

Evaluation of activity-normalized fall rates in glaucoma

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Purpose: Falls are the leading cause of accidental mortality in older adults. Prior work has identified visual field (VF) loss as a risk factor for falls, as well as for physical activity restriction. Here, we prospectively evaluate fall rates in persons with varying degrees of VF loss from glaucoma, and combine falls data with accelerometer-defined physical activity to express fall rates as a function of both time and activity.

Methods: Enrolled subjects were age 57 or greater and had a diagnosis of glaucoma or suspected glaucoma. Right and left eye 24-2 VF data were integrated on a pointwise basis, and used to calculate mean sensitivity of the integrated VF (IVF). Subjects completed a one-week triaxial accelerometer trial to estimate daily steps and completed questionnaires to evaluate educational, cognition, medications, and comorbid conditions. Subjects were shown videos to define a fall and kept prospective fall diaries to identify fall rates over a period of 6-22 months. Subjects reporting a fall completed a phone interview to determine if any injuries resulted.

Results: The 246 study patients had a mean age of 70.6 years (SD=7.6) and an average IVF sensitivity of 26.1 dB (IQR=25.1 to 29.7 dB; range=1.7 to 33.9 dB). For the full study group, the cumulative incidence of one or more falls at 12 months was 44%, while the cumulative incidence of one or more injurious falls at 12 months was 20%. In the full study group, 50% of patients were modeled to have fallen after walking 1.44 million steps, whereas in analyses restricted to subjects with an IVF sensitivity below 28 dB, 50% of subjects were predicted to have fallen after a total of 1.08 million steps. In multivariable negative binomial regression models, each 5 dB decrement in IVF sensitivity was associated with a 51% higher rate of falls/step (95% CI = 12 to 100%, $p=0.005$). In separate multivariable models, similar associations were noted for a 5 dB decrement in the superior (47% higher rate; 95% CI=12-93%, $p=0.005$) and inferior (43% higher rate; 95% CI=11-85%; $p=0.006$) IVF, respectively.

Conclusions: Falls and fall-related injuries were common in the studied population, and fall rates were significantly higher in persons with more advanced VF loss. Further work is needed to identify and validate strategies for preventing falls in this high-risk population.

Layman Abstract: Nearly 50% of patients with glaucoma fall, and 1 in 5 sustain a fall-related injury over the course of year. The rate of falling is much higher for persons with significant damage to their peripheral vision. More work is needed to develop approaches for fall prevention in this high-risk population.