Fourth Juntendo University–Hitachi Cooperative Research Workshop
Development of Novel Downsized Motion Capture Technology to Assess Outpatients with Knee Osteoarthritis in a Clinical Setting

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Osteoarthritis (OA) of the knee is one of the major causes of locomotive syndrome, defined as being restricted in one’s ability to walk owing to a dysfunction in one or more parts of the motor organs. Although the gait of patients should be measured using motion capture technology, the current devices require a huge space to monitor and scan the patient’s motion, making their use difficult in a clinical setting.

The aim of this study was to introduce novel motion capture technology developed by HITACHI Ltd. to monitor the walking ability of patients with knee OA in a clinical setting. This device consists of linked stays and insole-type pressure sensor arrays. The stays have inertial sensors (accelerometers and gyroscopes) to measure the hip joint angles and potentiometers to measure the knee joint angles. The pressure sensor arrays that are inserted into the shoes measure the balance (center of pressure) of the patients while they walk. This lightweight (350 g including shoes) and small (3×5×2 cm) device can measure the gait and send the results to a PC. Its accuracy and safety for gait analysis have already been confirmed in comparison to those of conventional motion capture devices.

We measured the gait of patients with end-stage knee OA before and after receiving total knee arthroplasty using this device. We will continue to obtain data about patients with early–to-end-stage knee OA after implementation in a clinical setting. We are also planning to examine the association between its pathophysiology and walking ability, and to predict the factors associated with the progression of this disease.

Key words: osteoarthritis, knee, motion, accelerometers, gyroscopes

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