The internal ear is a membranous organization of tubes and sacs filled with fluid called ''Endolymph'' and suspended in a different fluid called ''Perilymph'' within a similar shaped bony house. Endolymph is rich in salts while perilymph has the same composition as CSF (Cerebrospinal Fluid). See the figures below:

Figure 1

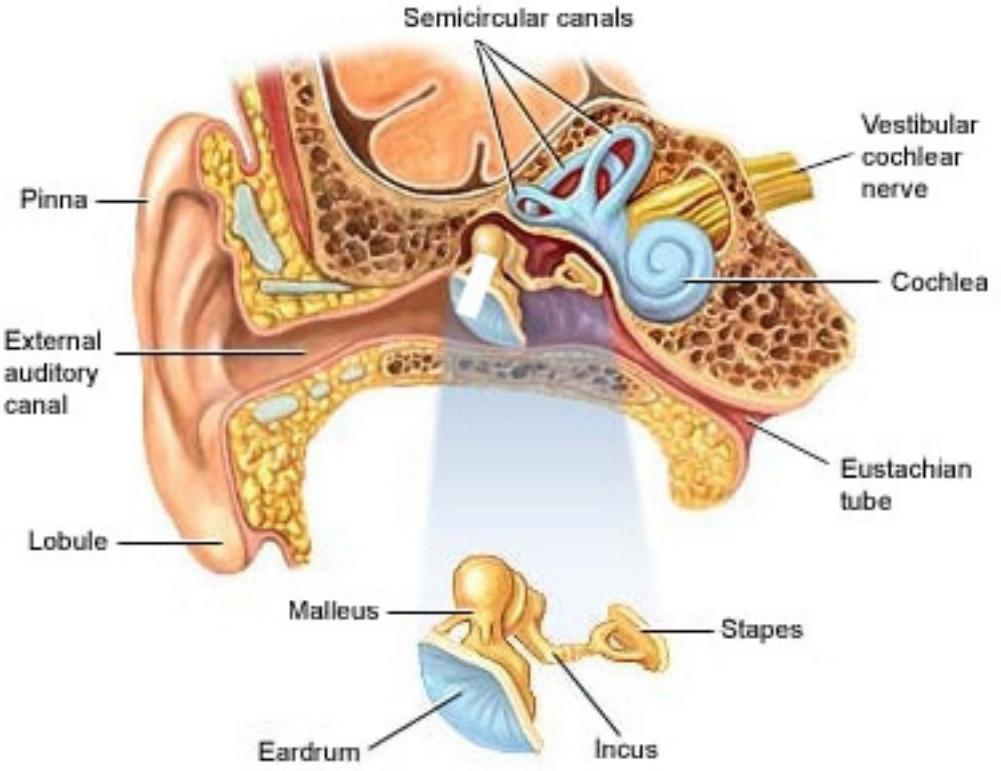
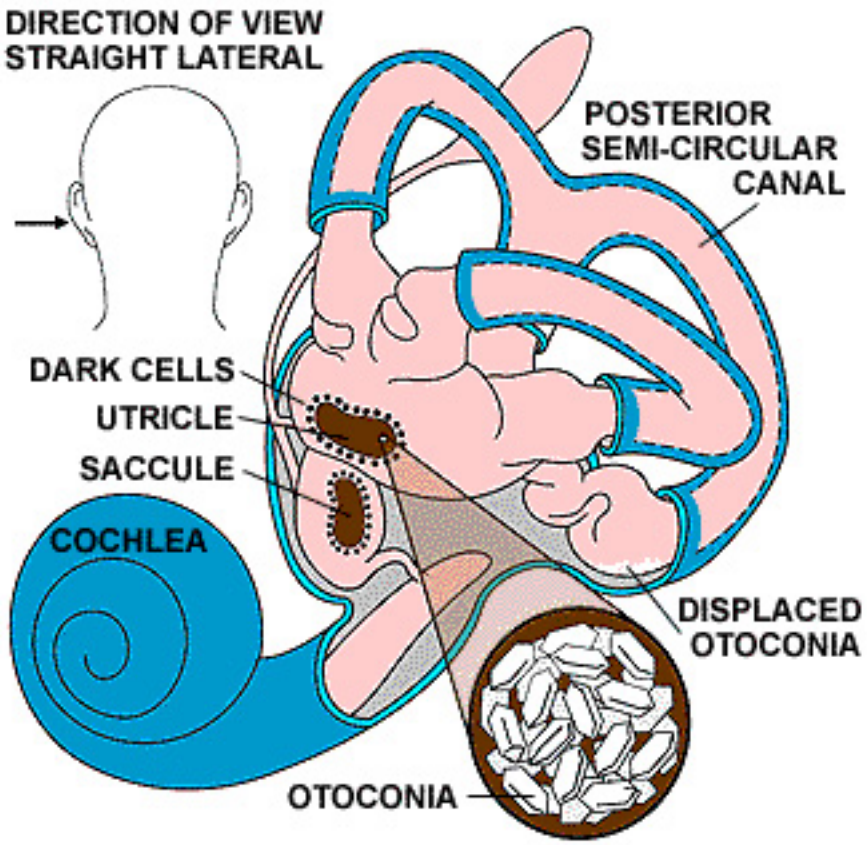


Figure 2



In summary, the calcium crystals called ''otoconia'' which normally are riding on a gelatinous membrane called ''tectorial membrane'' are confined in a membranous chamber of labyrinth called ''Utricle'' to which are attached three semi-circular canals via 5 openings instead of 6. That is because posterior and superior semi-circular canals join together to form a single tube called ''crus communes'' before opening into the utricle. This is the channel through which the dislodged otoconia pass through and enter the posterior semi-circular canal (90% of the times).

These misplaced otoconia then would create ripples in the endolymph on the movements of head and stimulate the balance organ lying in the ampulated end of the posterior semi-circular canal (SCC) which then produces the sense of imbalance. This usually happens when the head moves in the direction of the affected ear.

Mechanics of Epley's Manoeuvre:
As mentioned above, there are misplaced otoconia in the posterior SCC which are responsible for stimulating the balance organ in its ampulated end. So, logically, to treat the condition, these otoconia need to be tracked down back to the utricle to allow them to lodge back onto the tectorial membrane. This is only possible via crus communes.
So, the head of the patient is moved in some specific directions to help these otoconia to fall back into the utricle. This procedure is called ''Epley's manoeuvre'' and is illustrated by the diagram below:

Figure 3

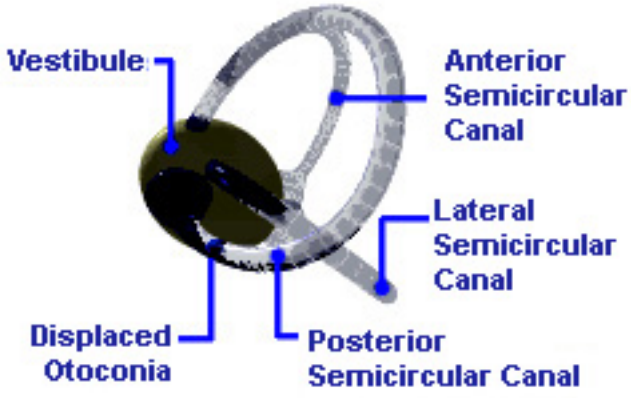
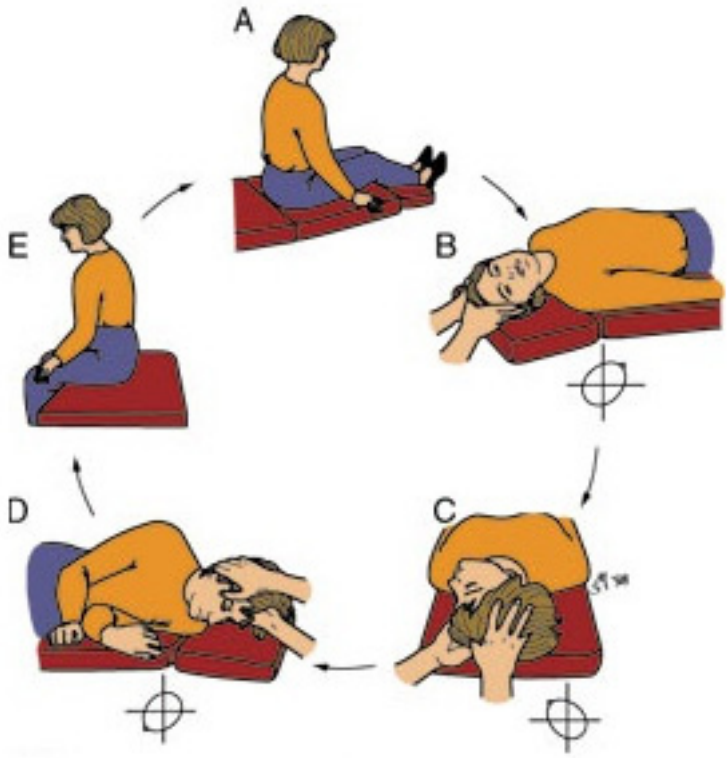


Figure 4



Steps (Modified from Burgess L, Aug 30, 2017)

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The first step in the Epley's manoeuvre is called ''Dix-Hallpike'' test.

1. Ask the person to sit upright on an examination table, fully extending their legs out in front of them.
2. Rotate the person's head at a 45-degree angle towards the side they are experiencing the worst vertigo.
3. Quickly push the person back, so that they are lying down with their shoulders touching the table. The person's head is kept facing the side worst affected by vertigo but now at a 30-degree angle, so that it is lifted slightly off the table. The doctor holds the person in this position for between 30 seconds and 2 minutes, until their dizziness stops.
4. Rotate the person's head 90 degrees in the opposite direction, stopping when the opposite ear is 30 degrees away from the table. Again, the doctor holds the person in this position for between 30 seconds and 2 minutes, until their dizziness stops.
5. Next, they roll the person in the same direction that they are facing, onto their side. The side that they experience the worst vertigo on will be facing upwards. The doctor holds the person in this position for between 30 seconds and 2 minutes, until their dizziness stops.
6. Finally, the doctor brings the person back up to a sitting position.
7. The whole process is repeated up to three times, until the person's symptoms are relieved.

Findings

The data was then collected over a period of 8 months from the clinicians who were given the training. Because all the data was electronically recorded on a common medical records system called ''System One'', it was easy to retrieve all the patients treated over this period and their follow up appointments. A total of 144 patients were seen by these 25 trained doctors over a period from March to October. Rather than analysing the data on the basis of all individual 25 clinicians, we preferred to analyse the data as a joint effort from all. All ages were included in the study.

Those patients who attended again within a week with no relief in symptoms were considered as ''misdiagnosis''. Those cases were personally examined by the author and the most common condition which was misdiagnosed as BPPV was ''cervical vertigo'' which usually occurs with some arthritic changes in the cervical spine and causes transient vertiginous symptoms on moving cervical spine in almost any direction. We can see from the data, there are only a few misdiagnosed patients.

Table 1:

Total No. Patients	Required 2nd treatment within 3 months	Misdiagnosed	Successfully treated	Unsuccessful
144	39	9	114	39
	27%	6.25%	79.16%	27.08%

In the first analysis, all 144 patients were included. The reason was to find out the number of misdiagnosed cases which were found to be 9. The total unsuccessful cases in the table also include the misdiagnoses. So after correction, the total true BPPV cases were found to be 135.

On the corrected analysis, all the misdiagnosed cases were excluded and the data was re-analysed, see Table 2.

Table 2:

Total No. Patients	Required 2nd treatment within 3 months	Successfully treated	Unsuccessful
135	39	114	30
	28.88%	84.44%	14.58%

As a summary, overall 135 patients were correctly diagnosed with BPPV over an 8 month period and 114 of them were successfully treated. 39 patients out of 135 did require a second session of Epley's manoeuvre. 30 patients did not improve even after the second session. The reasons for this phenomenon can be theoretically proposed as follows:

1. The otoconia are present in lateral SSC instead of posterior SCC or may be in both.
2. The otoconia do not stick well onto the tectorial membrane after the procedure and hence keep coming back to the SSCs too early and too frequently.

Cost Effectiveness:
In the private sector, the initial consultation fee for an ENT patient is £150 and a follow up visit costs £120. So, based on this tarrif the cost effectiveness yielded by this project is shown below:

Table 3:

	Total No. Patients	Required 2nd treatment within 3 months	Successfully treated	Unsuccessful
	135	39	114	30
		28.88%	84.44%	14.58%
Cost	£20,925	£4,875		Total = £25,800.00

This small project in primary care saved £25,800.00 which is a considerable amount. As we can see in this calculation, all the misdiagnosed cases have not been counted which if presented in private practice, would have been charged at least the first visit fee. However, we only calculated the money saved on successful cases.

Results

1. The efficacy of Epley's manoeuvre remains unchallenged and in our study it was around 84.44%. This showed a better outcome than many other studies in secondary care which achieved a success rate of around 70% or more (Mujeeb & Khan 2000, Moreno et al 2019).
2. The rate of misdiagnosis was only 6.25% in the hands of family medicine doctors who were given training. This is almost negligible as compared to the overall achievement of the project.
3. A significant sum of money was saved by this project (Kovacs et al, 2019).

Conclusions

Based on this study, the following conclusions can be drawn:
1. The efficacy of the Epley's maneuver proves it the treatment of choice for BPPV.
2. This treatment can be safely given in the primary care set up.
3. Performing this procedure in primary care is cost effective and can save a significant sum of money and reduce the referral rate to secondary care.
4. Primary care doctors felt confident with this training and the project and showed overall better work satisfaction to all the participants.
5. Pre-medication with Prochlorperazine and Betahistidine reduced the discomforting vertiginous feeling in all patients during the procedure.

Recommendations

Drawn from the above study, we suggest the following recommendations:
1. Training primary care physicians in delivering the Epley's maneuver is very useful and carries lots of benefits, such as better work satisfaction, cost effectiveness, reducing referral rate to secondary care and convenient and quick for our patients.
2. Similar training should be given to more primary care physicians and the multicentre studies should be audited and presented from other regions.
3. If proven by multicentre studies, it should be made a national recommendation to train all primary care physicians in delivering the Epley's manoeuvre.
4. Growing health systems like in Qatar and other Middle Eastern countries, may adopt this practice nice and early in their system as it would be easy in the beginning to change a practice than later.
5. Pre-medication as mentioned in this study should be tried in all other studies as we found it extremely useful in our patients.

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