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Vertigo in Vestibular Schwannoma Patients Due to Other Pathologies

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Objective: To report findings from a cohort of vestibular schwannoma (VS) patients presenting with vertigo from a secondary comorbid vestibular disorder; and to discuss management strategies for this subset of patients presenting with both episodic vertigo and VS.
Patients: All VS patients who presented with vertigo as the primary symptom from 2012 to 2015 and endorsing no other major complaints were examined.
Intervention: Treatment with migraine lifestyle and prophylactic therapy, or Epley maneuver.
Main Outcome Measure: Resolution of vertigo following medical treatment alone.
Results: Of the nine patients studied, seven (78%) suffered from vestibular migraine, and two (22%) experienced benign positional vertigo. All patients experienced complete resolution of symptoms after treatment. As a result of symptomatic improvement, seven patients (78%) avoided surgery in favor of observation, while two patients (22%) underwent radiosurgery due to continued tumor growth and other nonvertigo symptoms.
Conclusion: VS patients can sometimes present with a history of recurrent episodic vertigo. The etiology of the vertigo could be due to the tumor itself or may be due to an underlying comorbidity such as vestibular migraine or benign positional vertigo. VS patients presenting with vertigo should undergo a standard vertigo history and examination to identify other potential causes of vertigo. Most VS patients in our cohort avoided intervention and had resolution of their vertigo. **Key Words:** Acoustic neuroma—Dizziness—Migraine—Vertigo—Vestibular migraine—Vestibular schwannoma.

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Each year, 19 new patients per 1 million develop vestibular schwannoma (VS), and in total, VS constitutes 6% of all intracranial neoplasms (1,2). Currently, observation, microsurgical resection, or stereotactic radiosurgery (SRS) are the primary treatment modalities for VS patients (3–6). Given that most VSs do not grow and that surgical intervention carries many risks (7,8), some patients are better served with SRS or observation (4).

VS patients commonly present with hearing loss (39–95%), tinnitus (45–75%), and dizziness (49–66%) (9,10). Additionally, the presence of mild vertigo symptoms is not uncommon, with 10 to 19% of VS patients presenting with vertigo as a primary symptom. The underlying mechanism is attributed to the VS growing into the internal auditory canal and impinging on the eight nerve, cerebellum, and/or pons (11). Furthermore, the VS can cause secondary hydrocephalus and vestibular changes, which can result in vertiginous episodes. Due to these established mechanisms, alternative comorbid vestibular etiologies may be dismissed from the differential diagnosis of VS patients who present with vertigo as the primary presenting symptom. Because of the strong association of vertigo with VS, patients who undergo surgery or SRS do not experience improvement in vertigo and can oftentimes experience worsening symptoms, especially after surgery (12–14). We aim to report findings from a cohort of VS patients with a secondary comorbid vestibular disorder, and to discuss management strategies for this subset of patients presenting with both episodic vertigo and VS.

METHODS

After IRB approval, the charts of all VS patients who presented to a neurotology clinic in a tertiary care academic center from 2012 to 2015 were retrospectively queried, and patients with episodic vertigo as the primary presenting symptom were included. The primary intervention in these patients was treatment with migraine diet/lifestyle changes and migraine

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TABLE 1. *Tabulation of the otherwise healthy vestibular schwannoma (VS) cases presenting with vertigo as the primary presenting symptom*

Patient Number	Age	Sex	Diagnosis	Maximum Tumor Dimension (mm)	Pretreatment Dizziness Duration	Pretreatment Weekly Vertigo Frequency	Pretreatment Vertigo Duration	Medication Used for Resolution of Vertigo	Time to Resolution After Initiating Treatment	Eventual VS Treatment	Follow-up Duration (Mo)
1	73	F	VM	12 mm	7 years	7	0.25–2 hours	Nortriptyline 50 mg	2 months	Continued observation	9
2	74	F	BPV	1.9 mm	3 years	7	< 1 minute	Verapamil 120 mg	1 week	CyberKnife radiation therapy	36
3	71	F	VM	2.5 mm	3 years	5	1 hour	Nortriptyline 75 mg	9 weeks	Continued observation	11
4	47	F	VM	10 mm	2 years	7	<1 minute	Nortriptyline 75mg	9 months	Continued observation	5
5	78	F	VM	13 mm	3 years	2	0.5 hours	Topiramate 25 mg	3 months	Continued observation	14
6	62	M	VM	14 mm	2 years	3	1–2 hours	Nortriptyline 10	3 weeks	CyberKnife radiation therapy	18
7	51	M	BPV	20 mm	3 week	7	< 1 minute	Epley maneuver	1 week	Continued observation	24
8	41	F	VM	10 mm	2.5 years	2	1 hour	Verapamil 240 mg	3 months	Continued observation	34
9	63	F	VM	11 mm	1 year	4	2 hours	Topiramate 150 mg	2 months	Continued observation	22

BPV indicates benign positional vertigo; VM, vestibular migraine.

prophylactic therapy (e.g., nortriptyline, topiramate, verapamil) or the Epley maneuver (15). A diagnosis of vestibular migraine (VM) was determined according to International Headache Society criteria (16).

The patients suffering from VM were treated with migraine lifestyle changes, diet, and migraine prophylactic medications. The first-line therapy was most commonly nortriptyline, verapamil, or both if there was no resolution. Second-line treatment was topiramate if no resolution was achieved with first-line therapy. All medications were given at escalating doses.

RESULTS

From 2012 to 2015, 143 new patients with VS presented to our clinic. Of these, nine (6.3%) initially presented with a chief complaint of episodic vertigo due to VM or BPV (Table 1). Seven (78%) fulfilled the criteria for VM and two (22%) had BPV. Before treatment, patients characterized vertigo frequency to be, on average, five times per week (range: 2–7 events/wk), and lasting an average of 48 minutes (range 1–120 min) per episode. All VM patients experienced complete symptomatic improvement of vertigo, endorsing no dizziness episodes after completing medication therapy during an average course of 10 weeks (range: 1–36 wk). Eight (89%) achieved resolution with migraine lifestyle and medication therapy while one achieved symptomatic resolution following a particle reposition maneuver. Of the two patients diagnosed with posterior canal BPV, one failed multiple Epley maneuvers and several weeks of Brandt–Daroff exercises. In this patient, treatment for possible underlying migraine-related BPV was initiated. For those on medication therapy, six (67%) achieved resolution on one medication alone—either nortriptyline or verapamil. Two patients (22%) failed first-line medication treatment and required topiramate to resolve symptoms.

Patients experienced chronic dizziness for an average of 3 years (range: 1–7 yr) at the time of presentation. The average maximum tumor dimension was 10.5 mm (range 1.9–20 mm). After medical treatment, seven patients (78%) avoided surgery and elected to continue with observation, while two (22%) underwent radiosurgery due to growth and other nonvertiginous symptoms (e.g., hearing loss) that were directly attributed to VS. The mean follow-up time was 19 months (range: 5–36 mo).

DISCUSSION

In our cohort of nine patients with VS and episodic vertigo, symptomatic resolution of vertigo occurred when treating patients for underlying VM or BPV. We think alternative etiologies should be evaluated and treated before attributing the vertigo to VS and considering surgical intervention. Conservative medical management of vestibular symptoms may resolve vertigo, and impact the patients' treatment decision. While some authors have advocated for surgical intervention in VS patients with vertigo, other vestibular pathologies should be ruled out before considering microsurgical excision

for VS patients with episodic vertigo purely based on vertigo symptoms (12,17).

VS with concomitant dizziness occurs in 49 to 66% of patients, but is the primary presenting symptom in only 10 to 19% of VS patients (18–21). In 73% of the VS patients who present with vertigo as the primary presenting symptom and undergo surgical VS resection, there has been found to be no improvement in vertigo handicap postoperatively (12). This suggests that in patients presenting with vertigo as a primary complaint and are otherwise a candidate for observation, microsurgical intervention may not be necessary. The presence of VS should not reflexively be thought to be the etiology of vertigo, instead other causes of vertigo should be ruled out before proceeding with intervention.

In our practice, treatment of VM begins initially with conservative therapy and diet/lifestyle modification, and then migraine prophylactic medication. Of the two patients experiencing BPV, one was determined to have migraine-related BPV, and was treated with migraine medication. The relationship between migraine and BPV has been established (22–24). Once the patients' symptoms have been quiescent for at least 3 months, the medication is tapered off. Patients with episodic vertigo and VS should be differentiated from those with VS with concomitant imbalance. Chronic imbalance in patients with VS may be due to the tumor mass effect or due to comorbidities such as peripheral neuropathy (25).

In contrast to BPV, no definitive diagnostic test exists to confirm VM, which is a clinical diagnosis based on patient history. In addition, VM treatment with nortriptyline and verapamil has widespread and nonspecific CNS effects, and may indirectly modulate vertigo relating to the tumor's impact on the vestibular nerve, and requires further investigation. The prevalence of VM and BPV in our study was 4.9 and 1.4%, respectively. VM and BPV have been shown to have a prevalence of 1 and 2.4% in the adult population, respectively (22,26).

The use of medical intervention in treating vertigo may ultimately increase the overall percentage of patients treated with observation and monitoring of their VS and avoid unnecessary surgery early on in the treatment course. All patients in this series had complete resolution of their vertigo. Although vertigo is commonly present with VS, it does not improve significantly after surgical or SRS intervention (11), medical management of vertigo should be attempted before intervention.

CONCLUSIONS

Although vertigo may initially be attributed to the VS, underlying comorbid conditions should be thoroughly evaluated before attributing the vertigo to the VS. All VS patients presenting with vertigo should undergo a standard vertigo history and examination.

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