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Balance and Vestibular Rehabilitation in the Patient with Acquired Brain Injury

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Introduction

Acquired and degenerative neurologic disorders are frequently associated with disequilibrium, dizziness, and vertigo. Conditions such as traumatic brain injury (TBI) and cerebrovascular accident (CVA) can present with varying degrees of motor, sensory, and central processing impairments that can dramatically impact daily life activities and increase the risk of injury due to falls. A majority of individuals who sustain brain injury complain of dizziness for up to 5 years following injury (Sataloff et al., 1993). Stroke survivors often have problems with balance, with a reported 40% experiencing a serious fall within the first year after the CVA (Health on the Net Foundation, 2003).

Falls and the fear of falling are associated with considerable mortality, morbidity, reduced functioning, and premature nursing home admission. A study of persons who fell at home reported a greater deterioration in mobility and independence in daily living than in age- and gender-matched controls (Wild et al., 1981). In addition to the impact falls can have on health and well-being, treating the resulting complications contribute to higher health care costs. Recurrent falls account for 40% of admissions to long-term care institutions (Centers for Disease Control and Prevention, 2003). Five percent of older people who fall require hospitalization and related injuries account for 6% of medical expenditures for this age group (Centers for Disease Control and Prevention, 2003). Medicare costs for hip fractures are estimated to be over 3 billion dollars per year (Centers for Disease Control and Prevention, 2003).

Each member of the brain injury rehabilitation team needs to be equipped to recognize persons who may be experiencing problems with the balance system. Physical therapists must be aware of the multifactorial nature of balance disorders and must be trained to uncover key underlying impairments that contribute to the symptoms of imbalance and dizziness. Other team members must recognize the value of their assessments in determining a patient’s risk for disequilibrium and falls. Occupational therapists can provide an assessment of visual perceptual function and the potential contribution to the patient’s imbalance. Similarly, the neuropsychologist can discuss observed cognitive deficits and coordinate team
strategies to help mitigate them. Additionally, the attending physician can review current medications and manage them accordingly to minimize side effects, including dizziness. Once a balance deficit is identified, it is important for the team to refer the patient to the appropriate caregiver. Specialty physicians involved in diagnosing the origin of a balance disorder include neurologists, neurotologists (specialists in neurologic and inner ear disorders), and otolaryngologists (ear, nose, and throat specialists). Allied health personnel, such as audiologists and nurse practitioners, may also be involved in the diagnosis and treatment of disequilibrium. Finally, the nature of balance and vestibular rehabilitation requires that the therapist providing the intervention and management be specially trained and certified in vestibular rehabilitation. Rehabilitation of balance and vestibular problems involve technical skills that are not typically fully developed in general therapy education programs. This chapter seeks to provide the reader with an overview of balance and vestibular rehabilitation so that patients with symptoms of disequilibrium, dizziness, and vertigo are readily identified and well cared for.

Fall Risk Factors

Falls generally result from an interaction of multiple and diverse risk factors, many of which can be corrected. Risk factors for falls can be classified as intrinsic, extrinsic, and environmental in nature (American Geriatrics Society et al., 2001). **Intrinsic risk factors** include cognitive impairment, muscle weakness, poor visual acuity, presence of chronic illness, and balance disturbance. **Extrinsic factors** include the effects of medications on a person, such as the phenomenon of polypharmacy (multiple medications negatively interacting with one another). Many intrinsic (cognitive, visual, and balance problems) and extrinsic (multiple medications) factors are present after acquired brain injury. **Environmental risk factors** include environmental risks, such as lighting, tripping hazards, and lack of safety equipment in the home. As the number of risk factors increases, the risk for falls increases dramatically. This is known as **risk factor synergism**. Tinetti et al., (1988) found that older persons with less than two risk factors had a 27% chance of falling, where the risk for fall increased to 78% in persons with four or more factors. Unfortunately, these risks frequently become evident only after a fall-related injury.

Basics of Balance

Before specific rehabilitation techniques can be explored, a basic understanding of the balance system is necessary. Nashner (1989) defines the role of the balance system as maintaining the center of gravity over the base of support in a given sensory environment. The center of gravity (COG) is an imaginary point where all the forces acting on the body equals zero and is anatomically located in the pelvis anterior to the sacrum. A person is most stable when the COG is positioned midline within the base of support (BOS). The BOS in standing is the area contained within