



EFFICACY OF POSTURAL STABILITY EXERCISES IN CONTROL OF COMMON VERTIGINOUS SYNDROMES

Neurosciences

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ABSTRACT

Vestibular system pathology is the most common cause on Vertigo. Such a peripheral vertigo is classically identified by characteristic clinical profiles including a positive Head impulse test (HIT). Defective proprioceptive impulses from muscle spindles and Golgi tendon organs contribute the morbidity of vertigo, by increasing the risk of falls in elderly population leading to for example fracture neck of femur. Postural stability exercises aim to alleviate the symptoms of vertigo and improving the balance, by strengthening the postural reflexes. Our study aims to investigate the benefits of a 6-week regime of home based/ teleconsultation based Vestibular rehabilitation with a focus on practice of Postural stability exercises. The Visual Analogue Scale (VAS) Vertigo and Dynamic Gait Index (DGI) which an index composed of 8 exercises were measured before and after a 6-week exercise regime. We found that Postural stability exercises help improving the quality of life of patients suffering from myriads of vertiginous syndromes like Vestibular neuritis. Patients report benefit of the improved balance. Gait and mobility are also improved which is seen by the increased of the modal Dynamic Gait Index (DGI) score. Increase in confidence and improvement in attitude of patients was noted on interview, of all cases after completion of the exercise regime.

KEYWORDS

Vestibular rehabilitation, Vertigo, Meniere's disease, Balance, Paroxysmal vertigo, Positional vertigo

INTRODUCTION

Vestibular system is a silent and a unique organ of sense. They are unique that even in deep sleep and state of motionless; they continue to signal the position and orientation of our body. They are silent as we have no recognizable direct sensation. Human vestibular neurons have very high basal firing rate (up to 90 times per second). This causes a continuous flux of information to the Vestibular Nucleus. Unlike sense of vision or hearing we do not sense the Vestibular system until something goes wrong and causes symptoms of Vertigo¹.

Most common causes of Vertigo are due to pathologies of the Vestibular system called as Peripheral Vertigo. Vertigo is more common in elderly population. The symptoms increase with head movements or persist even after eye closure. This persistence of symptoms is differentiating for True vertigo¹.

Feedback from the muscles to the vestibular nucleus, modulated by the cerebellum, regulates the tone of the skeletal muscles. Vestibular reflexes become weak and ineffective in cases of cerebellar damage. Inside the cerebellum it is the cerebellar vermis (midline) respond to vestibular stimulation and controls the reflexes².

Vestibular rehabilitation in form of Postural stability exercises improve the Vestibular dysfunction, by stimulating proprioception, leading to a gradual improvement in stable vertiginous syndromes like benign paroxysmal positional vertigo (BPPV), Vestibular neuritis, vascular disorder affecting the inner ear, and Meniere's disease³.

Studies have shown that early induction of exercise regime designed to strengthen Proprioception reduces the vertigo and disequilibrium in these clinical conditions⁴.

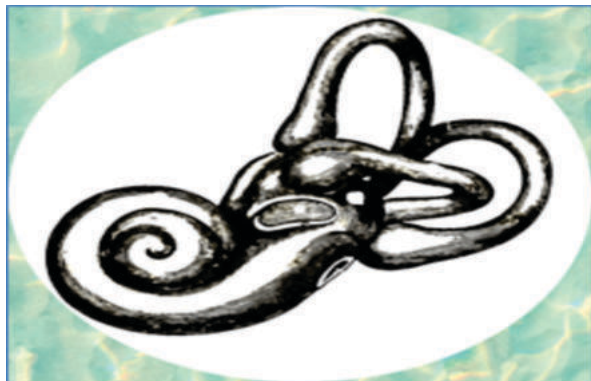


Figure 1: Most common cause of Vertigo is pathology of the Labyrinth or Inner ear (vestibule)⁵ Source: CC0 in Public domain after editing

NEED OF THE STUDY

Postural stability exercises help in improving balance in vertigo by modification of Somatosensory inputs like for example from muscle spindles, Golgi tendon organs, joint receptors, and cutaneous mechanoreceptors which are found throughout the body. These provide information about the relative location of body parts relative each other and the body's position and movement on a fixed surface like the floor⁶.

STUDY MATERIAL AND METHODS

The study was carried out in a tertiary care hospital and physiotherapy clinic. The target population were those suffering from Vertigo, who did not have any progressive pathology. Simple random sampling was employed, and 30 patients were recruited for this study. Study power was 80% and 95% Confidence Interval ($p \leq 0.05$) was assumed to be significant. The exercise regime was conducted for a 6-week period.

Patients of both genders were included and Vertigo evaluation with the Visual Analogue Scale (VAS) using a 10-pt scale of self-assessment of the symptoms level were used. Dynamic Gait Index (DGI) which an index composed of 8 exercises, each of which is scored from 0 (severe impairment) to 3 pts (the highest level of functioning); the maximum score of 24 pts; score less than 19 pts show imbalance and higher risk of falls⁷.

PATHOGENESIS OF POSTURAL INSTABILITY

The following table summarizes the patho-mechanics of postural disturbances leading to clinical signs and symptoms.

Table – 1 The Patho-mechanics Of Postural Disturbances In Vertigo⁷

Vestibular Pathology	Patho-mechanics	Clinical presentation
Reduced Proprioceptive Input	More energy to maintain the upright posture	Fatigue and Tiredness
	Imbalance increases when vision is flooded with sensory inputs (Super-market vertigo syndrome)	Imbalance and risk of fall increases in crowded and noisy places like market
	Amplitude of EMG are reduced	Compensatory body sway and increased risk of fall
Disrupted Proprioceptive Input	Vestibular nucleus inputs present	Able to maintain balance in well acquainted environment like house
	Inappropriate signals from Proprioceptive organs	Instability in new or complex environment like Store or market

OUR EXERCISE PROTOCOL⁸

Compensation may develop rapidly within 6 to 8 weeks, or it may take as long as 6 months. Individualized customized, exercise prescription is necessary as the pathology of vertigo and the compensatory mechanisms vary in person to person.

In addition, advanced age, and presence of comorbid conditions like Osteoarthritis or Diabetic foot or risk of falling, alters the ability to perform many vigorous postural exercises in the armamentarium of Vestibular Rehabilitation.

The following postural exercise protocol was followed in each therapy session. The exercises are of increasing order of difficulty and the symptoms of vertigo regress. This is protocol developed by us based on renowned Cooksey Cawthorne Exercises⁸.

- Patients try to stand and walk with eyes open supported by the therapist.
- Patients try to stand and walk with eyes closed supported by the therapist.
- Patients try to stand and walk with eyes open unsupported by the therapist.
- Patients try to stand and walk with eyes closed supported by the therapist.
- Stand on foam and uneven floor with help vision and support of therapist.
- Walk on up and down the ramp while touching wall or bars or the therapist (but not holding).
- Slow body turns supported by the physical therapist

OBSERVATION

The patients were administered VAS and DGI scores before the induction of exercise regime and after completion of a six-week course of exercise. The modal scores of patients before and after the exercise regime are as follows.

Table – 2 Scores Before And After Vestibular Rehabilitation

Patients	Modal Vertigo VAS scores		Modal Dynamic Gait Index (DGI)	
	Before	After	Before	After
Vestibular neuritis	7	6	15	17
Benign paroxysmal positional vertigo (B.P.P.V)	6,7 (double mode)	5	16	23
Meniere's disease	8	6	12	13
Misc. condition Like e.g. — traumas of the inner ear, — neoplasms of the inner ear, — systemic diseases	6	4	20	22

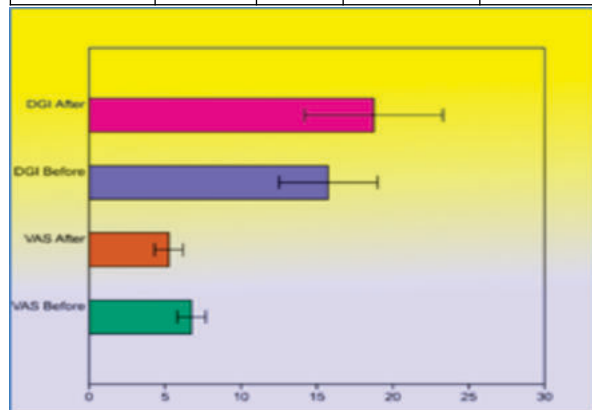


Figure 1: Bar Charts Showing The Mode Of VAS And DGI Scores Before And After Postural Stability Vestibular Rehabilitation

BIOSTATISTICAL ANALYSIS

Shapiro-Wilk test was used to measure the probability of normal distribution approximation. The data was then analyzed using non-parametric statistical tests for significance like Mann-Whitney U test and Paired t-Student test for difference in means of before and after completion of the Postural stability exercise regime. Wilcoxon's signed rank test was used to analyze data within the group.

RESULTS

There was improvement in the subjective sensation of vertigo, reduction of VAS score in almost all patients after the completion of vertigo, the modal score improved from about 7/10 to about 5/10 and 6/10 (double modes). The modal Dynamic Gait Index (DGI) score also showed an improvement in gait of the patients from a modal score of 15 to 18. The improvement of scores is statistically significant in both at 95% confidence (p value <0.05).

CONCLUSIONS

Postural stability exercises help improving the quality of life of patients suffering from myriads of vertiginous syndromes like Vestibular neuritis. Patients report benefit of the improved balance. Gait and mobility are also improved which is seen by the uptick of the modal Dynamic Gait Index (DGI) score. Increase in confidence and improvement in attitude of patients was noted on interview, of all cases after completion of the exercise regime.

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