VESTIBULAR REHABILITATION CONTRIBUTION TO IMPROVEMENT OF HEALTH-RELATED QUALITY OF LIFE IN VESTIBULAR NEURONITIS

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ABSTRACT

Objective. Our study aims to evaluate health-related quality of life (HRQoL) and reveal the actual benefit of vestibular rehabilitation (VR) in patients with vestibular neuronitis.

Material and methods. Twenty four patients diagnosed with vestibular neuronitis in the Institute of Phono-Audiology and Functional ENT Surgery and Otomed Medical Center Bucharest were assigned to 2 groups who underwent 1 month of VR in the aforementioned settings. Group 1 included patients who started VR within first month of disease and group 2 comprised patients who began VR after more than a month from the onset of symptoms. Group 2 served as control group because they began VR after group 1 had already finished one month of VR. HRQoL was assessed before and after VR, using Dizziness Handicap Inventory (DHI), Activities-specific Balance Confidence scale (ABC), disability scale and Visual Analog Scale (VAS).

Results. Both groups achieved statistically significant improvements in almost all questionnaires after VR ($p < 0.05$). When group 1 scores after one month of VR were compared to control group results before VR, we found statistically significant differences in DHI-Physical, disability scale and VAS ($p < 0.05$). After one month of VR, 13 patients became symptom-free, while 11 patients still had bothering symptoms and continued VR. The latter category revealed significantly higher DHI scores and levels of intensity of symptoms on VAS during first examination ($p < 0.05$).

Conclusions. VR improves HRQoL after vestibular neuronitis and reduces self-perceived disability and intensity of symptoms during usual activities. Higher DHI and VAS scores at first evaluation may predict a longer VR period needed. The clinical and emotional benefit of VR overweight it's costs and recommend it as a valuable method in the management of vestibular neuronitis.

Key words: vestibular neuronitis, health-related quality of life, rehabilitation

INTRODUCTION

Vestibular neuronitis is an acute vestibular disorder caused by an imbalance of the afferent neuronal input between the ears which is clinically expressed as long-lasting vertigo, nausea, vomiting and gait impairment. Its etiology remains unknown, the most popular theory suggesting a viral cause which is supported by the presence of herpes simplex type 1 in vestibular ganglia (1).

Physical recovery usually happens very soon after the onset of vestibular neuronitis, but residual symptoms tend to restrict daily activities even when they are physically possible. This is caused by the fact that patients still worry about the next episode of vertigo or dizziness and try to avoid several apparently triggering situations and also because vestibular deficit after vestibular neuronitis doesn't compensate completely on its own. Theref ore, recovery assessement is relevant only when taking into account the patient's perspective and not just completing physical performance tests. In order to evaluate a patient's self perception of health status and health-related quality of life

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(HRQoL), many tools have been proposed over the years. Whether the y quantify the degree of disability associated with any cause of dizziness (DHI), the fear of falling in everyday situations (ABC), the global self-perceived disability (disability scale) or the intensity of dizziness (visual analog scale), they all serve the physician a larger view over the impairment and the way it evolves during treatment.

One of the current treatment modality for vestibular dysfunction, vestibular rehabilitation (VR) is also widely accepted in the treatment protocol of patients with vestibular neuronitis. The actual outcome of a VR program is difficult to assess because most patients with vestibular neuronitis will get better on their own, so the improvement achieved can't be entirely attributed to rehabilitation therapy. Assessment of HRQoL before and after VR can measure the contribution of treatment in reducing the impact of disease in daily life. Improvement of HRQoL after rehabilitation protocol certifies the success of VR.

Our study evaluates HRQoL in patients with vestibular neuronitis and VR contribution to its improvement.

MATERIAL AND METHODS

This study consists in a prospective analyze of patients with vestibular neuronitis referred to the Institute of Phono-Audiology and Functional ENT Surgery Bucharest and Otomed Medical Center Bucharest from November 2010 till March 2012.

All patients included in the study were diagnosed with vestibular neuronitis based on medical history, clinical ENT examination (including Romberg/sharpened Romberg, stepping and head thrust tests), infrared oculography, computerized dynamic posturography (CDP) and pure-tone audiometry.

We excluded: pregnant women, patients who lived far away from the hospital (another city) and non-adherent patients to the VR program.

Patients received symptomatic treatment consisting in vestibular sedatives (diazepam), antiemetics (metoclopramide) for 3 days and corticosteroids for 5 days if they were enrolled in the study during their first days of disease. Otherwise, they all underwent medical treatment (betahistine 24 mg PO BID) and VR. The latter was started immediately after vestibular suppressant treatment and consisted in twice a day home-exercises and once a week training session under specialized supervision in the Institute of Phono-Audiology and Functional ENT Surgery or Otomed Medical Center. Home-exercises were derived from Cawthorne's (2), Cooksey's (3) and Herdman's (4) protocols and were used according to the patient complaints and improvement of symptoms. The weekly session comprised exercises of weight shifting and mobility on a powered platform providing visual feedback of the centre of gravity and adjustable surface and surround (Fig. 1) or virtual reality environment exposure and engagement in different virtual activities which challenge balance and retrain it. These exercises were also customized to each patient according to symptoms and impairments and were progressively more difficult.

FIGURE 1. *Exercises on a powered platform with visual feedback, adjustable surface and surround in Otomed Medical Center Bucharest*

Rehabilitation treatment ended when patients' complains became minimal and their daily activities were entirely and successfully resumed.

Patients were required to fill in several questionnaires before starting VR and one month afterwards, in order to quantify their HRQoL. We used 3 questionnaires reflecting HRQoL: DHI, ABC scale, disability scale, and one which quantifies symptoms: VAS.

Developed in 1990 by Jacobson and Newman (5), DHI is one of the most commonly used 'standardized questionnaires' in assessing the dizzy patient. It is a validated, self-report questionnaire consisting in 25 questions which assess the physical activity affected by dizziness and unsteadiness

as well as the functional and emotional consequences of the vestibular disease. There are 7 questions for physical aspects, 9 questions assessing emotional aspects and 9 evaluating functional issues. The answer options are: 'yes', 'no' and 'sometimes'. Four points are given to a 'yes' answer, 0 points to a 'no' and 2 points to a 'sometimes'. The total score ranges between 0 and 100: 0–30 indicates mild, 31-60 moderate, and 61–100 severe handicap caused by dizziness (6). According to the original authors (5), a decrease of al least 18 points in DHI total score is considered to reflect significant reduction of disability for an individual. Scores for the 3 subscales (physical, emotional, functional) can also be calculated and used separately.

DHI has proven to be a useful tool in measuring the disability resulting from dizziness and unsteadiness and nowadays it is widely used as an outcome measure of the treatment of vestibular disorders.

ABC (7) is a 16-item, self-report questionnaire measuring confidence in performing various ambulatory activities without falling: walking around the house, up or down stairs, up or down a ramp, in crowded places, on icy sidewalks, reaching for something, bending over and picking something, getting into or out of a car, stepping onto or off an escalator. Patients were asked to rate their confidence in performing each of the stated activities on a scale from 0 to 100%, whereas 0 means no confidence and 100 indicates complete confidence. Overall score is calculated as the mean mathematical value of the 16 different items rates. Lower ABC scores are associated with lower levels of mobility (8) and fall (9). A total score lower than 67% indicates a risk for falling (9). Any increases in the ABC score after treatment represents an improvement in balance confidence.

ABC scale was developed by Powell and Myers (7) in 1995 from the Falls Efficacy Scale (10) to which there have been added new challenging activities. Although the initial intent of the questionnaire was to assess elderly people's everyday difficulties and the content is not specific to vertigo, ABC scale seems to correlate significantly with DHI in patients with vestibular disorders (11).

Disability scale (12) developed by Shepard and colleagues is an instrument which quantifies the overall self-perceived disability. It is a 6-item scale of disability scored as follows: 0 – no disability, negligible symptoms; 1 – no disability; bothersome symptoms; 2 – mild disability; performs usual work/duties, but symptoms interfere with outside activities; 3 – moderate disability; symptoms disrupt performance of both usual work and outside activities; 4 – recent severe disability; on medical leave or had to change job because of symptoms; 5 – established severe disability; unable to work for over 1 year or established permanent disability with compensation payments. Patients had to choose the one statement that best described how they felt about their symptoms. The authors provided evidence that disability scale can predict rehabilitation outcome and is responsive to therapeutic intervention. A score of 4 or 5 points correlates with a poor rehabilitation outcome.

Visual analog scales have been reported to be valid and reliable for a variety of symptoms, their most common use being for assessement of pain intensity.

The intensity of subjective symptoms such as dizziness, stability or oscillopsia can also be evaluated with a 10-cm VAS (13,14). We measured the intensity of the 3 symptoms in the following situations: dizziness while sitting and after one minute of horizontal head movement at a frequency of 1 Hz, visual clarity while sitting, walking and being in a car that is moving, steadiness while sitting and walking. We used a 10-cm vertical line for each of these situations. The top of the line signifies 'as bad as it can be' and the bottom means 'no dizziness/instability/visual difficulty at all', depending on the symptom assessed. These words were anchored at the corresponding end of the line. Patients were instructed to draw a horizontal line along the 10-cm vertical line according to the severity of their symptoms. The score for each situation is calculated as the distance from zero ('no dizziness/instability/visual difficulty at all') to the mark (in centimeters). The total score of the VAS is the mean mathematical value of the 7 measured distances.

Because most scientific papers (15,16) agree to the fact that VR is beneficial to patients with vestibular neuronitis and our clinical experience also support the theory that recovery happens faster and almost completely after VR, we could not refrain any patient from undergoing this form of therapy. Therefore, all patients followed a VR program. In order to have a control group which could certify the efficacy of one month rehabilitation protocol, we separated the lot in group 1: patients who started rehabilitation during their first month of disease, and group 2: patients who started physical therapy after one month from the onset of symtoms. We considered the latter to be our control group because these patients' recovery was spontaneous for more than a month, while the others' recovery during first month was facilitated by the VR program. The 2 groups were similar regarding gender ($p >$

0.05, Fisher's Exact Test), age, severity of symptoms (VAS) and compensation of vestibular deficit (CDP) before starting VR ($p > 0.05$, Mann-Whitney U test). Postrehabilitation tests of group 1 were compared to initial tests of group 2 because both groups were in similar moments in time from their onset of symptoms. Thus, the actual benefit of VR was measured.

We calculated pre and post vestibular rehabilitation scores for DHI (total, physical, emotional, functional), ABC, disability scale and VAS in order to evaluate the benefits achieved in HRQoL for both groups.

Data were analyzed using SPSS version 19 statistical package. The nonparametric Wilcoxon signed rank test was used to compare the parameters obtained before and after rehabilitation within the whole lot and each group. The nonparametric Mann-Whitney U test was used to compare scores between group 1 and group 2 and also between symptom-free patients and patients with residual symptoms after one month of VR. A p value below 0.05 was considered statistically significant. Statistically significant differences were written in bold in the tables.

RESULTS

We followed-up 24 patients, 13 women and 11 men. The mean age was 43.9 years old (range 12-74). All patients were active persons and stated their overall functional status was 100% prior to the onset of symptoms. The whole lot experienced vertigo lasting for hours to days, gait impairment, nausea and some of them even vomiting. Most of them (18 patients) were admitted to a hospital for 2 to 10 days and underwent intravenous treatment, including corticosteroids.

Every patient's scores before and after VR for all questionnaires are displayed in Fig 2 and Fig 3.

The mean mathematical value of the pre and post rehabilitation scores in DHI (total, physical, emotional, functional), ABC, disability scale and VAS and their comparison are displayed in table 1. The higher the difference, the greater is the improvement perceived by patients in their HRQoL. We used the Wilcoxon signed rank test to compare the parameters before and after VR for both groups and there were significant improvements in most questionnaires ($p < 0.05$).

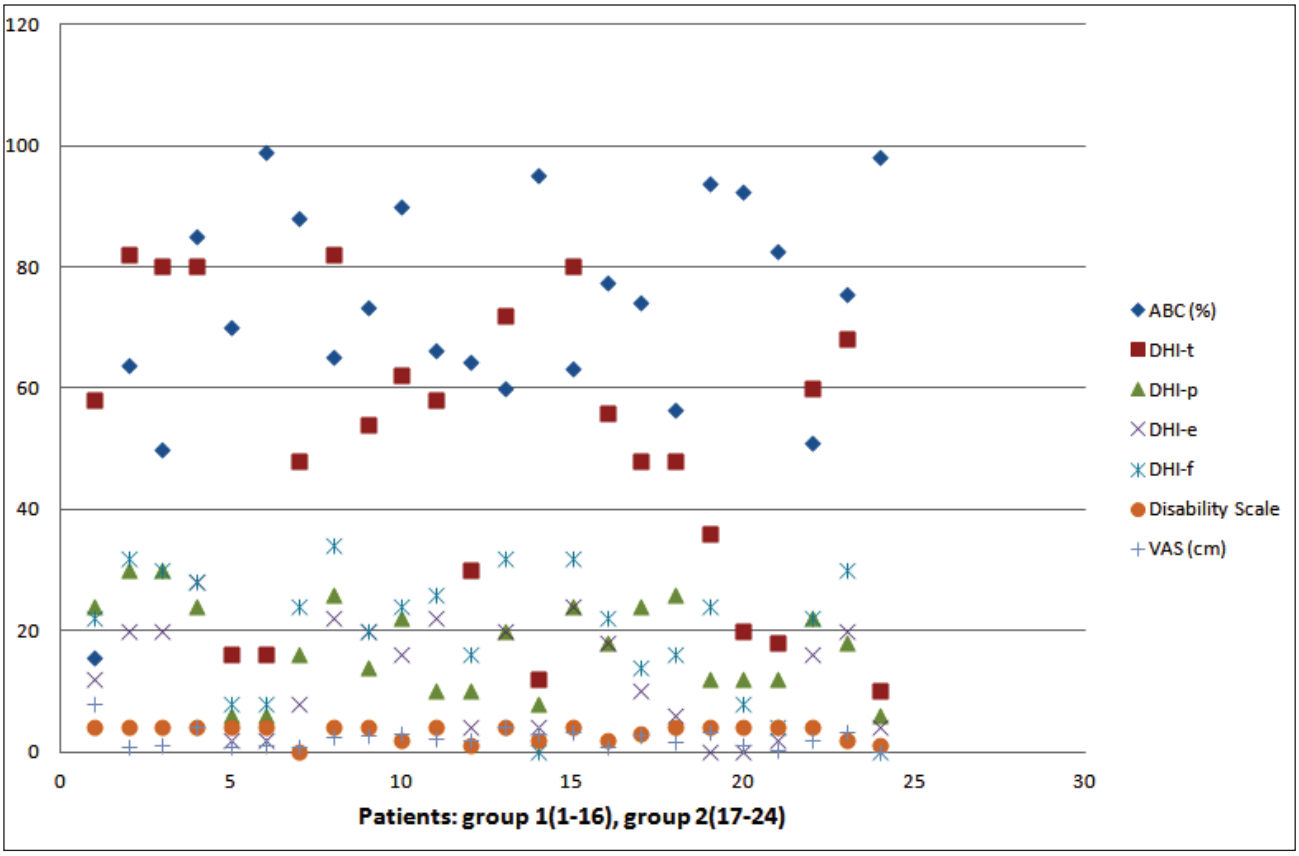

***FIGURE 2**. Results of all questionnaires for every patient before VR*

ABC: Activities-specific Balance Confidence scale. DHI-t: Dizziness Handicap Inventory-total score. -p: physical score. -e: emotional score. -f: functional score. VAS: Visual Analog Scale.

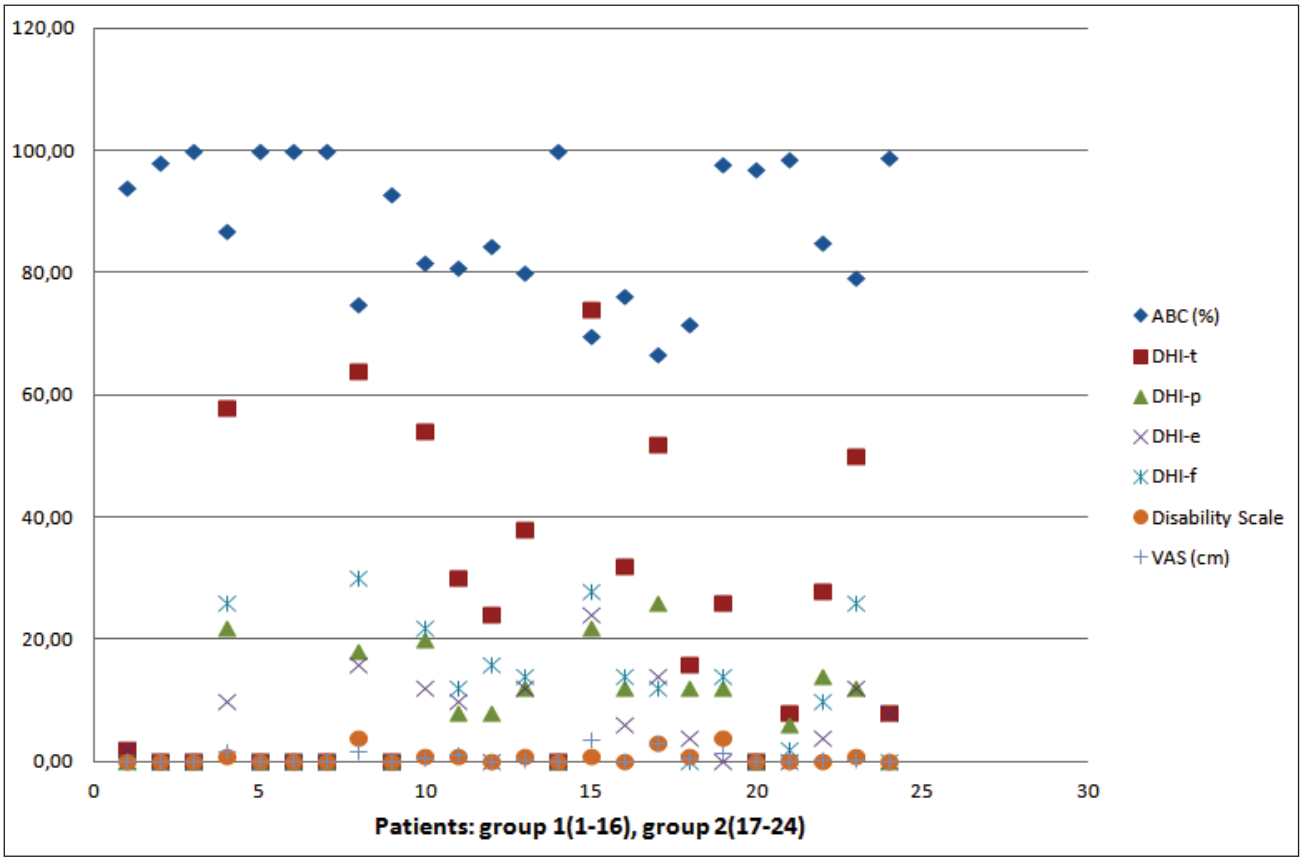

FIGURE 3. *Results of all questionnaires for every patient after VR*

ABC: Activities-specific Balance Confidence scale. DHI-t: Dizziness Handicap Inventory-total score. -p: physical score. -e: emotional score. -f: functional score. VAS: Visual Analog Scale.

TABLE 1. *Mean scores of all questionnaires for both groups, intragroup and intergroup comparison*

	Group 1			Group 2			P*
	Pre-VR	Post-VR	P1	Pre-VR	Post-VR	P2	
ABC (%)	70.3±20.1	88.7 ± 10.5	**0.003**	77.9±17.2	86.8 ± 13.1	0.069	0.093
DHI-t	55.3±24.8	23.5 ± 27	**0.001**	38.5 ± 21	23.5 ± 19.3	**0.025**	0.153
DHI-p	18 ± 8.2	7.6 ± 8.8	**0.001**	16.5 ± 7	10.2 ± 8.4	**0.027**	**0.023**
DHI-e	15.1 ± 8.5	5.7 ± 7.4	**0.002**	7.2 ± 7.4	5.2 ± 5.5	0.461	0.490
DHI-f	22.3 ± 9.9	10.1 ± 11.5	**0.002**	14.7±10.3	8 ± 9.3	**0.018**	0.264
Disability Scale	3.1 ± 1.3	0.5 ± 1	**0.002**	3.2 ± 1.1	1.1 ± 1.5	**0.026**	**0.001**
VAS (cm)	2.5 ± 1.8	0.6 ± 0.9	**0.002**	1.7 ± 1.2	0.7 ± 1	**0.034**	**0.032**

VR: Vestibular Rehabilitation. ABC: Activities-specific Balance Confidence scale. DHI-t: Dizziness Handicap Inventory-total score. -p: physical score. -e: emotional score. -f: functional score. VAS: Visual Analog Scale. P1: p value for intragroup 1 comparison. P2: p value for intragroup 2 comparison. P*: p value for comparison between Post-VR scores of group 1 and Pre-VR scores of group 2.

Group 1 started physical therapy at a mean period of 1.52 weeks from the onset of symptoms (range 1-3), while group 2 began rehabilitation at 7.25 weeks from the first day of disease (range 5-12.8) (Fig 4). **In order to dissociate the effect of VR over HRQoL from spontaneous recovery, we compared the post-rehabilitation results of group 1 with the pre-therapy scores of group 2 (control group) (Table 1).** Statistically significant differences were found for Physical aspect of DHI, disability scale and VAS (P* < 0.05, Mann-Whitney U test). There were no significant differences in DHI total score, Functional and Emotional aspects of DHI and ABC scale (P* > 0.05, Mann-Whitney U test). The post-rehabilitation results of group 1 did not significantly differ from the post-rehabilitation results of group 2 (p > 0.05, Mann-Whitney U test).

After 1 month of VR, 13 patients (54.1%) became symptom-free, while 11 patients (45.9%) still had bothersome symptoms and continued rehabilitation. We analyzed whether there was any aspect from the initial evaluation that could indicate the

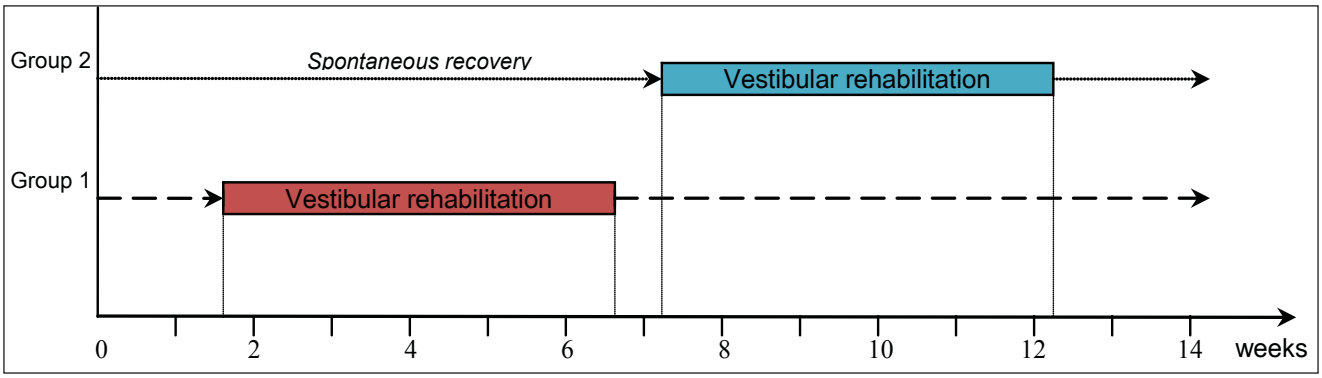

FIGURE 4. *Evolution in time for group 1 and group 2*

resolution of symptoms after a month of VR. Patients with residual symptoms did not differ significantly regarding gender, age and time from the onset of symptoms from those without symptoms ($p > 0.05$, Fisher's exact test, Mann-Whitney U test). The 2 categories also scored similar results in Physical aspect of DHI, ABC and disability scale before therapy ($p > 0.05$, Mann-Whitney U test). They had though statistically significant differences before therapy in DHI total, emotional and functional scores and the intensity of symptoms measured by VAS ($p < 0.005$, Mann-Whitney U test). Symptom-free patients had a mean pre-therapy VAS score of 1.8, while patients with residual symptoms had a mean score of 2.7 on pre-therapy VAS.

DISCUSSION

Vestibular neuronitis is a condition that usually affects active, healthy, middle-aged people. Worsening the HRQoL in this category of people has a negative impact on their social life and work performance, leading not only to psychological damage (low self-confidence, depression, frustration), but also economical losses (long medical leave, poor concentration and performance). A customized VR program seems to be the treatment of choice for them because its effectiveness, safety and low-cost.

In agreement with other studies (17,18,19,20), the present one has shown that VR can significantly reduce vestibular symptoms, improve self-perception of disability, emotional and functional status and promote independent activities. In order to identify the benefits and limits of a customized VR program for vestibular neuronitis and try to improve it, adequate tests should assess disability and symptoms before and during physical therapy. The questionnaires used in our study had proven to be responsive to therapeutic intervention, therefore helpful in assessing VR effects on HRQoL.

DHI total scores for both groups show that most patients in our study had a moderate level of disability before VR (mean score 31-60), but improved to mild or no disability level (mean score < 30) at the end of the protocol (6). When we compared the DHI total scores before and after VR, we found statistically significant differences for both groups ($p < 0.05$, Wilcoxon signed rank test) (Table 1). Physical and functional aspects of DHI also revealed statistically significant differences between first evaluation and one month afterwards in both groups, while emotional score improvement after one month was not significant for group 2 (Table 1).

The significance of ABC results are similar to DHI. The questionnaire indicates moderate functional level (mean score 50-80) before VR and high functional level (mean score > 80) at the end of the protocol for all patients (7). Although both groups improved their scores after VR, only group 1 had statistically significant differences ($p = 0.002$, Wilcoxon signed rank test) (Table 1).

In agreement with DHI and ABC, the disability scale also revealed that most patients had moderate disability (score 3: symptoms disrupt performance of both usual work and outside activities) at the begining of VR. No patient from our lot had to change his job because of vestibular neuronitis. The difference between disability scale scores before and after VR was statistically significant for both groups ($p < 0.05$, Wilcoxon signed rank test) (Table 1).

The degree of dizziness, stability and visual clarity as perceived by a patient in usual situations (sitting, standing, walking, following head movements) also decreased considerably after a month of VR for both groups ($p < 0.05$, Wilcoxon signed rank test) (Table 1).

Many clinicians feel that VR is appropriate for the treatment of vestibular neuronitis, but some of them consider that spontaneous evolution of the disease is enough for most cases to recover and only few patients may actually need it. Trying to

get a point of view over this matter, we considered a control group (group 2) of patients who came to our department after more than one month from the onset of disease, so their VR started later. Our initial evaluation of these patients, who hadn't benefited from VR, was compared to the evaluation after one month of VR of patients who started rehabilitation within first month of disease. Thus both groups were in similar moments from the onset of vestibular neuronitis, but one evolved spontaneously, while the other underwent VR. The analyze revealed better scores in all questionnaires for patients undergoing VR, but statistically significant differences were detected only in Physical aspect of DHI, disability scale and VAS (Table 1). These mean that VR decreases self-perceived global disability (disability scale), allows more movements of eyes, head and body without onset or worsening of symptoms (Physical aspect of DHI) and minimizes dizziness, unsteadiness and oscillopsia (VAS). The confidence regarding physical performance (ABC) was higher in group 1 after VR than in group 2 before VR, but the difference didn't reach statistic significance. Moreover, emotional, functional and DHT total scores tended to be lower in group 1, indicating a lower level of disability, although their differences were not statistically significant. With or without VR, patients with vestibular neuronitis seem to have similar impairments in performing professional, domestic or social activities, dependence to perform walk outside the house or in the dark (Functional aspect of DHI), frustration, depression and shame of disease (Emotional aspect of DHI). These findings suggest that spontaneous evolution of vestibular neuronitis may allow a patient to resume his usual activities, but troublesome symptoms and a higher self-perceived handicap may persist and affect his HRQoL. VR promotes adaptation and habituation to symptoms in patients with vestibular neuronitis, therefore better and faster return to normal life. Our findings are in agreement with other studies (21,22) which showed the ability of VR to improve central compensation after vestibular neuronitis.

Considering the duration of a VR program necessary to vestibular neuronitis patients, our study tried to find out whether one month of rehabilitation was enough for a patient to get symptom-free. The results revealed that one month of VR was enough for only 54.1% patients, while 45.9% patients had to continue VR program due to residual bothering symptoms. In order to determine whether there was any aspect from the initial evaluation that could predict the outcome of one month of VR, we compared symptom-free patients with patients with residual symptoms. There was not a statistically significant difference concerning age, gender and time past from the onset of disease, which is in agreement with another study about remaining symptoms after 6 months from an acute unilateral vestibular loss (23). Conversely, Godeman et al (24) found that female sex correlated with chronic vertigo after 6 months in patients with vestibular neuronitis and Bjerlemo et al (25) proved that higher age was related to sick leave 6 months after acute unilateral vestibular loss.

In our study, physical aspect of DHI, ABC and disability scale could not predict remaining symptoms after one month of VR because their results during first examination were similar in patients with and without residual symptoms. We found though that DHI total, emotional and functional scores before therapy were significantly higher in patients with residual symptoms after 1 month of VR ($p < 0.05$, Mann-Whitney U test). Besides this, the overall level of dizziness, unsteadiness and oscillopsia while sitting, walking and being in a car that is moving, as measured by first VAS evaluation, also differed considerably between patients with and without symptoms after one month of VR ($p < 0.05$, Mann-Whitney U test). These suggest that higher scores on DHI and VAS during first evaluation may indicate remaining symptoms after one month, therefore longer period of VR needed. Similar results were found by Kammerlind et al (23) in a study of 40 patients suffering from acute unilateral vestibular loss who underwent at home VR exercises. They proved that patients with substantial symptoms after 6 months had significantly higher scores on DHI and VAS (dizziness during movement and at rest) before starting therapy. Nevertheless, we consider that larger groups of patients would be necessary to precisely identify the power of DHI and VAS to predict remaining symptoms after VR in patients with vestibular neuronitis.

CONCLUSIONS

Vestibular neuronitis causes moderate disability which gets mild or disappears after VR.

The VR exercises can improve HRQoL and reduce self-perceived disability and intensity of symptoms during usual activities.

Higher DHI and VAS scores at first evaluation may predict a longer VR period needed.

The clinical and emotional benefit of VR overweight it's costs and recommend VR as a valuable method in the management of vestibular neuronitis.

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