Abstract

This study examined whether scores on a motion sensitivity questionnaire (MSQ) could distinguish between vestibular migraine (VM) and Meniere's disease (MD). As a secondary goal, we examined whether scores on the MSQ correlated with results from caloric testing. A MSQ was administered to 20 subjects meeting American Academy of Otolaryngology (AAO) criteria for MD, 30 subjects meeting Neuhauser criteria for both probable vestibular migraine (pVM) and definite vestibular migraine (dVM), and 22 controls. The average score on the MSQ was 5.9 for VM, 4.25 for MD, and 0.4 for controls. Both VM and MD scored significantly higher than controls (p<0.0001), but results were not statistically different from each other (p=0.17). However, average score for subjects with dVM was 7.1, which was significantly higher than subjects with pVM, whose average score was 4.2 (p=0.045), and higher than subjects with MD (p=0.048). Scores of MSQ did not correlate with total eye speed on caloric testing. We found that a motion sensitivity questionnaire was able to distinguish between subjects with definite vestibular migraine and those with Meniere's disease. Importantly, we also found that subjects with Meniere's disease have more motion sensitivity than controls. Total eye speed did not correlate with motion sensitivity.

Introduction

Vestibular migraine (VM) is responsible for a large proportion of people complaining of dizziness. Unfortunately, diagnosis can be difficult because many symptoms of vestibular migraine can overlap with other vestibular disorders. This is a particular concern with Meniere’s disease (MD), because both diseases can share a history of episodic dizziness, hearing loss, sensitivity to food triggers, and headache. Distinction between the two conditions is important because successful treatment algorithms are generally quite different. This diagnostic dilemma has motivated a search for findings on either clinical exam or exam that can reliably distinguish the two conditions.

Despite past efforts at identifying factors specific to each condition, the diagnosis often remains challenging. Here, we examined two possible measures for separating VM from MD. First, based on the observation that subjects with both migraine and VM have been noted to have higher motion sensitivity than normal subjects, we examined if results on a motion sensitivity questionnaire would be different between VM and MD. Second, based on reports that subjects with migraine have changes in the vestibulo-ocular reflex relative to normals, we compared responses to caloric stimulation between VM and MD.

Methods and Materials

After obtaining approval for the study through the Washington University Institutional Review Board, subjects were identified for participation through searching a database of all subjects who had undergone vestibular testing in the last ten years. Subjects meeting the 1995 AAO guideline criteria for Meniere’s disease were identified, as were those meeting the Neuhauser criteria for “probable” and “definite” vestibular migraine. Subjects who qualified were contacted by telephone, and administered a motion sensitivity questionnaire (MSQ) based on a visual vertigo analogue scale developed by Dannenbaum. Control subjects who had no history of migraine, otologic, neurologic problems, or dizziness were administered the same questionnaire. All subjects, including controls, underwent caloric testing as well.

<table>
<thead>
<tr>
<th>Table 1. Scores on the Motion Sensitivity Questionnaire</th>
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<tbody>
<tr>
<td>Scenario</td>
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<tr>
<td>Walking in a Supermarket</td>
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<tr>
<td>Being a Passenger in a Car</td>
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<tr>
<td>Being under Fluorescent Lights</td>
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<td>Being at a Busy Intersection</td>
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<td>Are you a Motion Sensitive Person?</td>
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<td>Overall Score</td>
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Note: P-value only compares vestibular migraine to Meniere’s scores. Higher scores indicate more motion sensitivity.

Results

Participants included 30 subjects (24 female) with vestibular migraine, 20 subjects (11 female) with Meniere’s disease, and 22 controls (14 female). Of the subjects with vestibular migraine, 17 had dVM and 13 had pVM. The average age of the combined VM group was 49 (SD=12), the Meniere’s group was 57 (SD=13), and the control group was 49 (SD=22). 3 subjects met criteria for both VM and MD and were therefore excluded from participation. Mean total scores on the motion sensitivity questionnaire were 5.87 for VM (7.12 for dVM and 4.23 for pVM), 4.25 for MD, and 0.37 for controls. The difference among these groups was statistically significant (Kruskal-Wallis test, p=0.0001) (Figure 1). Planned pairwise comparisons showed that MSQ scores were higher among subjects with dVM than those with pVM (p=0.045) or MD (p=0.048). Scores for VM (combining subjects with pVM and those with dVM) and MD were not significantly different from each other (p=0.172) but both were higher than controls (p<0.0001 for both). Analysis of the individual questions of the MSQ with multiple pairwise painless comparisons between VM and MD showed that only motion sensitivity to riding in a car had a statistically significant difference, with mean VM score 0.57 and mean MD score 0.50 (p=0.048) (Table 1).

Caloric testing demonstrated a mean TES of 64.1°/sec in VM, 49.9°/sec in MD, and 96.0°/sec in controls. TES values were similar for dVM (mean TES 61.5°/sec) and pVM (mean TES 67.5°/sec). There was no significant difference among the three groups (Kruskal-Wallis, p=0.122) (Figure 2). Total score on the MSQ, taken across all groups, did not correlate with TES (Spearman r=0.018, p=0.88) (Figure 3).

Mean caloric asymmetry, defined by Jongkees formula, was 23.7% for VM, 40.1% for MD, and 17.0% for control subjects. Asymmetry varied significantly among groups (Kruskal-Wallis, p=0.007), with Dunn’s multiple comparison test showing significance for MD versus VM and MD versus control, but not for VM versus control. The percentage of subjects in each group with asymmetry as defined by a cutoff value of 30%, and excluding subjects with bilaterally reduced responses (TES less than 20 degree/second), was 23% for VM, 88% for MD, and 14% for controls. There was no significant correlation between scores on the MSQ and caloric asymmetry (Spearman r=0.014, p=0.73).

Discussion

Motion Sensitivity

We found that subjects meeting a strict definition for vestibular migraine have increased motion sensitivity. We built on previous work by subdividing patients with vestibular migraine into those that met criteria for dVM and pVM. We found that those with dVM did have more motion sensitivity than those with pVM.

A novel and important finding of our study was the observation that subjects with Meniere’s disease have greater motion sensitivity than control subjects. This was demonstrated not only by increased sensitivity to the various scenarios in the questionnaire, but also with increased self perception of being a motion sensitive person. This may have important implications for understanding symptomatology in Meniere’s and developing effective treatments.

Although the motion sensitivity questionnaire was unable to distinguish between MD and VM, it was able to distinguish between dVM from pVM, and dVM from MD. Analysis of the individual questions showed that only motion sensitivity to riding in a car separated VM from MD.

Caloric Responses

We did not find any significant differences between our test groups based on TES. We did, however, find that our subjects with MD had high levels of caloric asymmetry, which is a helpful diagnostic clue in separating them from VM.

We did not find any correlation between score on the motion sensitivity questionnaire and total eye speed, consistent with recent studies showing no relationship between eye speed and motion sensitivity.

Conclusions

We found that a motion sensitivity questionnaire was able to distinguish between subjects with definite vestibular migraine and those with Meniere’s disease. Importantly, we also found that subjects with Meniere’s disease have more motion sensitivity than controls, which we have not seen previously reported. Total eye speed was not elevated among subjects with vestibular migraine compared to those with Meniere’s disease or normal subjects.

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References

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Figure 1. Score on the Motion Sensitivity Questionnaire (MSQ). dVM is definite vestibular migraine, and pVM is probable vestibular migraine.

Figure 2. Total Eye Speed on Caloric Testing. dVM is definite vestibular migraine, and pVM is probable vestibular migraine.

Figure 3. The Relationship of Total Eye Speed on Caloric Testing to Scores on the Motion Sensitivity Questionnaire.