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Vestibular Rehabilitation with Virtual Reality in Mal De Debarquement Syndrome: Case Report

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Objective: Mal de debarquement syndrome (MdDS) is a movement-induced oscillatory vertigo disorder that persists after movement stops. Mal de debarquement syndrome (MdDS) is a disorder of persistent oscillatory vertigo following passive movement such as sea, air or land travel. Symptoms are often triggered by sea, air and car travel. Mal de debarquement patients may have mild vestibular imbalance characterized by rotation during the Unterberger test. Other symptoms include loss of orientation, postural instability, unsteadiness, fatigue, cognitive impairment and kinesiophobia. An increased visual sensitivity has been reported in patients with mal de debarquement. Virtual reality systems have recently been used as an effective therapy in vestibular rehabilitation. The aim of using virtual reality technology in vestibular rehabilitation is to reduce symptoms, use a realistic visual environment that causes retinal shifts and induces habituation, increase vestibulo-ocular reflex (VOR) gain and optokinetic responses, and improve postural stability. This study demonstrates the success of using Virtual Reality in the treatment process of Mal de debarquement disease. We aim to increase awareness among clinicians to effectively manage the under-recognized Mal de debarquement syndrome.

Case Report: A 51-year-old male military helicopter pilot came to our clinic with the complaint of swaying sensation for 7 months. He had a medical history of benign paroxysmal positional vertigo (BPPV) which resolved with maneuvers. He was examined by a neurologist, cardiologist and ENT at an external center and no diagnosis was made. Magnetic resonance imaging (MRI) results were normal. V-HIT was performed to evaluate the semicircular canals and the results were normal. Bilateral hearing was normal in audiometry test. Acoustic Reflex measurements revealed bilateral Type A tympanograms and immitancemetric measurements were normal. Romberg and tandem romberg were normal. Unterberger test showed 30 degrees right rotation. Dysmetria and dysdiadokinesia were normal. VNG test was normal. Dizziness Disability Inventory score was 56, Beck Anxiety Scale score was 20, Visual Vertigo Analog Scale score was 44. The patient was diagnosed as Mal de Debarquement in the absence of any pathologic findings in the tests performed and based on the patient's anamnesis. Virtual Reality Vestibular Rehabilitation was performed once a week for a total of 12 sessions, each session lasting 1 hour. SVV, Optokinetic (Horizontal, Rotatory and Vertical) tests, Optic Flow, Car, Sea, Elevator, Escalator, Target Tracking, Subway, City, shopping mall simulations on Virtualis Balance VR device were used. Difficulty level was increased in each session. The patient was standing. In the 1st session, he had difficulty in all of them and felt shaky and dizzy. At the end of the 12th session, she could do all of them. In the post-session evaluation, Dizziness Disability Inventory score was 18, Beck

Anxiety Scale score was 14 and Visual Vertigo Analog Scale score was 6. The patient stated that his complaints had resolved.

Discussion: Individuals with mal de debarquement syndrome describe symptoms of swaying after sea, air or land travel. These symptoms may be due to the inability of the vestibulo-ocular reflex (VOR) to adapt to the rotation of the head during rotation. Dai et al. proposed a treatment method that involves passively rotating the patient's head while watching optokinetic strips, which stimulates the vestibulo-ocular reflex (VOR) and improves Mal de debarquement syndrome. Yakushin et al. investigated whether virtual reality (VR) goggles with a limited visual field can effectively simulate a laboratory environment for the treatment of Mal de debarquement syndrome in 5 patients. All five patients in this study responded favorably to treatment with limited field horizontal optokinetic eye flicker (OKN) stimulation. Therefore, limited-field optokinetic eye flicker (OKN) stimulation may be an effective stimulus for activation of velocity storage that can be used in the treatment of Mal de debarquement syndrome. In a study by Hoppes et al. a virtual reality city scene and optokinetic strips were used in a computer-assisted rehabilitation environment for the treatment of Mal de debarquement syndrome. During the treatment, the patient was seated in a chair. In the second session, the patient did not come to the third session because his symptoms disappeared. In our study, the patient was standing during a 1-hour virtual reality treatment consisting of 12 sessions one day a week and subjective visual vertical (SVV), Optokinetic (Horizontal, Rotatory and Vertical) tests, Optic Flow, Car, Sea, Elevator, Escalator, Target Tracking, Subway, City, shopping mall simulations were used. There is no definitive treatment for mal de debarquement syndrome. However, it is controlled with benzodiazepines, antiemetics, selective serotonin reuptake inhibitors, tricyclic antidepressants, beta blockers or anticonvulsants. In most patients, anti-emetics are tried as first-line treatment, but in most cases this is not sufficient and an additional treatment should be given. In our study, we found that Virtual Reality method can be effective in the treatment of this disease. Due to its rarity, more studies are needed to understand its therapeutic methods. It has also been described several times in studies that re-exposure to passive movement causes a temporary reduction of up to 80% in the symptoms of mal de debarquement syndrome. For this reason, we aimed to improve postural stability by increasing the gain of the vestibulo-ocular reflex (VOR) and optokinetic responses by presenting a realistic environment with virtual reality.

Keywords: Mal de debarquement Syndrome, Persistent Oscillating Vertigo, Disembarkment Syndrome, Virtual Reality, Vestibular Rehabilitation

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