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Evaluating Quality of Life in Patients With Meniere's Disease Treated as Migraine

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Abstract

Objective: To evaluate the change in quality of life (QOL) of patients with Meniere's disease (MD) after treatment with migraine prophylaxis therapy.

Methods: Patients with definite MD were given the Meniere's Disease Outcomes Questionnaire–Retrospective (MDOQ-R) after migraine prophylactic therapy to assess QOL. Changes in physical, emotional, and social parameters affected by MD were calculated, along with a global pre- and posttreatment QOL scores.

Results: The MDOQ-R was given to 27 consecutive patients with definite MD. Patients who had at least an 18-month follow-up were included, resulting in 25 questionnaires. The mean change in QOL score was 25 ± 16 (range, –3 to 55), $P = .02$. Quality of life was improved in 23 (92%) of the respondents in every metric measured, unchanged in 1 (4%), and poorer in 1 (4%) of patients after migraine prophylaxis treatment.

Conclusions: Majority of MD patients who had all failed diuretic therapy responded positively to medications used for migraine prophylaxis, as indicated by a significant improvement in QOL. This study may further suggest a correlation between the pathophysiologic basis of disease in MD and vestibular migraine. Patients with MD may be successfully managed with medications intended to treat migraine.

Keywords

vestibular migraine, Meniere's disease, quality of life, migraine, dizziness, vertigo

Introduction

The prevalence of Meniere's disease (MD) in the United States is estimated to be 190 per 100 000. It is more likely to occur in women, and the prevalence increases significantly with aging.[1] Meniere's disease is a chronic and intermittent disorder with a variety of fluctuating signs and symptoms, which include vertigo, hearing loss, tinnitus, aural pressure, and disequilibrium, among others.[2,3] If left untreated, these symptoms may lead not only to physical consequences, including imbalance and hearing loss, but also mental and psychological problems, such as depression, anxiety, panic, and cognitive defects, especially in the elderly.[4] Treatment of these patients usually begins with conservative therapy, including initiating a low-sodium diet, improving sleep hygiene, and avoiding stress and products that contain caffeine.[5] The next step in the treatment is diuretic therapy with medications such as hydrochlorothiazide.[6] Intratympanic therapy and surgery are options if medical therapy has failed.[7]

Previous studies have shown remarkable overlap between the signs and symptoms of vestibular migraine (VM) and those of MD. These include episodic vertigo, tinnitus, and sensorineural hearing loss (SNHL), which may also be experienced by patients with VM.[8-10] Disequilibrium, vertigo, and tinnitus cause significant morbidity in individuals with both disorders leading to physical and psychological impairment. Such overlaps may lead to misdiagnosis of MD as VM or vice versa. Although there are 2 sets of separate criteria for the diagnosis of MD (American Academy of Otolaryngology—Head and Neck Surgery [AAO-HNS] criteria)[11] and VM (International Headache Society [IHS] criteria),[12] there are

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Table 1. Vestibular Migraine: Diagnostic Criteria.

A. At least 5 episodes fulfilling criteria C and D
B. A current or past history of 1.1 Migraine without aura or 1.2 Migraine with aura
C. Vestibular symptoms of moderate or severe intensity, lasting between 5 minutes and 72 hours
D. At least 50% of episodes are associated with at least 1 of the following 3 migrainous features:
1. headache with at least 2 of the following 4 characteristics:
a. unilateral location
b. pulsating quality
c. moderate or severe intensity
d. aggravation by routine physical activity
2. photophobia and phonophobia
3. visual aura
E. Not better accounted for by another ICHD-3 diagnosis or another vestibular disorder.

no definitive diagnostic test that can distinguish these 2 from each other. The criteria for VM was set by an accord between the IHS and Barany society classification committees in 2014, which has been published in ICHD-3 (International Classification of Headache Disorders-3) (Table 1).[12]

Due to the debilitating nature of the disease, one of the most important goals of management is improving the quality of life (QOL) of the patient.[1,13] Proper management and control of symptoms with medical therapy and lifestyle modification programs can substantially and effectively decrease functional disability and handicap associated with vestibular disorders. It has been observed that nearly all patients diagnosed with definite MD have many symptoms of VM and responded to medications that are intended to be used for migraine.[8] This study was designed to evaluate and measure the changes in the QOL in patients with definite MD who had failed diuretic therapy and were treated with migraine prophylactic medications.

Methods and Materials

Patients

We retrospectively evaluated surveys from patients diagnosed with definite MD according to the AAO-HNS criteria and negative for vestibular migraine based on IHS criteria from January 2014 to August 2014 at our tertiary care neurotology practice.[12] These patients were subsequently treated with migraine prophylactic medications.

Patients with a chief complaint of vertigo were asked to fill out a questionnaire to further explore their dizziness, headaches (if any), and other migraine-related symptoms. Screening for MD criteria was performed using the questionnaire, clinical evaluation, audiogram, and vestibular testing (when available). From these, patients with a diagnosis of definite MD based on the AAO-HNS criteria were included in our study.[11] If a patient's diagnosis remained uncertain, they were excluded from the cohort. Approval was obtained from our Institutional Review Board.

Twenty-seven patients clinically diagnosed with definite MD were treated with migraine prophylaxis therapy. Of these, 25 had adequate follow-up (24 months) and were included in this study. All patients had been treated with hydrochlorothiazide/triamterene for 6 months prior to presentation and therefore served as their own control group. The diuretic was discontinued upon starting the migraine prophylactic therapy. As part of the migraine prophylaxis, patients were instructed to implement migraine lifestyle changes. This included a migraine diet, which consists of avoiding certain foods such as certain preservatives, fermented products (eg, cheese, etc), chocolate, nuts, eggs, alcohol, fresh breads/yeast products, aged/processed meats, certain beans, certain fruit (high histamine), and pickled or preserved fruits/vegetables. Patients were also instructed to sleep on a regular schedule and avoid dehydration and hunger by eating 3 meals per day on time. The patients were treated with migraine prophylactic medications even in the absence of a migraine diagnosis. The patients were most commonly prescribed nortriptyline 25 mg qhs with gradual escalation of 25 mg every 3 weeks up to 75 mg if the symptoms had not improved. Nortriptyline was used as a first line unless the patient was on another antidepressant, in which case, verapamil was prescribed. Verapamil SR 24 hr 120 mg qhs was used with escalation to 180 mg and then 240 mg every 2 weeks if symptoms were not improved. If the patient's symptoms had not improved after the initial medication, the second medication (either nortriptyline or verapamil) was added. If the combination was not effective, topiramate 25 mg qhs with weekly escalation of 25 mg up to 150 mg qhs was prescribed. The patient was instructed to not increase the dose if the symptoms were under control. If the patient was experiencing bouts of vertigo, they were instructed to report back and increase the medication as scheduled (Figure 3).

Data Collection

A written questionnaire was provided to patients as part of their clinical evaluation to ascertain the diagnosis. For each patient, validity of these written responses was verified during the clinic encounter by the senior author. After

Table 2. Comparison of the Final Results of Quality of Life in Patients With Meniere's Disease Before and After Treatment.

Groups	Category	Pretreatment Score	Posttreatment Score	Score Change	Mean Pretreatment Score	Mean Posttreatment Score	Absolute 95% CI	*P* Value[a]
Treated with migraine prophylactic medication	Mental	44.3	56.5	+12.2	7.1 ± 3.85	9.56 ± 3.23	3.26, 1.48	.001
	Physical	75.3	95.3	+20	12.04 ± 5.88	15.75 ± 6.16	11.2, 6.2	.001
	Social	44.8	69.5	+24.7	7.16 ± 4.5	13.1 ± 3.8	7.54, 4.29	<.001

[a]*P* value < .02 is considered significant.

determining the severity and nature of their dominant symptoms and establishing the proper diagnosis, appropriately targeted medical therapy was instituted. Patients were then followed for a minimum of 24 months, and their response to migraine prophylactic treatment was recorded at the follow-up visit.

At the 3-month follow-up visit after treatment, the Meniere's Disease Outcomes Questionnaire–Retrospective (MDOQ-R) was given to the patients.[14] The MDOQ-R is an internally validated tool with 18 multiple-choice questions to determine QOL after treatment of MD in 3 categories: physical, emotional, and social well-being. There were 36 paired items for pre- and posttreatment conditions, slightly modified to meet the treatment instituted here. Numerical values from 0 to 4 are assigned to the answers, with 0 corresponding to the answer indicating the poorest QOL and 4 given to the answer indicating the best QOL (minimum score = 0, maximum score = 72). The sum of the answers for the pretreatment and posttreatment items was calculated. Each one of these values is then divided by the maximum possible scores to determine the pretreatment QOL score and posttreatment QOL score, respectively. The pretreatment QOL score (total score for pretreatment items) was compared with the posttreatment QOL score. The main outcome measure was the change in QOL. Outcomes were also broken down by categories investigated. Questions on the MDOQ-R were subdivided into 3 separate categories: mental, physical, and social. Questions 9, 10, 19, 20, 23, 24, 25, and 26 were used to evaluate mental health; Questions 5, 6, 11, 12, 15, 16, 17, 18, 21, 22, 27, 28, 31, 32, 35, 36, 37, and 38 evaluated physical health; and Questions 3, 4, 7, 8, 13, 14, 29, 30, 33, and 34 assessed social health. Category-specific QOL scores were determined for each category.

$$\text{Pretreatment QOL score} = \frac{\textit{sum of Pretreatment question scores}}{\textit{Maximum possible pretreatment scores}} \times 100$$

$$\text{Posttreatment QOL score} = \frac{\textit{sum of posttreatment question scores}}{\textit{Maximum possible posttreatment scores}} \times 100.$$

Auditory results were evaluated according to the 1995 criteria of the AAO-HNS.[11] The worst audiograms during the 6 months before treatment was compared with the worst audiogram obtained in the period of 18 to 24 months after treatment. A 4-frequency [AQ: 2]PTA was calculated using 0.5, 1, 2, and 3 kHz. If 3 kHz was not available, it was calculated using the average of 2 and 4 kHz. Hearing change (meaning an improvement or deterioration) was defined as a difference of ±10 dB in PTA between pretreatment and posttreatment values. The frequency of vertigo attacks for the period of 6 months before treatment was compared with the interval occurring between 18 and 24 months after treatment. The results were reported using the AAO/HNS 1995 functional scale.[11] Also, functional level scales (FLS) before and after treatment were compared in each patient (Tables 4 and 6).[11]

Statistical Analysis

The frequency and percentage of patients with a diagnosis of definite MD who responded to migraine prophylactic treatment were calculated. Chi-square test was used to make comparisons between the nonparametrical variables such as correlation between the gender of the patients and their scores. Paired *t* test was performed for comparing the changes in the pre- and posttreatment scores and air conduction thresholds at different frequencies pre- and posttreatment. All statistical analyses were performed using PASW 18.0 (SPSS Inc, Chicago, Illinois, USA). Because multiple comparisons were made on the same data, the Bonferroni correction was applied to reduce the occurrence of type I errors. Therefore, a *P* value of <.002 was considered significant.

Results

The mean age of the patients was 58 ± 9 years (range, 40-77 years). The female to male ratio was 17 (68%) to 8 (32%). As shown in Table 2, the mean change in QOL score following treatment was +25 ± 16 (range, –3 to 55) (P = .02). Quality of life improved in 23 (92%) respondents, was unchanged in 1 (4%), and decreased in 1 (4%) after medical treatment (Figure 1).

There was significant improvement in all but 3 subitems of the questionnaire (Table 3). We used the first 2 questions as an internal control to test the validity. Category-specific QOL scores were calculated for each measure of improvement investigated. Each category-specific QOL score

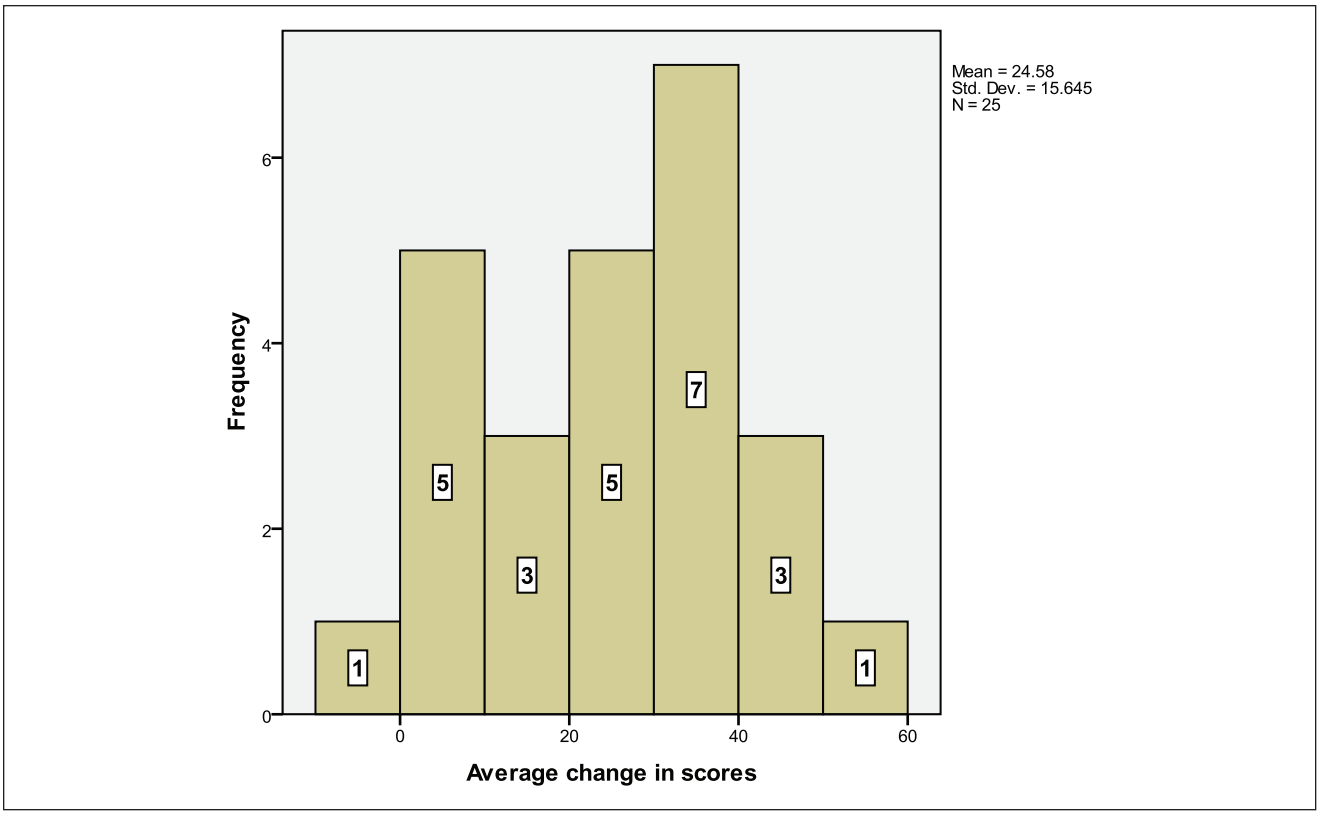

Figure 1. Distribution of change in Meniere's Disease Outcomes Questionnaire quality of life score. The mean change in quality of life score was 25 ± 16 points (range, –3 to 55).

Table 3. Comparison of the Quality of Life of Meniere's Disease Patients Before and After Treatment.[a]

Symptom	Pretreatment (mean ± SD)	Posttreatment (mean ± SD)	Absolute Difference (95% CI)	*P* Value
Dizziness affectS life	0.87 ± 0.97	2.61 ± 1.03	1.74 (1.10, 2.31)	.8
Dizziness preventS traveling	1.13 ± 1.10	2.78 ± 1.12	1.65 (1.17, 2.16)	.04
Bothered by hearing loss	1.83 ± 1.37	2.22 ± 1.2	0.39 (0.15, 0.76)	<.001*
Referring to doctor office	1.22 ± 0.99	2.09 ± 0.79	0.87 (0.49, 1.26)	.017
Self-confidence	1.7 ± 1.18	2.52 ± 0.89	0.82 (0.43, 1.24)	.03
Physical health	1.91 ± 1.04	2.57 ± 0.84	0.66 (0.20, 1.21)	.33
Trouble with daily tasks	1.61 ± 1.23	2.7 ± 1.02	1.09 (0.69, 1.48)	.01
Spinning episodes	0.70 ± 1.18	2.48 ± 1.41	1.78 (1.19, 2.31)	.023
Tinnitus problem	0.91 ± 1.08	1.26 ± 1.32	0.35 (0.13, 0.62)	<.001*
Memory problem	2.17 ± 1.15	2.43 ± 0.95	0.26 (0.1, 0.49)	<.001*
Difficulty walking straight	1.96 ± 1.29	2.57 ± 1.19	0.61 (0.30, 0.95)	<.001*
Difficulty in concentration	1.57 ± 1.27	2.22 ± 1.09	0.65 (0.35, 0.99)	<.001*
Feeling depressed	2.09 ± 1.31	2.65 ± 1.07	0.56 (0.31, 0.86)	<.001*
Feeling imbalance	2.04 ± 1.43	2.83 ± 1.11	0.79 (0.47, 1.20)	<.001*
Social activities limitation	1.65 ± 1.27	2.65 ± 0.98	1 (0.60, 1.48)	.03
Unsteadiness	1.13 ± 1.36	2.52 ± 1.44	1.39 (0.79, 2.04)	.042
Dizziness affecting work	1.70 ± 1.18	3.00 ± 1.13	1.30 (0.75, 1.75)	.022
Frequency of Meniere's attack	0.91 ± 0.67	2.22 ± 0.67	1.31 (0.98, 1.61)	.104
Severity of Meniere's attack	1.04 ± 0.56	2.30 ± 0.77	1.26 (0.85, 1.65)	.884

[a]An increase in the score is an improvement in quality of life.
*Statistically significant after Bonferroni correction.

Table 4. Pre- and Posttreatment Vertigo Attacks Results Using the 1995 AAO-HNS Reporting Guidelines.

Patient No.	Average Vertigo Attacks per Month Before Treatment	Average Vertigo Attacks per Month After Treatment	Numerical Value[a]	AAO-HNS Class	Functional Level Scale Before Treatment	Functional Level Scale After Treatment
1	9	1	11	B	4	2
2	7	0	0	A	3	1
3	6	0	0	A	3	1
4	9	0	0	A	3	2
5	8	0	0	A	3	1
6	8	1	13	B	3	1
7	5	0	0	A	2	1
8	5	6	120	D	4	4
9	8	0	0	A	3	1
10	9	1	11	B	3	1
11	9	0	0	A	3	1
12	8	0	0	A	3	1
13	12	2	17	B	4	2
14	9	1	11	B	4	1
15	14	2	14	B	3	1
16	4	4	100	D	2	2
17	7	0	0	A	3	1
18	9	0	0	A	3	1
19	11	1	9	B	3	2
20	9	0	0	A	3	1
21	9	1	11	B	3	1
22	4	0	0	A	2	1
23	8	0	0	A	3	1
24	7	0	0	A	3	1
25	9	1	11	B	3	1

[a]Numerical value (NV) = (X/Y) × 100, rounded to the nearest whole number, where X is the average number of definitive spells per month for the 6 months 18 to 24 months after treatment and Y is the average number of definitive spells for the 6 months before treatment. AAO-HNS, American Academy of Otolaryngology—Head and Neck Surgery; NV = 0, class A (complete control of definitive spells); NV = 1 to 40, class B; NV = 41 to 80, class C; NV = 81 to 120, class D; NV > 120, class E; class F (secondary treatment initiated due to disability from vertigo).

showed statistically significant improvement after treatment. Additionally, posttreatment audiograms showed no change in hearing in the affected ear ($P = .15$), which was not statistically significant (mean change of 3 dB). Prior to migraine prophylactic therapy, 22 (88%) were either FLS 3 or 4. After treatment, only 1 (4%) patient was FLS 3 or 4. Of the 25 patients in the cohort, 3 (12%) were FLS 1 or 2 (normal or near normal) before treatment, whereas after treatment, 24 (96%) were FLS 1 or 2. Fourteen (56%) patients were in class A (complete control) posttreatment, and 9 (36%) were in class B post treatment, with the remainder in class D (Table 4).

Also of note, most of the patients responded well to nortriptyline and verapamil among other prescribed medication regimens (Table 5). Nearly all patients (n = 24, 96%) had been treated with hydrochlorothiazide (alone or in combination with triamterene) prior to their presentation to our center. One patient had been treated with furosemide. The average frequency of attacks in our series decreased from 8.3 per month to 0.8 per month (Table 6).

Table 5. Doses of Medication at Last Follow-Up.

Medication	Dose (mg)	No. of Patients	Total No. of Patients Using the Medication (%)
Nortriptyline	10	2	11 (44)
	25	4	
	50	3	
	75	2	
Verapamil	120	4	8 (32)
	180	2	
	240	2	
Nortriptyline + verapamil	75 + 120	3	5 (20)
	75 + 240	2	
Topiramate	150	1	1 (4)

Most of patients were classified as class A (n = 14, 56%), and the rest classified as class B (n = 9, 36%) and class D (n =2, 18%). Functional level scale after treatment showed a significant change in comparison to FLS before treatment ($P = .006$) (Table 3).

Table 6. Functional Level Class.

Regarding my current state of *overall* function, *not just during attacks* (check the ONE that best applies):
1. My dizziness has no effect on my activities at all.
2. When I am dizzy, I have to stop what I am doing for a while, but it soon passes, and I can resume activities. I continue to work, drive, and engage in any activity I choose without restriction. I have not changed any plans or activities to accommodate my dizziness.
3. When I am dizzy, I have to stop what I am doing for a while, but it does pass, and I can resume activities. I continue to work, drive, and engage in most activities I choose, but I have had to change some plans and make some allowance for my dizziness.
4. I am able to work, drive, travel, take care of a family, or engage in most essential activities, but I must exert a great deal of effort to do so. I must constantly make adjustments in my activities and budget my energies. I am barely making it.
5. I am unable to work, drive, or take care of a family. I am unable to do most of the active things I used to. Even essential activities must be limited. I am disabled.
6. I have been disabled for 1 year or longer and/or I receive compensation (money) because of my dizziness or balance problem.

Discussion

The primary histopathological finding of MD has been found to be endolymphatic hydrops, which has been thought to be due to disruption in the endolymphatic production, resorption, or flow, among others.[15] In contrast, VM is considered to be a central or peripheral vestibular disorder arising from a central phenomenon. Factors such as neural inflammation, central vestibular abnormalities, and possibly changes in blood flow may be involved in the signs and symptoms seen in patients with VM.[16,17] In addition, neurogenic inflammation can be triggered by activation of the trigeminal-vestibulocochlear reflex, which can cause inner ear plasma protein extravasation. This can lead to the release of inflammatory mediators. The inflammatory mediators can in turn potentially cause a sustained activation and sensitization of the trigeminal afferents and lead to the symptomatology of VM.[18] However, there is evidence to suggest that migraine attacks may also damage the inner ear and lead to hydrops.[19] A shared pathological mechanism of VM and MD has been suspected.[8,16,19] Previous studies have shown that some MD patients have features that are comparable to those who have VM and that they respond similarly to medications that are used for VM patients.[8,13] Recently, cochlear migraine has been described as an entity that causes the clinical picture of endolymphatic hydrops with fluctuating hearing loss and response to calcium channel blockers.[20] It has been found that migraine can cause endolymphatic hydrops as seen on high-resolution magnetic resonance imaging of the inner ear.[21] In addition, aural fullness, which is seen commonly in Meniere's patients, has been found to be related to a migraine etiology and responds well to migraine prophylactic medications.[22]

A review of questionnaires and patient encounters for the 25 patients included in this study indicated that all patients met the AAO-HNS criteria for definite MD, had symptomatology that were highly suggestive for a migraine background, but did not fulfill the IHS criteria for vestibular migraine.[11] Our previous experience had noted that treating these patients with migraine prophylactic therapy, which includes dietary and lifestyle modifications, along with medication adjuncts, yields excellent outcomes.[8] Through this analysis, we were able to ascertain these findings and found that patient quality of life improved in 92% of the definite MD patients (n = 23/25) when managed in this manner, which is somewhat better than the 79% improvement seen in the diuretic therapy of MD found on a recent systematic review.[23] The MDQOL score did not change in 1 patient, and in another patient, the score decreased following treatment. We have found that patients who do not respond to medical therapy are those in whom triggering factors such as poor sleep habits, sleep apnea, hormonal changes from menopause, or dietary modifications have not been altered or cannot be controlled by patients.

As depicted in Table 2, category-specific scores changed significantly after treatment. The score change of +12.2 in mental category means that the patients had significant improvements in their memory function, depression, concentration, and self-confidence. This change in mental category means, for example, that the patient went from "often" having problems remembering things to "sometimes" having problems remembering things. This change represents approximately one category improvement on average, which would represent going from, for example, "sometimes" feeling depressed to "rarely" feeling depressed. The score change of +20 in physical category means that the patients had improvements in hearing loss and tinnitus, fewer spinning episodes and walking and imbalance troubles, and substantially decreased number and severity of Meniere's attacks. For example, patients who considered their physical health to be "average," posttreatment considered it to be "good." Or, a patient with a "moderate" amount of unsteadiness before treatment would have "a little bit" of unsteadiness after treatment. Also, patients went from an average of weekly attacks of Meniere's disease to monthly attacks. On average, there was a 1 category improvement in physical health with problems with hearing, balance, tinnitus, and so on, going from "often"

to "sometimes" posttreatment or "a moderate amount" to "a little bit." The score change of +24.7 in social category means that the patients could travel better with less symptoms and had less visits and referring to their doctors. Also, they showed higher performance in their daily tasks and jobs after treatment. For example, a patient whose job would "often" be affected by the disease, posttreatment would "rarely" have the job (job performance, sick days) affected by the disease. Another example would be a patient who would moderately be prevented from traveling "quite a lot" due to the disease would posttreatment have "just a little" interference with traveling. On average, there was an improvement in categories going from having problems with social activities (eg, shopping, exercising, going to restaurant, household activities) from "a lot" to "a little" or "none."

Kato et al[14] developed the MDQOL, which is a validated MD-specific QOL questionnaire, and used it to evaluate 215 patients with MD who underwent endolymphatic sac decompression. The questions included items such as self-confidence, limitations in activities of daily living (ADLs), severity of vertigo, tinnitus, and problems with recall, concentration, and depression, among others. Using this questionnaire, we found that nearly all the patients with MD in our cohort responded dramatically to the migraine prophylactic medications. As seen in Table 3, symptoms of dizziness, imbalance, ADLs, hearing loss, tinnitus, depression, and frequency of attacks all significantly improved within 18 to 24 months of prophylactic pharmacologic treatment. This difference was seen in 92% of patients, with a difference of nearly +26 points on average per respondent. As seen in Figures 1 and 2, 16 of 24 patients had QOL score improvement that was higher than the mean, with score changes as high as 60 points.

Our results show no clinically significant change in hearing. Generally, hearing loss, tinnitus, and other auditory symptoms tend to be very difficult to manage and often fail to respond substantially to treatment.[24]

An exacerbation of MD is typically manifested by unilateral ear fullness, fluctuations in hearing, and tinnitus, with severe attacks characterized by vertigo, imbalance, nausea, and/or vomiting. As seen in Table 3, these symptoms, including tinnitus, imbalance, vertigo, and generalized dizziness, improved after treatment with migraine prophylaxis. Additionally, the frequency of the episodes changed from an average of approximately twice a week (average of 8.3/month) to less than once a month (average of 0.8/month). The overwhelming response of the patients to this therapy is unlikely to be due to the natural fluctuation of the disease. Table 7 demonstrates the response rate of patients with MD to different modalities in different studies. In this study, we have shown that oral medication therapy in combination with dietary changes and lifestyle can result in a high response rate (92%) in patients with MD and improve the QOL in most patients and lead to an improvement in FLS and AAO-HNS class (Tables 4 and 6).

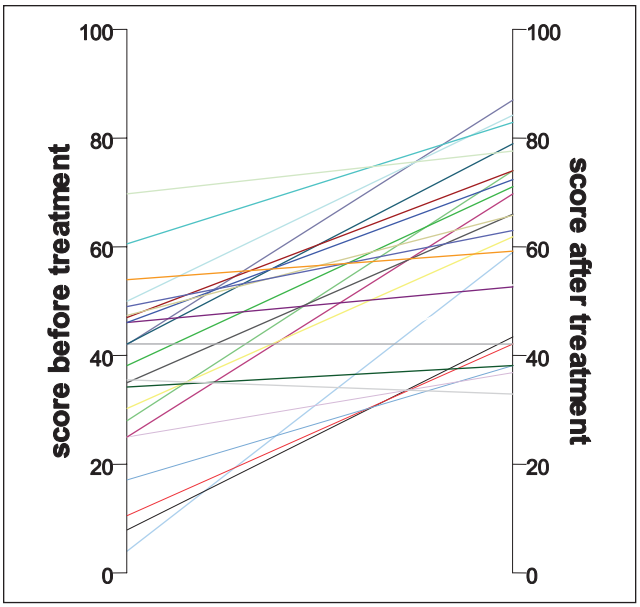

Figure 2. Pre- and posttreatment scores for each patient showing improvement in 25 patients.

Many have discussed the role of dietary modification as an adjunct treatment in MD.[25] Sodium restriction has been widely used for MD, as noted by Foster.[26] The combination of low-sodium diet with diuretics has been effective in decreasing the progression of hearing loss in some MD patients. Thiazide-based diuretic therapy is the mainstay of treatment in MD. A double-blind clinical trial has shown that thiazide diuretics with or without a potassium sparing agent is beneficial in reducing vertiginous episode in 51% (17/33) of MD patients.[6,27] However, a Cochrane review of thiazide diuretics for MD showed that there were no trials of high enough quality to meet the standard for their review,[28] which was echoed in a systematic review by Crowson et al.[23] All our patients had failed diuretic therapy and sodium restriction that had been prescribed by other physicians prior to their initial presentation. Several prophylactic medical therapies have been evaluated and found to be highly effective in the management of migraines, including tricyclic antidepressants (eg, nortriptyline), anticonvulsants (eg, topiramate), and calcium channel blockers (eg, verapamil).[29-33] Many of these medications are regularly used in our institution to manage patients with a definite MD diagnosis with or without vestibular migraine symptoms. Pharmacologic agents of choice in our clinic are verapamil and nortriptyline due to their high rates of efficacy and low side effect profile (Figure 3). Unfortunately, in some nonresponders to treatment, poly-therapy may be needed.[29,32] In our study, all patients required dose escalation to achieve symptomatic

Table 7. Comparison of Different Treatments and Their Outcomes on MD Patients.[a]

Reference	No.	Treatment	Improved Item or Symptom	Score System	Response Rate to Treatment (%)
Kato et al[14]	159	ESD	QOL	MDQOL	87
Hu and Parnes[38]	30	ESD	QOL	MDQOL	80
Convert et al[39]	90	ESD	QOL	MDQOL	81
Durland et al[40]	19	ESD	Vertigo		95
Barrs et al[41]	21	ITS	Vertigo		52
Dodson et al[42]	22	ITS	Vertigo		55
Cohen-Kerem et al[43] (meta-analysis of 15 studies)	627	ITG	Vertigo		74.7 (class A) 92.7 (class A of B)
Perez et al[44]	71	ITG	Vertigo		83
Wu and Minor[45]	34	ITG	Vertigo		90
Banerjee and Johnson[46]	21	ITG	QOL	GBI	81
Paradis et al[47]	67	ITG (37) ESD (30)	QOL	MDQOL	ITG (54) ESD (75)
Glasscock and Miller[48]	31	VNS	Vertigo		94
Pappas and Pappas[49]	41	VNS	Vertigo		90
Brookes[50]	62	VNS	Vertigo		93
Fukuhara et al[51]	28	VNS	Vertigo		78.3
Colletti et al[52]	48	VNS (24) ITG (24)	Vertigo		VNS (96) ITG (75)
Hillman et al[53]	64	VNS (39) ITG (25)	Vertigo		VNS (95) ITG (80)
Current study	25	Migraine treatment	QOL	MDQOL	92

[a]ESD, endolymphatic sac decompression; GBI, Glasgow Benefit Inventory; ITG, intratympanic gentamicin; ITS, intratympanic steroid injection; MD, Meniere's disease; MDQOL, Meniere's disease quality of life; QOL, quality of life; VNS, vestibular nerve section.

control, which along with combination therapy is usually necessary for achieving symptomatic control in classic migraine or vestibular migraine patients.[34-37] This was the case in 20% of our patients, who needed poly-therapy due to the nature or severity of their disease.

The study is limited by the need for multiple medications at various doses to achieve a therapeutic outcome. Ideally, we would like to have 1 drug at 1 dose work for all or most patients. However, treatment of patients suffering from a migraine-related condition is often complicated. We have found that these patients are very sensitive to medications, and the dosage of these medications should be gradually increased to find the lowest dose with the therapeutic effect. Since some patients can tolerate higher doses than others, combination of drugs at various doses is necessary to achieve substantial improvement in their condition. The administered medication is also limited by other medications the patient uses, such as antidepressants, antihypertensives, and antiseizures. If only verapamil at a dose of 120 mg, for example, is studied for this condition, only 3 of the 25 patients would have improved their symptoms in our study. This would have resulted in a negative result for the use of verapamil. However, when the dose is escalated or verapamil combined with other medications, 13 of the 25 patients had improvement. Therefore, more medication management is necessary when treating these patients than most neurotologists are accustomed to in treating other otologic disorders. Meticulous adjustment of the dosage of the different medications taken by each patient and individualized treatment is a new era in medicine and based on different factors such as genetic of the person, different medications taken by patient, and interactions of the medications with each other.

The other limitation of this study might be the retrospective nature of the questionnaire. Patients had to rely on their recall abilities regarding severity of symptoms prior to treatment and their changes after treatment. However, the recall bias was eliminated by referring to the medical record notes and history of the patients prior to the start of the treatment. The frequency of episodes was noted on the initial intake and collected prospectively thereafter. However, the QOL data was obtained at follow-up as the nature of the survey requires a retrospective recall by patient. The patients had to only recall 3 to 6 months into the past, so we believe this is not a significant weakness as the severity of vertigo makes them memorable. Additionally, the course of this disease is variable, with some MD patients exhibiting improvement in symptoms spontaneously without intervention. This study can be strengthened

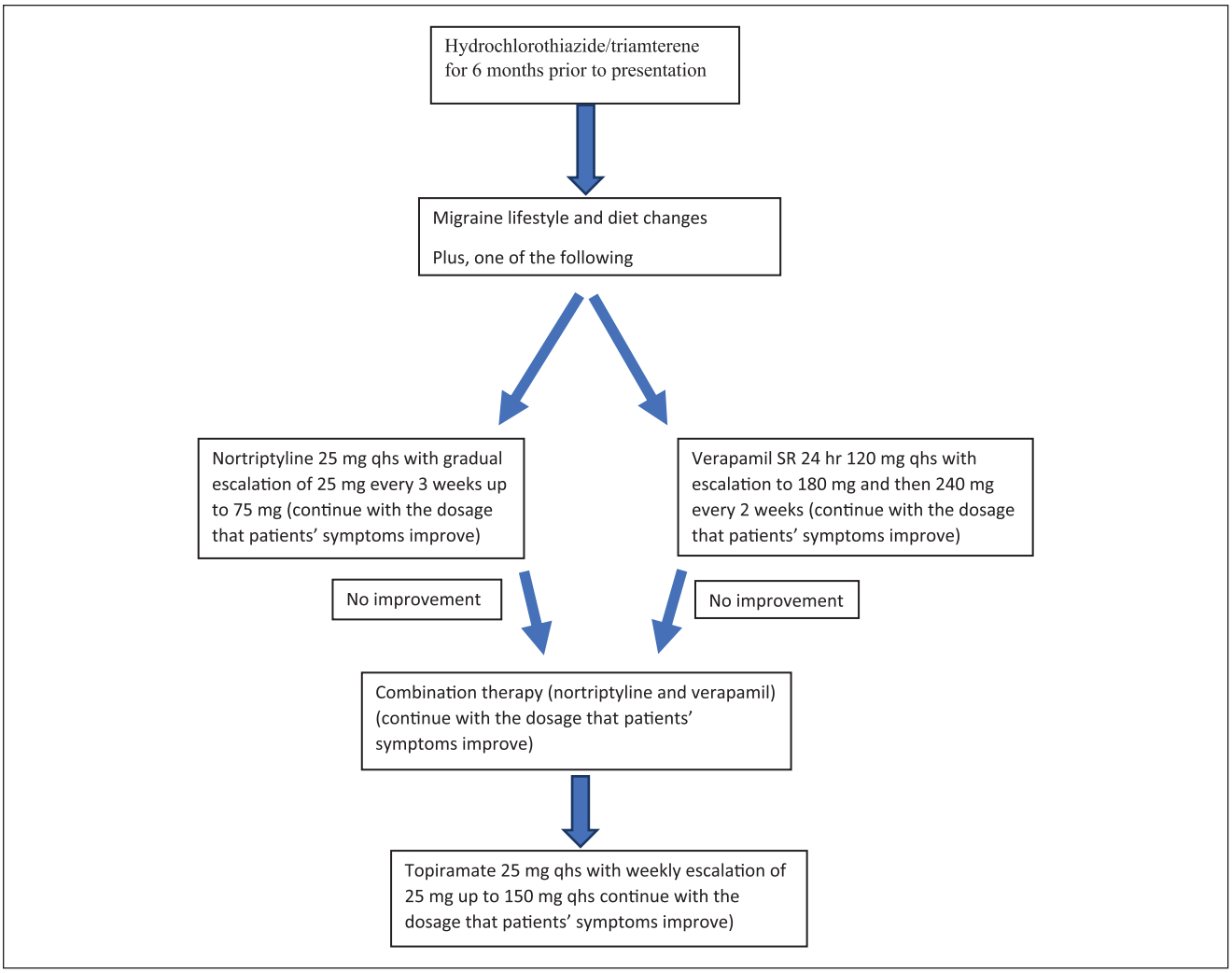

Figure 3. Treatment of the patients with Meniere's disease using migraine prophylactic medications.

by performing a double-blind trial and including a placebo arm that will be planned in the future. It should be noted that nearly all the patients in our cohort had been treated with a thiazide-based diuretic and MD diet changes prior to presenting to our center with no improvement. This may have led to a selection bias in that those who improved with diuretics had not presented to our center.

Conclusion

A majority (92%) of patients diagnosed with definite MD who had failed diuretic therapy responded to migraine prophylaxis therapy with diet and lifestyle changes. A response to treatment was seen in all markers in quality of life, including physical, emotional, and social, with no decline in hearing. These outcomes suggest a possible correlation between the pathophysiological basis of disease in MD and VM and support the treatment of patients suspected of having MD with migraine prophylaxis. Patients with MD who fail diuretic therapy should be treated with migraine prophylactic therapy prior to consideration of surgical or destructive intratympanic therapy.

Declaration of Conflicting Interests [GQ: 2]

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