



Original Article

Vestibular Assessment and Rehabilitation in Three Patients with Covid-19 Induced Vestibular Neuritis

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ABSTRACT

Background: COVID-19 could induce vestibular neuritis in some patients, and there is limited information on their vestibular evaluation and rehabilitation.

Methods: Three cases infected by COVID-19-induced vestibular neuritis underwent vestibular evaluation and rehabilitation. They showed unilateral dysfunction in caloric and video head impulse tests. A home-based vestibular rehabilitation (VR) was used for their treatment.

Results: Although the symptoms in one patient significantly improved, she still had a mild episode of vertigo. The other two patients completely recovered. They also had no remaining vertigo or imbalance at the end of VR. The final physical examinations were normal, and the total score on the Dizziness Handicap Inventory showed no handicapping.

Conclusion: VR could be effective in the management of COVID-19-induced vestibular neuritis. So, we could expect a good recovery similar to other disorders with unilateral vestibular hypo-function.

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Introduction

COVID-19 was initially recognized for its respiratory symptoms; however, it could simultaneously involve different systems such as auditory and vestibular systems. Moreover, different otologic symptoms were reported in COVID-19 patients, such as hearing loss [1, 2], tinnitus [3], vertigo [4], and dizziness [5]. Additionally, sudden sensorineural hearing loss [1], and otitis media [6] were reported in these patients. For the first time, a previous report introduced a case of COVID-19-induced vestibular neuritis [7]. The patient was a 29-year-old woman with vertigo, nausea, and vomiting and minimal recovery over time. The patient received vestibular rehabilitation (VR), but vestibular evaluation (VE) and VR results were not reported. Currently, there is limited information on the vestibular evaluation and VR in patients with COVID-19 induced vestibular neuritis. In this case-report, the

VE and VR of three patients with COVID-19 induced vestibular neuritis are discussed.

Cases

The patients had positive PCR with no history of vertigo or imbalance before COVID-19. They were referred between August and November 2020. The patients were evaluated with case history, physical examination, and auditory and vestibular tests. The physical examination included the Dix-hallpike maneuver, roll maneuver, Romberg test, Fukuda stepping gait, and Dizziness Handicap Inventory (DHI). The positive criteria for the Dix-hallpike maneuver and roll maneuver included the presence of expected nystagmus and/or vertigo. The positive criteria for the Romberg test were imbalance and/or falling. The Fukuda stepping gait would be considered positive if patients come forward or have an angle more than 45 degrees [8].

The auditory and vestibular tests included otoscopy, Pure Tone Audiometry (PTA, Maico) for 250 to 8000Hz, speech recognition threshold (SRT), speech

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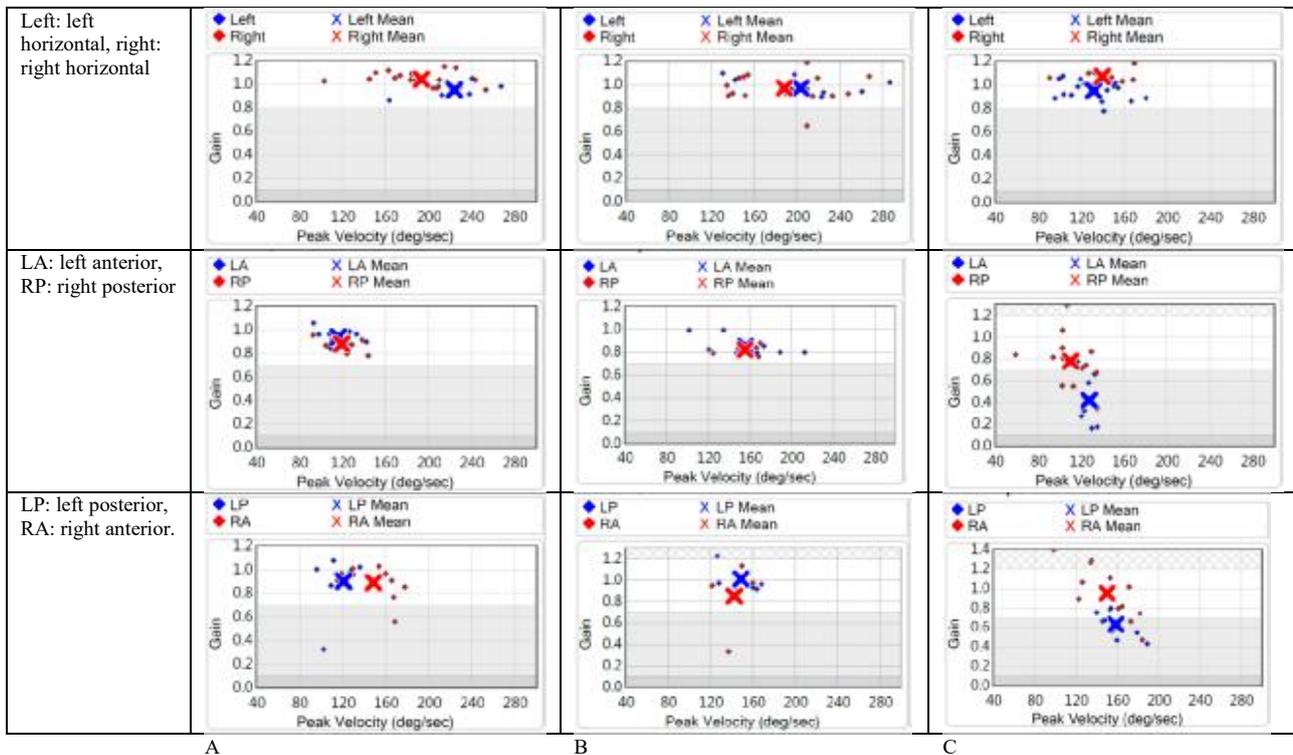


Figure 1: the v-HIT gain for horizontal, posterior and anterior semicircular canals in three patients. A) Case 1, B) Case 2, and C) case 3.

discrimination score (SDS), tympanometry (MI44, Maico), acoustic reflexes, electronystagmography (ENG), and video head impulse test (v-HIT). Notably, the PTA was considered normal if all of the thresholds were better than 25 dBHL with no air-bone gap [9], and the ENG tests (Hortmann, otometrics) were performed with horizontal (external canthus of eyes) and vertical electrode arrays (up and down of eye). The ENG tests included spontaneous nystagmus, gaze, saccade, smooth pursuit, positional nystagmus, caloric test (air-irrigation), and fixation test. The v-HIT (ICS, otometrics) was recorded at the sampling frequency of 250Hz. The velocity of impulses aimed to be within the range of 150 to 200 degrees/s. The gain of vestibular ocular reflex and the presence of covert and overt corrective saccades were evaluated.

After the evaluation, they were diagnosed with vestibular neuritis by neuro-otologists based on case history, physical examinations, and auditory and vestibular laboratory tests. A home-based VR was used because of the special situation during the current covid-19 pandemic. Patients visited in short sessions each week. They were monitored by case history, physical examinations, and DHI questionnaires. The DHI score could be 0 to 100, and scores under 10 show no perceiving handicapping. They were asked to perform the learned exercises and instructed new exercises to perform at least 2 to 3 times per day for 15 minutes. The exercises in all three cases were designed based on standard conventional VR for unilateral vestibular hypofunction [10].

These exercises were included gaze stability adaptation (sitting and standing, horizontal and vertical X1 with near and distant target, horizontal and vertical X2 with the small and large target, diagonal gaze stability,

walking with fixed gaze and horizontal and vertical head movement, etc.), habituation, anticipation exercise, central preprogramming, and gait exercises (walking with a fixed gaze, walking on and beside obstacles, walking on soft ground and ...

This case study was approved by the Ethics Committee of Mashhad University of Medical Sciences. The Patients signed a written consent form.

Case 1

The medical treatment for COVID-19 lasted for 2.5 months. The patient was a 28-year-old woman. The patient had vertigo since the 8th day. She also had dizziness, ear fullness, imbalance, gait abnormality, and nausea. Vertigo lasted for hours daily, increasing with head movement, standing, or walking. Imbalance and gait abnormality resolved in the first few days. The results of Fukuda's stepping gait were abnormal, and the initial DHI score was 92. The patient was consuming some medications for anxiety, and vertigo increased when she was more anxious.

The auditory tests for both ears were within normal limits. The patient also had normal results in ENG tests, except for the caloric test, which showed 41% left unilateral weakness. The v-HIT results showed normal gains for horizontal, posterior, and anterior semicircular canals (Figure 1), but the covert corrective saccades in the left horizontal semicircular indicated abnormal function. She was infected again with COVID-19 by passing four months after the first infection. It has no significant impact on the symptoms (according to the patient's DHI score), but it delayed VR for 3 weeks. After 6 months of VR, she still suffered from occasional mild episodes of vertigo. The final physical examinations were normal, and the DHI score was 26.

Case 2

The patient was a 36-year-old woman. She was home quarantined. She had vertigo since the 30th day. She only complained of mild, occasional episodes of vertigo with no other symptoms. The physical examinations were normal. The initial DHI score was 6. The patient had normal auditory results for her right ear and flat 30 dB conductive hearing loss for her left ear. This hearing loss was related to traumatic perforation of the tympanic membrane in the past 6 months. The auditory tests indicated no change relative to 6 months ago. The caloric showed 40% left unilateral weakness. The other tests, including v-HIT, were within normal limits with no corrective saccade (Figure 1). After three weeks of VR, The patient had no vertigo, and physical examinations were normal. The final DHI score was 0.

Case 3

The patient was a 42-year-old woman and was referred after three weeks. She had vertigo and a feeling of head fullness. Vertigo has been present since the 7th day. Vertigo increased with rolling in bed. She had no other symptoms. The physical examination tests were normal. The initial DHI score was 78.

The results of auditory tests were within normal limits. The ENG test was normal except for the caloric test, which showed 61% unilateral weakness on the left side. Moreover, the v-HIT test showed an abnormal low gain for left semicircular canals (Figure 1) and the covert corrective saccade in this ear.

The VR lasted 7 weeks, and the final DHI score was 0. Vertigo completely recovered.

Discussion

This case study presented the vestibular evaluation and rehabilitation of three patients with COVID-19-induced vestibular neuritis. The auditory and vestibular assessment did not differ from common vestibular neuritis cases. Patients didn't have hearing loss, and a caloric test confirmed the diagnosis of vestibular neuritis. The v-HIT results also confirmed other vestibular assessments and showed the reduced gains or presence of corrective saccades. The VR was successful in treating these patients despite some difficulties in the first patient, similar to other cases of unilateral vestibular hypo functions.

The VR is the common treatment in cases with unilateral vestibular hypofunction. The effectiveness of VR for unilateral vestibular hypo function was shown in many previous studies compared to no intervention, sham/control interventions, or medical interventions [11]. The VR is strongly recommended for treating unilateral vestibular hypofunction [12]. It improves patients' symptoms, function, and quality of life with no adverse effects [13]. The VR could also relieve the symptoms and improve postural control in patients with vestibular neuritis [13]. The VR could be performed as soon as possible in acute cases of vestibular neuritis [14]. Still, our patients were referred for the treatment because of their special situation, and we started the VR as soon

as they were available. Usually, treating vestibular neuritis could involve using some medications such as vestibular suppressants [12]. However, our patients with consultation with neuro-otologists suggested not to use medication during rehabilitation. In usual cases of vestibular neuritis, the nystagmus and vertigo would decrease after 2 weeks. Patients may have the sensation of dizziness or vertigo, even for several months, especially when moving their heads [12]. Our patients also had a similar, more severe condition for the first case.

The COVID pandemic caused a special situation. It has different psychological consequences like anxiety for many people. Especially during the COVID pandemic, female patients and those with dizziness showed higher stress, anxiety, and depression than others [15]. Additionally, patients with vertigo and psychological comorbidity, including anxiety, have more vertigo-related handicaps [16]. These psychological issues could affect both the VR process and outcome. The effects of Anxiety and depression could be reflected in the DHI scores [17, 18]. This may be related to very high initial DHI scores in our patients.

Limitations

The COVID pandemic also affected the VR process. Home-based exercises are usually used as support for regular therapeutic sessions. These are prescribed 3 times and at least 12-20 minutes per day [12]. However, many patients during the COVID pandemic were afraid to attend regular exercise sessions. We also see the need for home treatment to decrease the spread of the disease. We found using the home-based VR inevitable because this method helped many of our patients. The home-based VR needs shorter sessions. It is also more convenient for some patients to exercise at home at their chosen time and place. But it might also have some disadvantages as follows: it is unclear how much each patient exercised or did it correctly. In addition, the therapist has less control over patient's exercise and could not properly modify the exercise based on the patient's needs. So, for these reasons, the treatment period may last longer.

Conflict of Interest: None declared.

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