



【News】 Journal published on the long-term effect of Medical HAL for ALS

May 20, 2022
CYBERDYNE Inc.

CYBERDYNE Inc. (Tsukuba, Ibaraki, Japan, President & CEO: Yoshiyuki Sankai, from now on referred to as the “Company”) announced today that an international journal on the HAL for Medical Use Lower Limb Type (hereafter "Medical HAL") had been published by Toho University School of Medicine Department of Neurology in Internal Medicine*¹ published. In this journal, the research group from Toho University School of Medicine reported on a one-year Cybernics Treatment*² using Medical HAL for patients with Amyotrophic Lateral Sclerosis (“ALS”). In this progressive neurodegenerative disease, improvement of muscle weakness cannot be expected with therapeutic drugs and other means, although some can inhibit the progression. All three patients showed an effect of maintaining their walking function with HAL Cybernics Treatment. The average 2-minute walking distance remained at the same level as before the start of treatment at 300 days. Clinical trials have shown the efficacy of treatment with Medical HAL for eight types of progressive neuromuscular diseases, including ALS, which led to coverage of such treatment with public health insurance. However, this paper is an important achievement in the medical industry because it demonstrates the effectiveness of the treatment over a period of one year.

The research group that conducted this study included Assistant Professor Harumi Morioka (tenured), Lecturer Takehisa Hirayama, Professor Osamu Kano of the Department of Neurology, Toho University School of Medicine and Professor Satoru Ebihara of the Department of Rehabilitation Medicine, published a paper on March 17, 2022, regarding short-term (one to two months) Cybernics Treatment using a medical HAL for ALS patients. The Company notes that the difference with the journal posted on this occasion is that the relevant journal investigated the long-term effect (one year).



Image of Cybernics Treatment

◆ **Key findings**

- All three subjects showed improvement after each of three treatment courses with HAL.
- The average 2-minute walk distance remained higher than before the treatment at 300 days.

◆ Outline of the research (excerpts from the journal selected by the Company)

The study included three patients diagnosed with ALS at Toho University Hospital who received treatment between January and December 2019. All three patients recruited for the study could not walk independently and safely for more than 10 meters but could walk for more than 10 meters with assistance or walking aids. The evaluation method included three treatment courses of HAL (each course composed of nine sessions, frequency 2-3 sessions/week, for 1-2 months, duration: 20-40 minutes, excluding putting on HAL to the patient and breaks). 2-minute walking distance, 10-meter walking test (assessing speed, stride length, and walking rate), ALS motor function rating scale (ALSFRS-R), Barthel Index (BI), functional independence measure (FIM), and effort lung capacity were observed and analyzed before and after each treatment sessions. As a result, while significance was not observed due to a small number of subjects, the average walking distance after 3 phases increased by 16.61 m ($p=0.21$). Furthermore, cadence significantly increased by 1.3 steps ($p=0.02$) on average. The figure below shows that while the 2-minute walking distance was maintained by walking exercise using HAL, the ALSFRSR, a motor function evaluation scale for assessing motor functions such as swallowing function and upper limb ability of ALS patients, which were not covered by the HAL Lower Limb Type, decreased with the progression of ALS.

◆ Attached material (quoted from the announcement of Toho University Hospital)

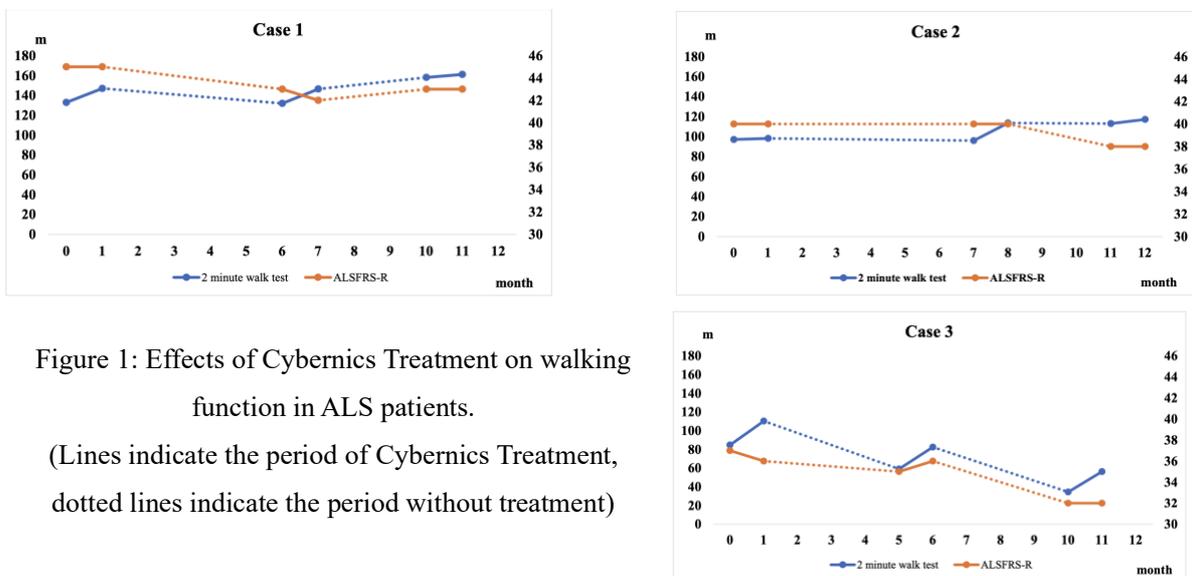


Figure 1: Effects of Cybernics Treatment on walking function in ALS patients.
(Lines indicate the period of Cybernics Treatment, dotted lines indicate the period without treatment)

◆ Accepted journal

Name of the journal: Internal Medicine 61 (May 15, 2022)

Title: Effects of Long-term Hybrid Assistive Limb Use on Gait in Patients with Amyotrophic Lateral Sclerosis

Author: Harumi Morioka, Kiyoko Murata, Tatsuki Sugisawa, Mari Shibukawa, Junya Ebina, Masahiro Sawada, Sayori Hanashiro, Junpei Nagasawa, Masaru Yanagihashi, Takehisa Hirayama, Masayuki Uchi, Kiyokazu Kawabe, Satoru Ebihara, Yoshitaka Murakami, Takashi Nakajima, Osamu Kano*

DOI Number: 10.2169/internalmedicine.8030-21

URL: https://www.jstage.jst.go.jp/article/internalmedicine/61/10/61_8030-21/pdf/-char/ja

◆ Comments by Prof. Osamu Kano

We reported that short-term treatment (1-2 months) using HAL for ALS patients showed improved gait function (Morioka H et al. Journal of Clinical Neuroscience 2022). And this time, after one year of long-term observation, it was confirmed that ALS patients could maintain their walking function by introducing HAL Treatment. Although it is believed that ALS progression can be controlled with drugs and rehabilitation therapy, stopping the disease is not feasible. In fact, symptoms other than walking of the ALS patients in this study worsened. It is necessary to verify the effect of HAL Treatment on the prolongation of life expectancy and its impact on quality of life (QOL) by accumulating cases in the future.

We want to take this opportunity to express our deepest gratitude to the entire staff of the Toho University ALS Clinic for their cooperation in producing the results of this study.

*1 Internal Medicine is an English-language online journal published bi-weekly (on the 1st and the 15th of each month) by the Japanese Society of Internal Medicine. The Journal aims to provide helpful knowledge in clinical practice and valuable information for medical education and contribute to internal medicine development and enrichment of physicians' resources.

*2 Cybernics Treatment is a treatment that uses Wearable Cyborg, HAL, to improve the function of the wearer. The treatment targets spinal cord injury, stroke, neuromuscular diseases, etc. When a person tries to move their body, nerve signals are transmitted from the brain to the muscles via motor neurons, causing the musculoskeletal system, including joints, to move. At that time, faint "bio-electrical signals" reflecting a person's intention to move the body leak out to the skin surface. HAL can read this signal and control the power unit to assist joint movement in unison with the person. When HAL realizes intended motion, interactive biofeedback is promoted in and outside of the body between HAL, brain, nervous system,



and muscular system. The iBF theory (interactive bio-feedback theory) suggests that repeating this interactive loop promotes functional improvement in patients with mobility impairment. The effect of this technology is confirmed through clinical application. In other words, the key to promoting functional improvement is the transmission of voluntary command signals from the human brain to the musculoskeletal system via the spinal cord and peripheral nerves and the return of feedback from the sensation of actual movement to the human brain. Cybernetics Treatment is one of the new treatment technologies based on this iBF theory, aiming to improve human motor functions using HAL.