Gait changes across lighting conditions in persons with glaucoma

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Purpose: Individuals with glaucoma frequently report difficulty adjusting to dim and bright light conditions. Here, we assessed how gait parameters change between normal and bright/dim lighting across the spectrum of visual field (VF) damage.

Methods: The GAITRite Electronic Walkway (CIR Systems Inc) was used to collect gait parameters (velocity, stride length, base of support, and stride-to-stride variability (coefficients of variation [CoV]) for each of these measures) under normal, dim and bright light conditions. Mean sensitivity of the point-wise integrated visual field (IVF) was used as a measure of glaucoma severity. Multiple regression models were constructed in which differences in gait parameters (bright or dim value minus normal lighting value) were considered as the dependent variable, IVF sensitivity was included as the primary independent variable, and age, race, gender, number of comorbidities and medications were considered as covariates.

Results: Data from 214 participants were used in this analysis. Differences between dim and normal-lighting gait velocity were more pronounced in patients with worse IVF sensitivity (β=-7.27 cm/s per 5 dB IVF decrement, $p<0.001$) as were differences in stride length (β=-5.07 cm per 5 dB IVF decrement, $p<0.001$). Differences between bright and normal-lighting gait velocity were also more pronounced in patients with worse IVF sensitivity (β=-1.85 cm/s per 5 dB IVF decrement, $p=0.01$), as were differences in stride length (β=-0.97 cm per 5 dB IVF decrement, $p=0.05$). Bright versus normal-lighting base of support differences were more evident amongst patients with worse IVF sensitivity (β= -0.24 cm per 5dB IVF decrement, $p=0.02$), while differences between dim and normal-lighting base of support did not vary with IVF sensitivity ($p=0.27$). Differences between dim and normal-lighting variability in stride length (β=1.75% per 5 dB IVF decrement, $p<0.001$) and stride velocity (β=3.35% per 5 dB IVF decrement, $p<0.001$) were greater in patients with worse IVF sensitivity, while differences between bright and normal-lighting gait variability measures did not significantly differ ($p>0.34$).

Conclusions: Glaucoma patients with worse IVF sensitivity demonstrate more pronounced gait changes between normal and bright/dim lighting, suggesting greater challenges in mobility under the extremes of lighting.