Analysis of gait and posture control in peripheral vestibular disorder utilizing 3D motion capture system

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Learning Objectives:

- Introduction: Electronic walkway and video-based gait analysis provide comparable temporospatial gait information in healthy and peripheral vestibular disorder (PVD) subjects. In this study, we investigated the motion of body parts to establish the quantitative evaluation methods for the gait and posture in PVD patients.

- Design: Data were acquired simultaneously by a walkway and an eight-camera motion capture system (Locus 3DMA-8000, Anima Co.) in 8 healthy subjects (Control) (age 24 ± 2.5 yrs) and 4 people with unilateral Canal Paresis (CP) in Caloric test (20°C, 5 ml, 20sec) (Superior vestibular dysfunction: SVN group) (age 70 ± 5.9 yrs), 6 people with unilateral loss of response in vestibular-evoked myogenic potential (VEMP) (Inferior vestibular dysfunction: IVN group) (age 37 ± 1.3 yrs) and 5 people with unilateral CP and loss of response in VEMP (SVN & IVN group) (age 61 ± 8.1 yrs). Each group demonstrated free walk and upright stance posture for 30 secs in their eyes’ open or closed, with reflective markers attached to their skin. Movement of each marker, gait velocity, stride time, stride length, step length, percent single support, and percent total support were compared among four groups.

- Results: Movement of markers which subjects closed their eye in upright stance posture and free walk was significantly larger than that in open their eyes in “Control, SVN group and SVN & IVN group” and “Control and IVN group”, respectively. SVN group walked unsteadily the most among all groups in their eyes’ open and closed. Gait speed and stride length were significantly decreased in PVD groups.

- Conclusions: We have demonstrated the analysis of gait and posture control in in PVD utilizing 3D motion capture system. Quantitative assessment in motion in PVD is necessary for the development of vestibular rehabilitation. We considered that 3D motion capture has the potential to become new methods of the evaluation for gait and postural control in vestibular disorder.