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Vestibular Rehabilitation for Migraine-Associated Dizziness

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Abstract: The purpose of this study was to investigate the effects of a vestibular rehabilitation program on patients with the diagnosis of migraine-associated dizziness. Subjects were placed in four groups as follows: idiopathic migraine-associated dizziness; idiopathic migraine-associated dizziness and associated benign positional vertigo; posttraumatic migraine-associated dizziness; and posttraumatic migraine-associated dizziness and benign positional vertigo. Vestibular rehabilitation therapy was administered to all patients. Criterion measurements included the dizziness handicap inventory, activities-specific balance confidence scale, computerized dynamic posturography performance, and dynamic gait index. After vestibular physical therapy, all subjects showed significant improvement in the dizziness handicap, activities-specific balance confidence, dynamic gait, and computerized dynamic posturography measures. Patients with migraine-associated dizziness can benefit from physical therapy intervention. The results of this study are important in considering the approach to vertiginous migraine patients with and without head injury.

Key Words: dizziness; head trauma; migraine; migraine-associated dizziness; vertigo

The occurrence of migraine headaches with secondary vestibulopathy and associated vestibular dysfunction is well documented [1–4]. Vestibular physical therapy rehabilitation has been established as a useful intervention in the management of patients with a wide range of vestibular disorders [5–7]. However, historically, vestibular physical therapy rehabilitation has been reserved for patients with complaints of consistent dizziness, imbalance, or other vestibular dysfunctions that are reproduced with movement activities. Vestibular physical therapy rehabilitation has been used with successful outcomes after vestibular neurectomy, labyrinthectomy, and Ménière's disease [5–8]. Gottshall et al. [9] reported successful outcome measures after vestibular physical therapy in patients with Ménière's disease. Herdman et al. [10] reported improved postural stability after a regimen of vestibular physical therapy in postoperative patients after acoustic neuroma resection.

Whitney et al. [5] conducted a retrospective study of patients complaining of migraine headaches and seen for vestibular physical therapy rehabilitation. These authors reported significant improvement in functional outcomes in their patient population after vestibular physical therapy rehabilitation. Johansson et al. [11] reported decreases in dizziness in elderly patients after vestibular physical therapy rehabilitation and cognitive behavioral therapy. Brown et al. [12] reported significant improvement in outcome measurements after a regimen of physical therapy rehabilitation in a cohort of patients exhibiting bilateral vestibular loss.

However, research has shown that patients with episodic disorders, such as migraine-associated dizziness (MAD), have not responded consistently to vestibular physical therapy rehabilitation programs [13]. The purpose of this study was to investigate the effects of a vestibular physical therapy rehabilitation program used in conjunction with preventive migraine medications for patients presenting with MAD.

PATIENTS AND METHODS

Thirty-four (25 male, 9 female) consecutive patients with migraine-related vestibular symptoms were treated

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with a customized vestibular rehabilitation program and a migraine preventive medication. Patients were followed up for a period ranging from 6 months to 3 years. All the patients had migraine headaches as classified by the international headache system [14]. In addition, all patients had vestibular symptoms of imbalance, true vertigo, dizziness, or unsteadiness. The vestibular symptoms were reported as an aura prior to the headache, during the headache, or completely independent of the headache.

All the individuals underwent a workup that included a detailed otolaryngologic history and physical examination, standard neurological examination, and a magnetic resonance imaging scan to rule out a cerebellopontine angle lesion or other pathological findings. We administered to each patient a functional test battery consisting of an impulse head-thrust test, a Fukuda step test, a Romberg test, a tandem Romberg test, and a dynamic gait index (DGI) [7]. Each patient also underwent a sensory organization test, a motor control test, and an adaptation test on computerized dynamic posturography (CDP). In addition, we administered the dizziness handicap index (DHI) [9] and the activities-specific balance confidence (ABC) scale surveys [8]. The foregoing measurements were obtained before treatment, during treatment, and after treatment (6–8 weeks after treatment initiation). We documented subjective patient reports of degree and length of imbalance perception throughout treatment. Finally, we recorded the length of time required for patients to return to work after the initiation of physical therapy.

We studied 25 male and 9 female patients (age range, 11–56 years; mean age, 32 years). The patients were divided into four groups. Group A consisted of six patients with idiopathic migraine-associated dizziness (IMAD); these patients had at least a 2-year history of migraines and at least 6 months of vestibular symptoms and had failed to respond to medical therapy. Group B consisted of four patients with IMAD and benign positional vertigo (IMADBPV); they were identical to the group A patients but, in addition, had BPV as defined by a positive Dix-Hallpike test on their initial visit. Group C consisted of 17 patients with posttraumatic closed-head-injury migraine-associated dizziness (PTMAD); these patients had suffered a closed-head injury with a Glasgow comma scale rating of 13–15 and no loss of consciousness. They were initially evaluated by our medical system within 2 weeks of the head injury and then were referred to our clinic. These patients had no prior pathological findings or history of headaches and reported an interval of approximately 2 weeks between head injury and headaches. Group D consisted of seven patients with PTMAD and BPV (PTMADBPV); they were identical to the Group C patients but, in addition, had BPV as defined by a positive Dix-Hallpike test on their initial visit.

The vestibular rehabilitation strategy employed specific exercises designed to decrease dizziness, increase balance function, and increase general activity levels. Exercises to decrease dizziness focused on exposure to specific stimuli for habituation or attenuation of the dizziness response in the brain. Balance retraining involved exercises designed to improve organization of sensory information for balance control and coordination of muscle responses. General activity exercise involved a daily aerobic exercise program of progressive walking, cycling, or swimming.

Specifically, the vestibular exercise program included vestibuloocular reflex exercises, cervicoocular reflex exercises, depth perception training, somatosensory retraining, and varied ambulation skill exercises. The vestibuloocular reflex exercises, cervicoocular reflex exercises, and depth perception training were graded in difficulty based on increases of head motion, object motion, and progression of body positioning from sit to stand to ambulation. The somatosensory exercises were graded in difficulty by narrowing the base of support, making the surface uneven, changing the surface from firm to soft, or the wearing of distortion lenses to decrease visual preference.

Large-amplitude head and trunk movements were also employed to increase somatosensory input. These exercises included the proprioceptive neuromuscular facilitation techniques of slow-reversal head and neck patterns, modified chopping and lifting for head and trunk in progression from supine to sitting and standing postures, and total body mass rolling activities.

Ambulation exercises were graded in difficulty by a change in direction, performance with eyes closed, increasing speed of ambulation, proprioceptive neuromuscular facilitation, resisted balance and resisted gait, walking on soft surfaces, and stair climbing. During ambulation, patients were challenged with distracting stimuli, which included stationary obstacles, moving objects, and ball skills.

Patients were also instructed in a progressive aerobic exercise program of increasing time and distance and were instructed to perform the exercises twice daily at home. They were monitored by the physical therapist twice the first week and once weekly for the subsequent 7 weeks. Patient compliance to the home exercise program was surveyed by the physical therapist during patient visits.

All patients were treated with low-dose Neurontin as a migraine preventive medicine (100 mg twice daily). All patients had the medicines discontinued 3–4 months after the resolution of symptoms. Comparisons using a one-way ANOVA were performed between pre- and

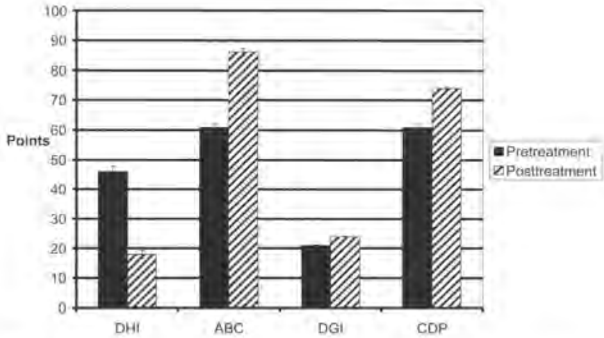

Figure 1. Analysis of outcomes measures for the entire study. An improvement in the dizziness handicap index (*DHI*) is demonstrated by a reduced posttreatment score. The other three measures—activities-specific balance confidence scale (*ABC*), dynamic gait index (*DGI*), and sensory organization test score on computerized dynamic posturography (*CDP*) are improved as indicated by an increase in the posttreatment score.

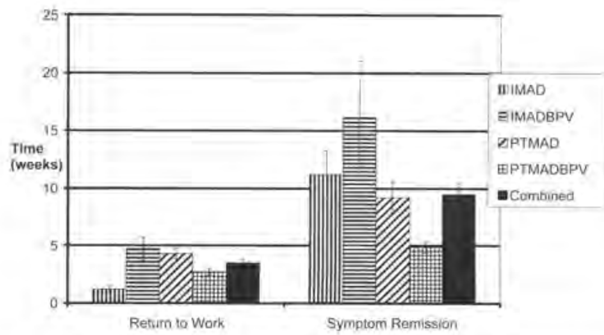

Figure 3. Time required for return to work and for symptoms resolution after initiation of treatment for each group and for the entire study. Differences between the groups were not significant. (*IMAD* = idiopathic migraine-associated dizziness; *IMADBPV* = idiopathic migraine-associated dizziness with benign positional vertigo; *PTMAD* = posttraumatic migraine-associated dizziness; *PTMADBPV* = posttraumatic migraine-associated dizziness with benign positional vertigo.)

posttreatment test results for all the patients, for each group of patients, and to compare groups. Significance was accepted at a p value of .05.

RESULTS

We studied 25 male and 9 female patients (age range, 11–56 years; mean age, 32 years). The mean age was 31 years for the PTMAD group and 29 years for the PTMADBPV group. The posttraumatic groups' mean ages were younger than the mean ages for the nontraumatic groups. The mean age of the IMAD group was 36 years and, for the IMADBPV group, 37 years.

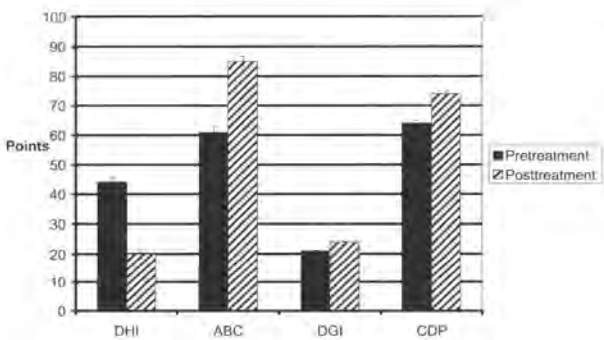

Figure 2. Analysis of outcomes measures for patients who suffered mild head injury (posttraumatic closed-head-injury migraine-associated dizziness and posttraumatic closed-head-injury migraine-associated dizziness and benign positional vertigo groups). All measures demonstrated significant improvement after treatment. (*DHI* = dizziness handicap index; *ABC* = activities-specific balance confidence scale; *DGI* = dynamic gait index; *CDP* = computerized dynamic posturography.)

Figure 1 demonstrates the results of the DHI, ABC, DGI, and CDP measurements before and after 6–8 weeks of treatment for all the patients studied. As can be seen, significant improvement is noted on each measure. Analysis of individual group differences demonstrated significant improvement for all four groups on the DHI ($p < .05$). However, only the two posttraumatic groups showed significant improvement in the ABC, DGI, and CDP (Fig. 2). The nontraumatic groups also showed improvement in the ABC, DGI, and CDP, but the difference did not attain significance.

The results of the time to return to work and time to remission of symptoms are presented in Figure 3. The time required to return to work from the date of initiation of treatment ranged from 1.2 weeks to 4.7 weeks (mean, 3.5 weeks). The difference in time to return to work between the groups was not significant.

The mean time required to achieve remission of symptoms was 9.5 weeks (range, 4.9–16.3 weeks). However, the two posttraumatic groups demonstrated shorter remission times, with a combined average of 7.5 weeks as compared to 13.5 weeks for the nontraumatic group.

DISCUSSION

Our work demonstrates that vestibular physical therapy rehabilitation strategies produced improvement in DHI, ABC, DGI, and CDP measures for all groups studied. This agrees with the work of Whitney et al. [5], Johnson [15], and Wrisley et al. [16] in migraine patients with vestibular disorders. Our results are unique in that our population was predominantly male and composed of a high number of posttraumatic patients.

Nevertheless, our group response was similar to previously studied groups.

As we have indicated, this study had a greater population of male subjects and a greater population of younger subjects than did previous studies [6,15,16]. The posttraumatic groups accounted for the majority of these differences. These two groups were composed primarily of active-duty military personnel engaged in strenuous physical activity, and they were at a high risk for head trauma. Both posttraumatic groups showed more improvement than did the other groups after vestibular rehabilitation procedures. The younger age of this group, their general high level of physical condition, and their level of motivation may have influenced this result. In addition, we are reporting on patients with coincident BPV. The 33% rate that we report in this study does not differ from previous work in the literature. In particular, we cite the reports by Baloh [17] and Herraiz et al. [18], who note a 34.7% rate of BPV in patients with migraines.

All patient groups responded to vestibular rehabilitation. We analyzed the time required to return to work and the time required for remission of symptoms. In a comparison of the nontraumatic groups to the posttraumatic groups, the posttraumatic groups had remission of symptoms in one-half the time required by the nontraumatic groups (7.5 versus 13.5 weeks), but the posttraumatic groups took more time to return to work than did the nontraumatic groups (3.5 versus 2.6 weeks). A factor that might have produced this longer return-to-work time in the posttraumatic groups was a more physically demanding work environment. The posttraumatic groups were composed of individuals who sustained a head injury in sports, military training, military combat, or motor vehicle accidents. As the mechanism of injury did not affect outcome, our results have implications for treating head injuries received in high-risk, collision sports (such as football, ice hockey, boxing, and rugby).

In this study, we have not compared these treated patient groups to control (nontreated) groups. Because the final outcome data of all groups were the same, we can now compare this entire group of patients to a control group of untreated patients. This is advantageous because a comparison of all treated to all nontreated patients will allow for a more statistically powerful analysis. This work is under way in our laboratory.

Finally, all patients in this study were maintained on a migraine preventive medication. This was thought to be necessary to treat the underlying migraine pathology. Certainly a controlled study comparing medicated to nonmedicated individuals would be helpful.

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