

## **Gait measurement in spine surgery patients by compact gait analysis sensors: pre- and postoperative changes in gait and related factors.**

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**Disclosures:** we used the gait analysis sensors provided by NEC Corporation. Since the sensors were provided to Toho University for a fee, there was no conflict of interest for presenters affiliated with Toho University and Tokai University. Presenters affiliated with NEC Corporation received income from the company, creating a conflict of interest. However, they were only responsible for providing guidance on the usage of the sensor and extracting data from the sensor. They were not involved in data analysis or interpretation of results.

**INTRODUCTION:** Gait analysis sensors that can be inserted in shoe insoles, allowing for convenient and quantitative monitoring of gait and enabling measurement values to be checked via a smartphone application, has been released by NEC Corporation to the general public. These sensors were applied to observe changes in gait before and after spinal surgery, investigating changes in gait due to surgical intervention and examining the factors associated with these changes. This study was approved by an Ethics Committee of the Toho University School of Medicine (#A23041A20060).

**METHODS:** The subjects were 25 patients (18 males and 7 females) who underwent micro endoscopic laminectomy (MEL) between December 2020 and December 2021 at our department and gave their consent to participate. Prior to surgery and at 1-, 3-, and 12-months post-surgery, measurements were taken during an approximately 70-meter walk at the outpatient department. These measurements included walking speed, stride length, peak foot sole angle in the dorsiflexion and plantarflexion directions, foot height, and circumduction. Changes in measurement values pre- and post-surgery were illustrated, and the correlations between background factors, clinical evaluations (using JOABPEQ), and measurement values were examined.

**RESULTS:** All measurements improved up to 3 months after MEL on both the symptomatic and non-symptomatic side and were maintained up to 12 months after MEL. However, in the group aged 75 years or older, the walking speed and stride length tended to worsen (speed: 4.3 km/h → 3.9 km/h, stride length: 122 cm → 110 cm) at 3 to 12 months after MEL. In addition, the group with strong psychological disturbance in JOABPEQ showed a similar worsening trend (speed: 4.6 km/h → 3.9 km/h, stride length: 131 cm → 113 cm) 3 to 12 months after MEL.

**DISCUSSION:** After MEL, gradual improvement in walking posture was observed up to 3 months. Immediately after surgery, walking stability improved alongside the alleviation of lower limb pain and incision site pain. Subsequently, walking posture improved further as ground contact angle, liftoff angle, and foot clearance improved through walking training. In this study, due to the short walking duration, intermittent claudication is believed to not have been detected. In the future, leveraging the benefits of wearable sensors, it is possible to measure walking posture at home. This could lead to patients themselves recognizing symptom improvement and acquiring insights that contribute to effective rehabilitation.

**SIGNIFICANCE:** After MEL, gait improves up to 3 months and then stabilizes. However, re-deterioration of gait was observed 3 months after MEL in the elderly and patients with severe psychological disorders.