

INTEGRATED MANAGEMENT OF THE BALANCE DISORDER PATIENT

By
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Introduction

The balance system is a complex integration of multiple sensory inputs from the vestibular organs, the visual system, and the somatosensory / proprioceptive systems. Evaluation and interpretation of disorders within the balance system therefore, requires an integrated management approach. This article is intended to provide the reader with an overview of the tools used in management decisions and the management options available.

Clinical History & Physical Exam

A complete clinical history is probably the single most important portion of the diagnostic evaluation for the balance disorder patient. The differentiation between the various peripheral and central vestibular disorders and the initial management path are particularly dependent on historical information.

Most vestibular disorders cannot be distinguished from one another simply by vestibular testing or other diagnostic procedures. While important primarily in a confirmatory role, laboratory based vestibular/balance function testing is much less likely to influence or direct management decisions than the detailed neurotologic history with direct clinical vestibular exam. Failure to properly discriminate these disorders on historical grounds may be the source of considerable ongoing distress for the patient, and may lead to improper management. When evaluating a patient with acute onset of vertigo for the first time, ruling out threatening causes of a neurological or cardiovascular nature is of primary importance. It is in the chronic patient with imbalance and/or dizziness that laboratory testing is typically useful.

Once the patient has shared the main concerns raised by his or her condition, the first specific questions should be phrased to gain information regarding the initial onset of the symptoms. Surprisingly, if the physician does not specifically inquire, patients who are preoccupied with recent symptoms and disability may neglect to report a very profound vestibular crisis that occurred many years earlier. Other important issues to discuss in the interview include specifics surrounding spontaneity of symptoms versus symptoms provoked by movement/position and a host of predisposing factors.

It is also very important to identify any hearing loss. A complete audiometric assessment should be performed early in the evaluation. The presence of an associated sensorineural hearing loss, whether stable, progressive or fluctuating can be the single strongest incriminating factor in identifying a pathologic labyrinth.⁸

Balance Function Testing

The purpose of balance function testing encompasses three primary goals:

1. Localization of site-of-lesion
2. When possible, objectification of patient symptoms
3. A limited evaluation of the level of physiologic and functional central compensation.

An initial core set of procedures are suggested to be:

- A. A complete neurotologic history.
- B. Some form of postural control evaluation, such as Clinical Test for Sensory Interaction of Balance (CTSIB).⁹
- C. ENG Nystagmus tests including Spontaneous, Hallpike (with direct visual observation of the eyes) Positional, and Caloric.
- D. ENG Ocular-motor tests including Smooth Pursuit, Saccade, and Gaze stabilization (fixation).

Knowledge of the clinical history and the results from these core tests can be used to determine whether to expand the testing to include rotational chair, active head rotation and dynamic posturography, using specific staged protocol criteria.⁷

When multiple tests are used on a patient, it is best to report the results in a way that integrates the findings into the following impressions:

1. Presence or absence of peripheral system involvement, side of lesion, and compensation status.
2. Presence or absence of central vestibulo-ocular or ocular motor pathway involvement and, if possible, the localization within the central system.
3. Status of postural control ability for maintenance of upright stance and status of coordinated response to recovery from unexpected sway.

The impressions from the findings and the patient's clinical history should be combined to provide recommendations covering the following issues:

1. The need for additional specialty referral for diagnostic evaluation and treatment such as otology, neurology or physical medicine.
2. The potential candidacy for the use of a vestibular and balance rehabilitation program.

Interpreting findings in isolation from other aspects of the test battery especially auditory symptoms and findings and patient's history may produce significant diagnostic confusion and ultimately lead to delays in diagnosis and appropriate treatment.

Vestibular Rehabilitation Therapy

Vertigo or dysequilibrium may persist after any acute injury to the balance system due to poor central nervous system compensation. Current knowledge about the process of central compensation for vestibular lesions suggests that avoidance of movements and body positions that provoke vertigo, as well as the routine use of vestibular suppressants for these patients, may be counterproductive. The stimulus for recovery and promotion of central compensation from a stable vestibular lesion is in part, repeated exposure to the sensory conflicts produced by movement of the head and eyes.⁴

Therefore, treatment of a stable acute or chronic vestibular system lesion would call for judicious, as needed, use of medications with either informal or formal vestibular rehabilitation activities leading to increased head and eye movement activity. If symptoms continue and do not involve complaints of spontaneous events (suggestive of an unstable lesion) a formal vestibular and balance rehabilitation program should be initiated.

Such programs are most effective when customized to the needs of the individual patient and supervised by an appropriately trained physical or occupational therapist.⁶ The development of any vestibular and balance therapy program should always give consideration to the following areas:

1. Adaptation and habituation exercises.
2. Balance & gait exercises.
3. General conditioning exercises.^{4,5,10,11}

It is important to realize that vestibular and balance rehabilitation programs are symptom driven, test findings (other than posturography) are not typically used to determine who is a candidate.

Patient populations that are most likely to benefit from customized vestibular and balance rehabilitation therapy are shown in Table 1.

VESTIBULAR AND BALANCE REHABILITATION CANDIDATES	
<i>APPROPRIATE</i>	<i>INAPPROPRIATE</i>
Stable peripheral or central lesion	Unstable peripheral or central lesion
Head or visual motion provoked symptoms	Only spontaneous events
Continuous symptoms with motion exacerbation	Progressive Central lesion (balance/gait)
Functional balance or gait dysfunction - with or without abnormal perceptions of movement (vertigo) or lightheadedness	
Spontaneous event with head/visual motion provoked symptoms in between and subsequent spontaneous events at least 6 - 8 weeks apart	
Any Age	

Table 1: Candidates for a formal vestibular and balance rehabilitation program

The specific details of the physical therapy evaluation needed to arrive at a customized plan for treatment varies depending on the symptom complaints of the patient. Detailed literature exists describing the process. Refer to these references for greater detail ^{1,4,10,11}.

Balance disorder patients whose symptoms occur only in spontaneous episodes, such as those seen with Ménière's patients, and/or those who have no residual symptoms between spontaneous events, will not typically benefit from a vestibular and balance rehabilitation program as referred to in the literature cited in this article. Patients such as these are most often managed with medical and/or surgical strategies.

Medical Therapy

For most chronic vestibular disorders, no disease-specific pharmacological treatment is available. The use of medications in the treatment of balance disorder patients falls into three major categories:

- A. General suppression of vestibular symptoms
- B. Pharmacological treatment of specific conditions that cause vestibular symptoms, such as Ménière's disease, autoimmune problems or migraine headaches.
- C. Treatment of the patient who has developed clinical depression and/or anxiety disorder in response to troubling vestibular symptoms, or is manifesting the anxiety disorder with symptoms of imbalance and dizziness.

Acute vertiginous attacks are usually treated with either an antihistamine or a Benzodiazepine. In addition, antiemetics may be given during acute vertiginous episodes. Diazepam (Valium[®]) is generally most effective for the suppression of severe vertigo. It appears to assist in the early phases of compensation, perhaps by allowing for earlier ambulation as well as the head movements that are required to initiate the dynamic aspects of vestibular compensation. Patients should be weaned from this medication once acute symptoms are resolved to prevent addiction.

Antihistamines are milder vestibular suppressants and are often used to help the Ménière's Disease patient in relieving a portion of the symptoms during an acute spell. Meclizine is popular for the treatment of dizziness symptoms. Meclizine, a safe and well tolerated medication, is sometimes completely adequate for the symptomatic management of acute symptoms or repeated spells that last longer than thirty minutes. As with other suppressive medications limits on "as needed" use is advised.

The third class of medications used as vestibular suppressants, are the anticholinergics such a Scopolamine. The cholinergic transmitter influence in the peripheral and to some extent in the central system may partially explain their efficacy.

Although vestibular suppressants can be appropriate for the short-term control of symptoms, they may be counterproductive with respect to the eventual desired outcome of rehabilitation of the patient. This however needs to be determined on a case by case basis. There are cases where medication use is needed to perform activities to promote compensation.

Some patients with classic migraine headaches may experience vertigo as part of the migraine process. ^{2,3} For these patients as well as those that show indications of either primary or secondary depression or anxiety disorders specific medical therapy assumes the role of primary focus of management.

Surgical Management

Patients appropriate for consideration of a surgical procedure are typically those presenting with unstable peripheral system lesions. The principle indicators that differentiate an unstable lesion from a stable, uncompensated peripheral insult involve complaints of spontaneous occurrence of symptoms and/or documented fluctuant or progressive changes in auditory sensitivity. While there are results from ENG, rotary chair and posturography evaluations that suggest lack of compensation, those findings do not differentiate incomplete compensation from a stable versus unstable lesion. The history and auditory findings are the key for that determination. The classic model for an unstable peripheral vestibular disorder is that of Ménière's syndrome.

Surgery for vestibular disorders typically falls into two categories, reparable and ablative. The reparable grouping includes procedures in middle ear pathologies that may be producing symptoms. Procedures suggested for Ménière's syndrome include endolymphatic sac decompressions and shunt placements. Dealing with perilymphatic fistulas with an exploratory tympanotomy and patching of deficits at the oval or round windows would be another example of a reparative procedure.

Ablative procedures, such as labyrinthectomy or vestibular nerve sectioning are designed to create a complete stable peripheral lesion for which the compensation process can then be applied. This assumes that the reason for the lack of compensation pre-surgery was the unstable, fluctuant nature of the labyrinth and not a condition of central system inability to compensate. It is critical that for ablative procedures to work the lesion must be confined to the labyrinth. It is important to realize that the ablative procedures are designed to arrest spontaneous events of symptoms, leaving the patient with unsteadiness and head movement provoked symptoms that can then usually be handled with activities to promote the compensation process, such as a vestibular and balance rehabilitation program.

The use of chemical infusion of ototoxic medications to the ear has been referred to as a chemical ablative procedure. However, to achieve the reduction in the spontaneous events complete destruction of all vestibular tissues may not be necessary, as indicated by the use of small doses of the drugs with prolonged control. For detailed discussions of the use of medical and surgical options together with vestibular rehabilitation therapy the interested reader is referred to other suggested literature.^{4,7,12,13}

Conclusion

Managing the complex vestibular disorder patient can be a challenging, even daunting task. An essential part of the care of this patient population is a careful and thorough evaluation followed by comprehensive counseling about the nature of the vestibular dysfunction. This will allay many of the patient's fears and produce, an understanding of their disease that will allow them to participate meaningfully in management decisions. An informed patient, along with the judicious selection of medical, surgical, and/or rehabilitative measures, will result in the most satisfying management course, even if the symptoms cannot always be entirely eliminated.

References

1. Borello-France DF, Whitney SL, Herdman SJ, (1994). Rehabilitation assessment and management. In Herdman SJ, (ed), *Vestibular Rehabilitation*, (pp287-315). Philadelphia:F.A. Davis.
2. Harker LA, Rassekh C, (1988). Migraine equivalent as a cause of episodic vertigo. *Laryngoscope*, 98, 160-164.
3. Harker LA, (1994). Migraine. In Jackler RK, Brackmann DE, (eds), *Neurotology* (pp 463-470). St. Louis: Mosby-Year Book, Inc.
4. Herdman SJ, (1994). *Vestibular Rehabilitation*. Philadelphia: F.A. Davis Company.
5. Shepard NT, Telian SA, Smith-Wheelock M, Raj A, (1993). Vestibular and balance rehabilitation therapy. *Ann Otol Rhinol Laryngol*, 102, 198-205.
6. Shepard NT, Telian SA, (1995). Programmatic vestibular rehabilitation. *Otolaryngol Head Neck Surg*, 112, 173-182.
7. Shepard NT, Telian SA, (1996). Practical management of the balance disorder patient. San Diego: Singular Publishing Group, Inc.
8. Shone G, Kennick JL, Telian SA, (1991). Prognostic significance of hearing loss as a lateralising indicator in the surgical treatment of vertigo. *J Laryngol Otol*, 105, 18-20.
9. Shumway-Cook A, Horak FB, (1986). Assessing the influence of sensory interaction on balance. Suggestion from the field. *The Journal of American Physical Therapy Association*, 66(10), 1548-1550.
10. Shumway-Cook A, Horak FB, (1990). Rehabilitation strategies for patients with vestibular deficits. *Neurology Clinics*, 8 441-457.
11. Smith-Wheelock M, Shepard NT, Telian SA, (1991). Physical therapy program for vestibular rehabilitation. *Am J Otol*, 12, 218-225.
12. Furman & Cass. *Balance Disorders: A Case-Study Approach*. F.A. Davis Company. 1996.
13. Baloh & Halmagyi. *Disorders of the Vestibular System*. Oxford University Press, New York, 1996.

Biography

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Dr. Shepard is Professor of Otorhinolaryngology-Head and Neck Surgery and Director of Audiology, Speech-Language Pathology & the Balance Center at the University of Pennsylvania. He received his undergraduate and masters training in Electrical and Biomedical Engineering from the University of Kentucky and Massachusetts Institute of Technology. He completed his Ph.D. in auditory electrophysiology and clinical audiology from the University of Iowa in 1979. Dr. Shepard has specialized in clinical electrophysiology for both the auditory and vestibular systems. Activity over the last 18 years has concentrated on the clinical assessment and rehabilitation of balance disorder patients and clinical research endeavors related to both assessment and rehabilitation.