The Journal of Laryngology and Otology
January 1999, Vol. **113,** pp. 19–23

Evaluation of the dizzy patient: experience from a multidisciplinary neurotology clinic

JUDITH M. HEATON, F.R.C.S., JASON BARTON, M.D., F.R.C.P.(C)*, PAUL RANALLI, M.D., F.R.C.P.(C)*, FELIX TYNDEL, M.D., F.R.C.P.(C)*, RYAN MAI, B.SC., JOHN A. RUTKA, M.D., F.R.C.S.(C)

Abstract
In 1993 a multidisciplinary neurotology clinic was established at the Toronto Hospital, University of Toronto, where patients with symptoms of dizziness were assessed by both otolaryngologists and neurologists. The results from the first 400 patients seen in consultation are described. The disease pathologies identified in this patient population with dizziness showed some significant differences from other published series, which we believe reflects the specialized tertiary nature of referrals to this clinic. A model for the collaborative investigation of the dizzy patient is provided consistent with the current trend towards multidisciplinary approaches in medicine.

Key words: Outpatient clinics, hospital; Dizziness; Multidisciplinary

Introduction

Dizziness is a very non-specific but common complaint in everyday practice. Although there have been many studies of patients in the world literature with particular diagnosis(es) causing dizziness, there have been relatively few studies documenting the presentation of disease pathologies especially in a tertiary referral setting.

In the past, some notable studies by Cawthorne and Hewlett (1954); Drachman and Hart (1972); Nedzelski *et al.* (1986); Wells and Yande (1987); and Davis (1994) have reported the results from clinics established to look specifically at the symptom of dizziness in either a discipline-specific or non-specialized setting. In this paper, however, we report the unique experience of a combined multidisciplinary neurotology clinic jointly participated in by both otolaryngologists and neurologists with sub-specialty interests in both neurotology, neurology and neurophthalmology at the Toronto Hospital, University of Toronto.

Method

In 1993, a multidisciplinary neurotology clinic was established at the Toronto Hospital, University of Toronto, between the Departments of Otolaryngology and Neurology. Its mission was to create a specialized unit dedicated to the clinical evaluation, investigation and treatment of the dizzy patient, utilizing available expertise in the subspecialties of neurotology, neurology, neurophthalmology and neuroradiology. From the inception of this clinic, data from each patient contact was collected both prospectively and separately from the clinical records. This allowed demographic information regarding the age and sex, the symptomatology, the positive findings on a standardized neurotological examination and diagnosis(es) to be specifically documented.

By history patients were required to initially describe their dizziness in order to determine whether any hallucination of movement (i.e. vertigo) existed and, if so, whether this was constant or episodic. The duration of the dizzy attack(s), being most important, was also documented. They were

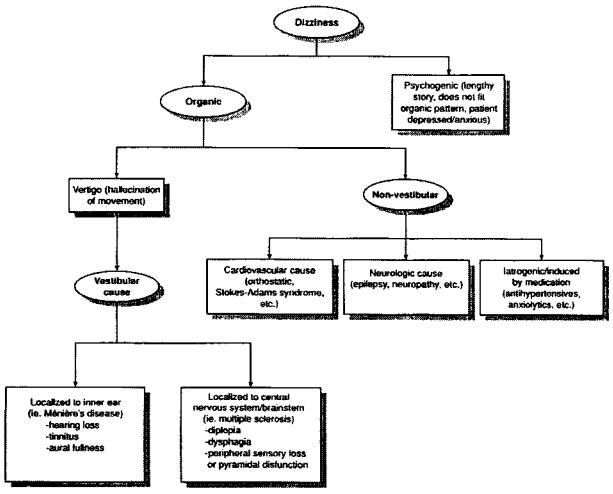

FIG. 1
Algorithm for the history taking in the dizzy patient

From the Departments of Otolaryngology and of Neurology*, The Toronto Hospital, University of Toronto, Toronto, Canada.
Accepted for publication: 18 October 1998.

TABLE I
ASPECTS OF THE FORMAL NEUROTOLOGICAL EXAMINATION

Otologic
Otoscopy
Tuning fork and fistula tests
Neurological
Cranial nerves
Cerebellar (midline, hemispheric)
Oculomotor (fixation, pursuit, saccades, convergence and accommodation)
Spontaneous and gaze evoked nystagmus
Proprioception and reflex testing
Romberg's test
Tandem gait
Special vestibular
Halmagyi manoeuvre (head thrust)
Vestibulo-ocular reflex (VOR) suppression
Head shake test
Oscillopsia test
Hallpike's positioning test
Hyperventilation × 60 sec

TABLE II
AVAILABLE INVESTIGATIONS AT THE TORONTO HOSPITAL, MULTIDISCIPLINARY NEUROTOLOGY CLINIC

1. *Neurotology*
Pure tone audiometry
Evoked response audiometry (brain stem and cortical)
Electronystagmography (ENG)
Pseudorandom rotational chair
2. *Neurophthalmology/Neurology*
Visual and somatosensory evoked potentials
Visual field testing
Scleral search coil testing
Nerve conduction studies/electromyography (EMG)
Electroencephalography (EEG)
3. *Neuroradiology*
Computerized tomography (CT)
Magnetic resonance imaging (MRI)
(MRI angiography, Functional MRI and Magnetic source imaging)
Selective angiography

asked whether visible objects seemed to 'jump' or 'bob' with head movement (oscillopsia) and about associated otological symptoms such as hearing loss, tinnitus, otalgia and otorrhoea, together with any symptoms of focal neurological dysfunction (diplopia, dysphagia, paresis, etc.) and/or losses of consciousness. Previous history of ear disease or prior ear surgery and of head injuries was sought, as well as the patient's general health, their medications and allergies. The algorithm for history taking is demonstrated in Figure 1.

Physical examination included otoscopy, tuning fork tests, the fistula test, oculomotor examination, cranial nerve examination and tests of cerebellar function. Regular and tandem gait were observed and the Romberg test performed (Romberg, 1846). Hallpike's positional testing (Dix and Hallpike, 1952) with Frenzel's glasses was performed on all patients regardless of their history. Tests of clinical vestibular function included vestibulo-ocular reflex (VOR) suppression (Barber, 1984), together with the Halmagyi manoeuvre (Halmagyi *et al.*, 1988), headshake test (Fujimoto *et al.*, 1993) and the oscillopsia test (Barber, 1984). Each patient was asked to hyperventilate for 60 seconds to determine if their symptoms of dizziness were reproducible (Table I). Depending on the differential diagnosis at this point, investigations were rationally chosen from a battery of available studies (Table II).

Following their initial assessment, the patient's diagnosis(es) was first classified as either peripheral, central, psychogenic or undiagnosed. These groups were then further subdivided into a specific clinical diagnosis(es). It should be noted that psychogenic dizziness was typically a diagnosis of exclusion. It was generally made when the history did not suggest peripheral or central vestibular dysfunction (i.e. dizziness typically lasting a flash or a few seconds, occurring during times of significant psychological stress, dissimilar and not as severe when compared to the sensation experienced from the caloric test etc) and the otoneurological examination and results of special investigations were normal, especially if there was an accurate reproduction of symptoms with hyperventilation (Nedzelski *et al.*, 1986; Rutka, 1994).

Patient details were entered onto a database using the program Filemaker Pro (Claris) on an Apple Macintosh Power Mac computer. After the first 400 patients had passed through the clinic, the information was analysed providing the following results (*vide infra*).

Results

Records were available on the first 400 consecutive patients, of whom 238 (59.6 per cent) were women and 162 (40.4 per cent) men. Their ages at presentation ranged from 17 to 90 years, with a mean of 50.7 years. The age and sex by decade at presentation is shown in Figure 2.

Specific symptoms were noted in 89 patients. This included a constant sense of 'dizziness and imbalance' in 66 patients, oscillopsia in 12 patients, oscillopsia plus constant dizziness in five patients and drop attacks in six patients. Physical signs were identified in 134 patients (34 per cent) and these are summarized in Table III. Nystagmus was present in 109 patients (27 per cent). The types of nystagmus

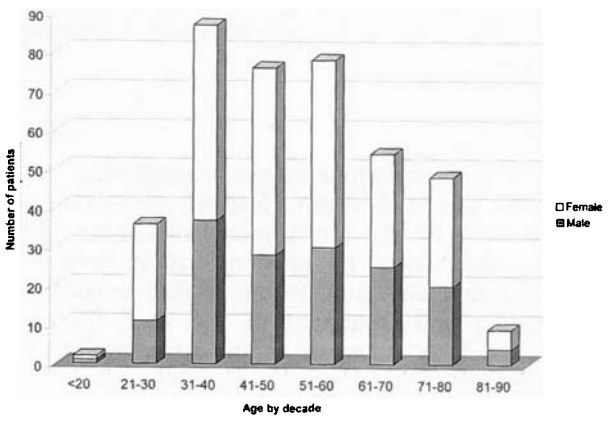

FIG. 2
Age and sex presentation by decade and sex to the multidisciplinary neurotology clinic

https://doi.org/10.1017/S0022215100143063 Published online by Cambridge University Press

TABLE III
PHYSICAL SIGNS (N = 134 PTS)

Nystagmus alone	81
Oculomotor abnormalities alone	1
Ataxia alone	6
Halmagyi test alone	5
VOR cancellation defect alone	1
Ocular flutter alone	1
Multiple signs	39
	134 pts

detected are shown in Table IV. Oculomotor abnormalities alone were noted in 18 patients.

When placed into major diagnostic categories a total of 230 patients (57.5 per cent) had diagnoses of a peripheral vestibular localization alone, whilst in 31 patients (7.75 per cent) a central cause alone was diagnosed. Forty-six patients (11.5 per cent) had psychogenic causes only, and 39 patients (9.75 per cent) were undiagnosed. See Table V. Detailed diagnoses are provided in Tables VI and VII. It should be noted that 50 other patients (12.5 per cent) fell into two major diagnostic (or mixed) groups and a further four patients (one per cent) fell into three diagnostic groups.

Discussion

The spectrum of disease encountered in this clinic reflects the tertiary nature of referrals but also differs from some previous reports (Cawthorne and Hewlett, 1954; Drachman and Hart, 1972; Nedzelski *et al.*, 1986; Wells and Yande, 1987; Davis, 1994). Historically multidisciplinary clinics have been established to investigate and manage certain clinical disorders and/or disease entities less frequently seen in the population at large that are often poorly understood or whose treatment typically requires involvement from numerous specialties in medicine with their expertise. Although dizziness is extremely common, its management nevertheless continues to evoke some degree of unease in most physicians. It was therefore hoped that this clinic would improve patient care with the efficient multidisciplinary clinical evaluation of dizzy patients that, in turn, would also provide research material to help the advancement of knowledge in this field.

The slight preponderance of women in this series (59 per cent) is a common finding in many reports concerning the dizzy patient. Our series (see Figure 2) and that of Nedzelski *et al.* (1986) found most dizzy patients were likely to be middle-aged (with

TABLE IV
TYPES OF NYSTAGMUS DETECTED (N = 109 PTS)

Post-headshake alone	38
Typical positional alone	25
Atypical positional alone	17
Typical (unilateral) + atypical (contralateral) positional	2
Gaze nystagmus alone	7
Primary directional alone	2
Congenital alone	3
Multiple types	15
	109 pts

TABLE V
DIAGNOSTIC GROUPINGS IN A MULTIDISCIPLINARY CLINIC (N = 400 PTS)

Peripheral vestibular (alone)	230 (57.5%)
Central (alone)	31 (7.75%)
Psychogenic (alone)	46 (11.5%)
Undiagnosed	39 (9.75%)
Mixed	54 (13.5%)
	400 pts

females outnumbering males especially between ages 20–60 years), the latter concluding that dizziness was predominantly a disease of middle-age likely to increase in prevalence with population aging. However, this would not be the experience of a paediatric or geriatric service. For example, Davis (1994) evaluated 117 men over 50 with dizziness at a US Veterans Affairs centre, and found 34 per cent had benign positional vertigo (BPV) while only three per cent had a psychophysiological diagnosis. There were, however, structural or metabolic central disorders in 22 per cent and with the increased age of the group, probably more visual and proprioceptive disorders contributing to their symptoms.

Symptoms recorded on the database included constant or persistent dizziness, oscillopsia and drop attacks. They did not include any hearing loss, tinnitus or other otological symptoms, although these were always asked about. The most frequently identified physical sign was nystagmus. This was found in 109 patients and occurred without other signs in 81 patients. In Table IV the majority of patients with documented nystagmus were identified during the Hallpike's positioning test, with the next most common type being post-head-shaking nystagmus (HSN). The use of Frenzel's glasses undoubtedly aided the identification of nystagmus especially post HSN. Patients with atypical positional nystagmus usually had transient downbeating nystagmus rather than rotatory nystagmus in the Hallpike's positioning test. They typically had a history suggestive of BPV with no evidence of central nervous system (CNS) disease.

TABLE VI
PERIPHERAL VESTIBULAR CAUSES OF DIZZINESS (N = 267 PTS)*

BPV historical alone	55
BPV typical alone	26
BPV atypical alone	9
BPV subtotal	90 pts
Recurrent vestibulopathy alone	52
Vestibular neuronitis alone	17
Menière's disease alone	10
Delayed endolymphatic hydrops alone	3
Ototoxicity alone	5
Acute cochleovestibular loss alone	5
Other individual peripheral causes alone	4
Undiagnosed peripheral alone	34
Multiple peripheral diagnoses†	47
	267 pts

*includes patients from mixed major diagnostic grouping where a peripheral disorder was present.
†majority of patients with multiple peripheral diagnoses had BPV or RV as well as history with typical findings.

https://doi.org/10.1017/S0022215100143063 Published online by Cambridge University Press

TABLE VII
*CENTRAL VESTIBULAR CAUSES OF DIZZINESS (N = 49 PTS)**

Idiopathic vestibulocerebellar degeneration alone	13
Cerebrovascular accident/transient ischaemic attack alone	7
Multiple sclerosis alone	6
Multisystem degeneration	5
Encephalitis alone	3
Tumour alone (meningioma, ependymoma)	2
Vertebrobasilar insufficiency alone	1
Intoxication alone	1
Other individual central causes	5
Multiple central causes	6
	49 pts

*includes patients from mixed major diagnostic groupings where a central disorder was present.

Although justifiable concern exists that the use of Frenzel's glasses may overdiagnose as abnormal the positionally-induced nystagmus often seen in normal subjects without dizziness it is important to realize that this type of nystagmus is not usually sustained, pronounced or present in more than one head position (Barber and Wright, 1973). Under these circumstances, when concerned, repetitive positional testing should be performed without Frenzel's glasses.

Nedzelski *et al.* (1986) described their experience of 2,515 patients in a Dizziness Unit where 56.8 per cent of referrals were from family practitioners. The most frequent diagnosis made was that of psychogenic dizziness (21.1 per cent), with 18.9 per cent being undiagnosed and 17.1 per cent having BPV. Another study, of only 104 patients, by Drachman and Hart (1972), found 32 per cent had either psychiatric disorders or hyperventilation-induced dizziness.

By comparison our study found that BPV was the most common presenting condition (129 patients, 32 per cent) diagnosed, with psychogenic dizziness alone accounting for only 46 patients (11.5 per cent). We suggest that a difference in referral pattern may have accounted for our findings compared to those of other series. Although our clinic was available to referrals from family practitioners, most of our patients had already seen an otolaryngologist or neurologist previously and had been selected either for their positive clinical findings or for a final opinion. There was also the possibility that we identified more cases of BPV as we adhered to positioning every patient in the Hallpike's positional test with Frenzel's glasses, whereas in a non-specialized setting, time constraints, physician reluctance to carry out the test and a lack of Frenzel's glasses are often the norm. Moreover, since the description of particle repositioning procedures (Semont *et al.*, 1988; Epley, 1992) there has been wider appreciation that effective therapy may be available for BPV, and hence more BPV patients were possibly referred to the specialized clinic in the hope that a cure could be facilitated.

In addition to BPV, other peripheral vestibular disorders formed the majority of diagnoses in our series. The second most common peripheral vestibular disorder was that of recurrent vestibulopathy (RV) (77 patients, 19.2 per cent) either alone, or in *combination with other peripheral vestibular disorders*. Broadly defined, RV describes a clinical syndrome of unknown aetiology that comprises of recurrent attacks of episodic vertigo similar to that seen in Menière's disease but without auditory or neurological symptoms or signs (LeLiever and Barber, 1983). Typically synonymous with terms such as vestibular Menière's, vertigo without deafness, benign episodic vertigo etc, long-term prospective follow-up in a cohort of RV patients over 8.5 years by Rutka and Barber (1986) demonstrated spontaneous resolution for the most part with little evolution to a more recognizable form of inner ear dysfunction. The third most common peripheral vestibular disorder identified was that of vestibular neuronitis (35 patients, 8.7 per cent). This group of patients typically experienced a solitary attack of acute vertigo for the most part lasting days to weeks that resolved spontaneously, although residual imbalance was not unusual afterwards. There was also a smaller group of patients with less common but interesting peripheral disorders, including drug ototoxicity (typically aminoglycoside-induced), acute cochleovestibular loss and delayed endolymphatic hydrops (DEH). Some 47 patients (11.7 per cent) had multiple peripheral diagnoses, which we believe represents a spectrum or continuum of inner ear dysfunction that may co-exist in any given individual, e.g. Rutka and Barber (1986) showed that a proportion of patients (22 per cent), although a minority, with RV occasionally went on to develop concomitant BPV or Menière's disease.

In the past some reports suggested a high proportion of dizzy patients had Menière's disease, e.g. 62 per cent of 1,902 patients seen by Cawthorne and Hewlett (1954). Nedzelski *et al.* (1986) found Menière's in only 9.8 per cent of their series and we had just 10 patients out of 400 (2.5 per cent). We therefore conclude that this condition was either formerly over diagnosed, that the prevalence of Menière's in the general population has significantly changed, or most likely that most practitioners appear quite comfortable making this diagnosis and that as effective treatment exists when required there is generally no need for referral to a multidisciplinary unit.

Of interest, no patients with acoustic neuromas (vestibular schwannomas) were diagnosed in this series. This was in spite of the fact that some of our referring physicians mentioned 'ruling out' this diagnosis as one of their reasons for referral. We believe that with the greater availability and accessibility of both computer assisted tomography (CAT) and magnetic resonance imaging (MRI) this condition is now more readily diagnosed elsewhere. Moreover, in general terms, acoustic neuromas tend to present with asymmetric sensorineural hearing loss and tinnitus rather than episodic dizziness and imbalance.

Central causes of dizziness were relatively rare in this series. Of patients identified with central vertigo, vestibulocerebellar degeneration in 13 patients (3.3

per cent) was the most common central abnormality noted. As fitting for this clinic there were also individual cases of relatively rare central disorders resulting in dizziness and imbalance, e.g. Creutzfeld-Jakob disease, progressive supranuclear palsy, tertiary syphilis, etc. Of interest, multiple sclerosis (MS) was only found in six patients (1.5 per cent). This most likely reflects the fact that true vertigo is also a relatively infrequent presenting complaint in MS. When the characteristic multiple neurological symptoms and signs separated in time appear in a patient, the diagnosis of MS is primarily considered and investigated for elsewhere.

In general one would normally expect a difference between the experience of a special centre and that of the individual otolaryngologist in community practice. Wells and Yande (1987) reported the experience of 86 new dizzy patients over 10 years in a general otolaryngology practice. The most frequent cause noted was 'cervical positional vertigo' in 50 per cent of their patients, e.g. rotational vertigo (not necessarily with nystagmus) lasting three to 10 seconds, precipitated by abrupt neck movements. In hindsight one wonders whether this could be the type of dizziness we defined as being compatible with historical BPV in our series or, possibly, represents continued symptoms from a poorly compensated unilateral peripheral vestibular lesion, although many patients appear to have been subsequently treated successfully by avoidance of neck movements and in some cases with a cervical collar. In many of Wells and Yande's patients a diagnosis of vertebrobasilar insufficiency was made. We would however follow Barber and Dionne's (1971) recommendation in not making the latter diagnosis without evidence of focal neurological signs. Interestingly, four patients in Wells and Yande's series were in fact later diagnosed as having BPV, presumably after typical findings on Hallpike's positioning testing.

Conclusion

We have found that the vast majority of organic dizziness in a multidisciplinary setting appears peripheral vestibular in nature, with BPV being the most common diagnosis. This fact underscores how important it is for treating physicians to be aware of this diagnosis through professional interface with their specialist colleagues and to perform the Hallpike's positional test in their patients before making a referral for dizziness. If the Hallpike's positional test were positive then a diagnosis of BPV could have been made at the level of the family practitioner or specialist thus obviating the need for referral to a multidisciplinary unit and possibly eliminating the anxiety patients face when their diagnosis appears unknown. In the multidisciplinary setting Menière's disease was infrequently diagnosed and not one patient was identified in our series to have an acoustic neuroma. The evolution however from one recognizable peripheral vestibular disorder to another, e.g. RV to BPV or Menière's disease, vestibular neuronitis to RV etc. was not unusual and occurred in approximately 11.3 per cent of our patients. For the most part central causes of dizziness (alone or in combination with other major diagnostic groupings) were relatively rare (12.2 per cent). Serious disorders such as stroke, MS or brain tumour were not identified to be common causes of dizziness. This supports our belief that the majority of patients with 'dizziness' do not have worrisome or life-threatening central pathology accounting for their symptoms. In our experience we believe that a multidisciplinary approach has led to the better understanding and more cost-effective management of challenging dizzy patients in a tertiary setting.

Acknowledgment

Ms Judith Heaton would like to acknowledge the TWJ foundation for her fellowship support at the University of Toronto. Ms Mabel Mai, senior vestibular scientist at the Toronto Hospital Center for Advanced Hearing and Balance Testing is also acknowledged for her role in the production of this manuscript.

References

Barber, H. (1984) Vestibular neurophysiology. *Otolaryngology Head and Neck Surgery* **92:** 55–58.

Barber, H., Dionne, J. (1971) Vestibular findings in vertebrobasilar ischaemia. *Annals of Otology, Rhinology and Laryngology* **80:** 809–812.

Barber, H., Wright, G. (1973) Positional nystagmus in normals. *Advances in Otorhinolaryngology* **19:** 273–280.

Cawthorne, T., Hewlett, A. (1954) Menière's disease. *Proceedings of the Royal Society of Medicine* **47:** 663–670.

Davis, L. (1994) Dizziness in elderly men. *Journal of the American Geriatrics Society* **42:** 1184–1188.

Dix, M., Hallpike, C. (1952) The pathology, symptomatology and diagnosis of certain common disorders of the vestibular system. *Annals of Otology, Rhinology and Laryngology* **61:** 987.

Drachman, D., Hart, C. (1972) An approach to the dizzy patient. *Neurology* **22:** 323–334.

Epley, J. (1992) The canalith repositioning procedure for treatment of benign paroxysmal positional vertigo. *Otolaryngology – Head and Neck Surgery* **107:** 399–404.

Fujimoto, M., Rutka, J., Mai, M. (1993) A study into the phenomenon of head-shaking nystagmus: Its presence in a dizzy population. *Journal of Otolaryngology* **22:** 376–379.

Halmagyi, G., Curthoys, I. (1988) A clinical sign of canal paresis. *Archives of Neurology* **45:** 737–739.

LeLiever, W., Barber, H. (1983) Recurrent vestibulopathy. *Journal of Otolaryngology* **12:** 61–63.

Nedzelski, J., Barber, H., McIlmoyl, L. (1986) Diagnoses in a dizziness unit. *Journal of Otolaryngology* **15:** 101–104.

Romberg, M. (1846) *Lehrbuch der NervenKrankheiten des Mennschen* A. Duncker, Berlin.

Rutka, J. (1994) Dizziness and vertigo: What's being missed? *Continuing Medical Education* **6:** 75–83.

Rutka, J., Barber, H. (1986) Recurrent vestibulopathy: third review. *Journal of Otolaryngology* **15:** 105–107.

Semont, A., Freyss, G., Vitte, E. (1988) Curing BPPV with a liberatory maneuvre. *Advances in Otorhinolaryngology* **42:** 290–293.

Wells, M., Yande, R. (1987) Vertigo in a district NHS hospital. *Journal of Laryngology and Otology* **101:** 1235–1241.

Address for correspondence:
Dr J. Rutka,
Staff Otolaryngologist, The Toronto Hospital,
Toronto General Division, 7EN-Rm 222,
200 Elizabeth Street,
Toronto, Ontario,
Canada, M5G 2C4.