# Transcranial direct current stimulation (tDCS) to reduce the psyhological symptoms in benign paroxysmal positional vertigo.

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## Introduction

Benign Paroxysmal Positional Vertigo (BPPV) is the most common peripheral vestibular disease in with an idiopathic cause [1]. Prevalence of BPPV has been found with high range in elderly patients (60 years or above) [2]. In clinical practice vertigo or dizziness are reported as the common complains of this patient population, whereas available literature also implicated some psychological factors such as anxiety or depression affect the recovery from these symptoms of BPPV or recurrence was reported [3]. Epley's maneuver (repositioning maneuver) has been reported as very effective in the treatment of the BPPV [4,5]. However recent evidence shows that psychological factors also influence the results of maneuvers and found the recurrence of this disease [1]. As many Cognitive Behavioural Therapies and approaches are used in the rehabilitation of cognitive impairments but these approaches are task specific only; or teachings to modify behavior of the patient [6]. Transcranial Direct Current Stimulation (tDCS) is non-invasive brain stimulation which modulates the cortical activities and induces the neuroplasticity; anodal stimulation on Dorsolateral Prefrontal Cortex (DLPFC) is used in a wide range for the improvement in the cognitive control over negative stimuli such as anxiety or depression [7]. The aim of this case report was to improve the psychological symptoms such as anxiety or depression in patient with BBPV by strengthening the cognitive control over fronto-limbic system [3].

### *tDCS mechanism in anxiety or depression*

According to the diagnostic neuromodulatory techniques, the right DLPFC has been linked with negative or threat related processes whereas left DLPFC has been linked with positive emotions or control on the emotions.. In available literature, tDCS has been used in the various anxiety disorders and proved significantly effective. Depolarization of the neuronal membrane by anodal (positive or excitatory) stimulation and hyperpolarization by cathodal (negative or inhibitory) stimulation [6,8]. As suggested in recently systemic review, anodal over left DLPFC and cathodal over right DLPFC proved more beneficial for the improvement of anxiety symptoms [9].

We reported the case of 63 years female neurologist suffering from posterior canal BPPV, also presented with anxiety depression symptoms. In medical history, patient reported that she had the BPPV one year back and got relief with conservative treatment, further no medications/treatment was taken. Dix hallpike (DH) maneuver has been performed to observe the nystagmus, however while performing DH maneuver nystagmus was absent but symptoms of vertigo or dizziness was present. After completing the assessment we found her scores on Hospital Anxiety and Depression Scale (HADS) was 11 points on depression component and 14 points on anxiety component, which revealed that these components stimulated the symptoms of BPPV; Dizziness Handicapped Inventory (DHI) was 53.

After taking a written consent, patient underwent a treatment of tDCS (TheBrainDriver v2.1) along with conventional physiotherapy treatment (CPT). Anode electrode (saline soaked 5 × 5cm) of tDCS was applied on the scalp covering F3 (based on the International 10-20 Electroencephalography system) equivalent to left DLPFC and cathode electrode (saline soaked 5 × 5cm) on F4 (based on the International 10-20 Electroencephalography system) equivalent to right DLPFC; intensity 2mA; duration 20 minutes. We aimed to target the left DLPFC was to improve the direct cognitive control on anxiety or depression. After tDCS session patient was relaxed for 5-10 minutes then underwent CPT which includes Epley's maneuver which was given for the recovery of symptoms (vertigo or dizziness) of BPPV. This repositioning maneuver was performed bilaterally on the patient as recommended in available literature [4].

We performed the treatment protocol for 3 alternate days per week for 4 consecutive weeks. Assessment of patient was done at baseline (before the first session of the treatment) and post treatment (after the last session of the treatment). Outcomes measured were HADS for the assessment of anxiety and depression of the patient; DHI scores were analyzed for the assessment of disability because of BBPV, baseline readings were: HADS (11 points on depression, 14 on anxiety) and DHI score was 53; Post intervention after 4 weeks HADS (6 depression and 7 on anxiety) and DHI score was 26. Improvement was found in both scales significantly and there was no adverse effect of tDCS to the patient while or after the treatment protocol.

## Conclusion

Results of both outcome measures indicated tDCS along with CPT proved effective to reduce the patient's anxiety or depression and the symptoms (vertigo or dizziness) of BPPV.

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Further large scale clinical studies are required to check the efficacy of tDCS aimed to improve the cognitive impairments or psychological factors that are affecting the recovery of BPPV.

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