

Aging and Vestibular System: Specific Tests and Role of Melatonin in Cognitive Involvement

D. Alpini¹, A. Cesarani², F. Franschini³, R. Kohen-Raz⁴, S. Copobiancio⁵, F. Cornelio⁶

1. Otolaryngology-Otoneurology Service, Scientific Institute S. Maria Nascente, don C. Gnocchi Foundation, Milan, Italy, Vertigo Centre, "A. Dufour," Milan, Italy, National Neurologic Institute "C. Besta," Milan, Italy

2. Otolaryngology Department, University of Milan, Milan, Italy

3. Chemiotherapy Chair, University of Milan, Milan, Italy

4. Special Education Department, Hebrew University, Jerusalem, Israel, and tetrax Ltd., Jerusalem, Israel

5. Otolaryngology Department, University of Sassari, Sassari, Italy

6. National Neurologic Institute "C. Besta," Milan, Italy

Summary

Balance disorders are frequent with aging. They are particularly important because they decrease social autonomy of the aged subjects and they often provoke falls. The cause is always multifactorial. There is evidence that aging affects multiple sensory inputs, as well as the musculoskeletal system and central nervous system ability to perform sensorimotor integration. For the evaluation of decreased balance skills in the elderly, a specific questionnaire has been prepared, in order to identify high risk of falling called falling risk inventory (FRI) questionnaire, and a complex psycho-sensory-motor test has been studied, called navigation test (NT). The correlation between FRI and balance disorders was studied by means of posturography, in order to detect specific vestibular impairment. Regarding ethiopathogenesis of balance disorders in aged subjects, because the decline of behavioral and cognitive performances are due also to decline of biological rhythm control, the role of melatonin (the hormone regulating circadian rhythms, being strictly involved in the aging process) has been investigated. Melatonin rhythm is strictly connected with cerebellar function, and it is well known that cerebellum acts in elderly both a motor and cognitive regulation. The goals of the present paper are: (i) To present a self-administered FRI questionnaire aimed at identifying the possible causes of falls and quantifying falling risk in the aged (ii) To validate posturography as a specific test to investigate vestibular involvement in elderly in correlation with FRI (iii) To present a complex behavioral test (NT) aimed at evaluating both spatial orientation and spatial memory in elderly, factors involved into the genesis of complex dizziness and unsteadiness (iv) To evaluate the role of melatonin in cognitive involvement in dizzy, old subjects due to functional correlations between circadian rhythms, cerebellum balance disturbances and cognitive disorders.

General conclusions are: FRO correlates with falling risk. Posturography identifies specific vestibular impairments correlated to balance disorders and elderly falls. Spatial orientation is altered in about 40% of dizzy patients but no significant differences are revealed in melatonin rhythm. Spatial memory is highly altered only in subjects with inversion of circadian melatonin rhythm. It is possible to hypothesize that the alteration of the normal circadian melatonin rhythm plays some role in the genesis of dizziness in a subpopulation of patients.