

ERIGO[®]

Early Rehabilitation with Robotic Mobilization and
Functional Electrical Stimulation



In early rehabilitation of neurological patients, a safe mobilization and intensive sensorimotor stimulation are key factors for the therapeutic success. An early activation and stimulation of the patient ensure the optimum utilization of the neuroplasticity and recovery potential. Furthermore, it improves the patient's communication and cooperation skills and counteracts secondary damage due to immobilization.



Patient Story

Maria Scaffidi – Early Rehabilitation After Surgery

After a severe fall, Ms. Scaffidi suffered a traumatic cervical spinal stenosis at C-4 and C-5 leading to a tetraparesis. Just a few days after spinal surgery, she began her rehabilitation with the Erigo at the Centre Hospitalier Universitaire Vaudois (CHUV) in Lausanne, Switzerland.

«Our experience has shown that patients who train with the Erigo recover much faster than those who receive conventional therapy only», explains Charlotte Gilart de Keranflec'h, Ms. Scaffidi's therapist. At the CHUV, Ms. Scaffidi was able to profit from the unique neurosensory therapy and is successfully continuing her rehabilitation with the goal of regaining her gait function.



Patient Story

Timothee Rajaonarivo – Motivated Towards Full Recovery

Timothee was a healthy 17 year old when all of a sudden he was diagnosed with Guillain-Barré, an inflammatory illness leading to malfunctions of the nerves throughout the body. After his admission to the CHUV in June 2013, he spent one month in an artificial coma. Already in the intensive care unit he started his therapy with the Erigo three times per week. «The goal was to activate the brain and the body», explains Timothee. «At the beginning I didn't feel my body at all. That changed through the mobilization with the Erigo».

His good physical condition before the onset in combination with the therapy with the Erigo helped him recover extremely quickly. «First it was the Erigo that moved his legs, and in the end it was Timothee who gave the impulse. That motivated him very strongly», explains Timothee's mother Valerie.

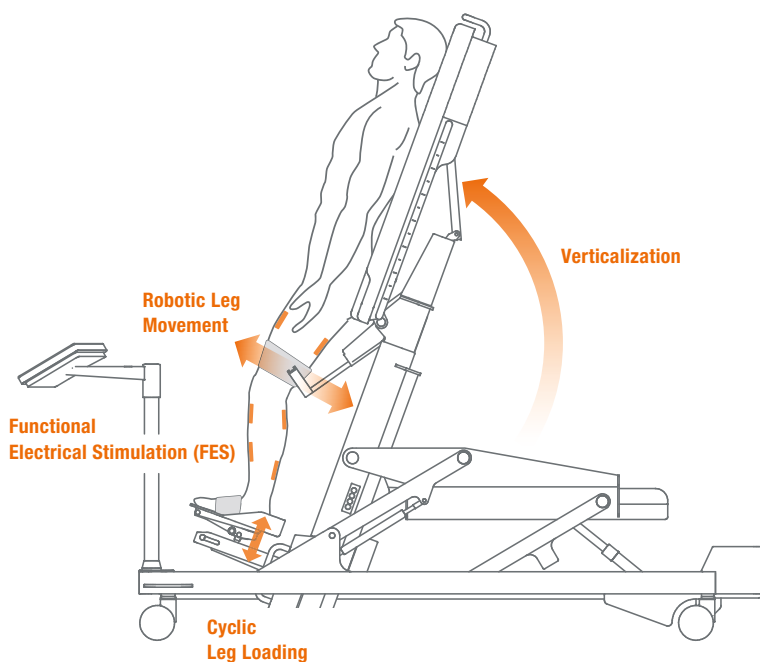
By end of July 2013 Timothee reached his goals of being able to breathe and eat on his own and to move his legs again. He was able to leave the CHUV and is looking forward to continue his rehabilitation including the therapy with the Lokomat. «Before my illness I was always healthy and never had to go to a hospital. I'm amazed and happy to see how many great devices there are to help people like me recover again.»

Early Rehabilitation with Robotic Mobilization

By providing a safe solution for early mobilization and accelerating the rehabilitation process, the Erigo is the ideal therapy device for training severely impaired neurological patients even in acute care.

Early and Safe Mobilization

The mobilization and verticalization of immobile patients with little or no capacity for interaction can be very demanding and challenging, especially in acute care, and can compromise the wellbeing of patients and therapists. The Erigo combines gradual verticalization with robotic movement therapy to ensure the necessary safety for the stabilization of the patient in the upright position. Due to the unique afferent stimulation provided by the Erigo and the flexible harness, patients can be trained intensively and safely already in a very early stage of rehabilitation.¹ Thereby, even with severely impaired neurological patients (e.g. vegetative state) the training with the Erigo can be induced efficiently within a few days after onset.



Cyclic Leg Loading

Patients verticalized with the Erigo generally do not suffer a drop of blood pressure and thus have a reduced tendency to collapse.² They tolerate the upright position better than patients treated on conventional tilt tables without a stepping function and cyclic leg loading (fig. 1 and 2). The Erigo offers robotic leg movement and physiological cyclic leg loading adjustable according to the patient's capabilities.

Fig. 1: Changes in mean arterial blood pressure (MBP) under orthostatic stress.³
[mmHg]

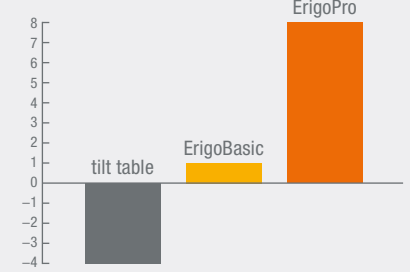
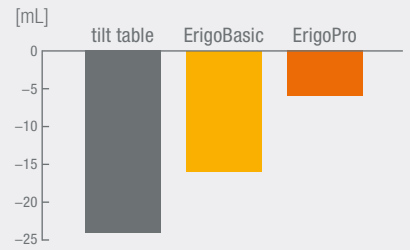


Fig. 2: Decrease in stroke volume (SV) under orthostatic stress.³
[mL]



- 1 Chernikova L, Umarova R, Trushin I, Domashenko M (2008). The Early Activation of Patients With Acute Ischemic Stroke Using Tilt-Table «Erigo»: The Prospective Randomized Blinded Case-Control Study. *Neurorehabil Neural Repair* 22(5):556.
- 2 Luther MS, Krewer C, Muller F, Koenig E (2008). Comparison of orthostatic reactions of patients still unconscious within the first three months of brain injury on a tilt table with and without integrated stepping. A prospective, randomized crossover pilot trial. *Clin Rehabil* 22:1034-1041.
- 3 Yoshida T, Masani K, Sayenko D, Miyatani M, Fisher J, Popovic M (2013). Cardiovascular Response of Individuals With Spinal Cord Injury to Dynamic Functional Electrical Stimulation Under Orthostatic Stress. *IEEE Trans Neural Syst Rehabil Eng* 21(1):37-45.



Patient T. Rajaonarivo with his therapist during the therapy with the Erigo. Picture courtesy of the CHUV, Lausanne, Switzerland.



The Erigo FES is fully synchronized with the robotic leg movement.



Up to eight Erigo FES channels are easily operated by the therapist on the touchscreen.



«The Erigo offers the unique possibility to train patients with circulatory instability and limited cooperation in a very early phase of their rehabilitation process. The Erigo FES efficiently supports this early treatment by substantially speeding up the acute recovery phase of the patient. I am convinced that the Erigo has a clear beneficial effect in the early remission stages of the brain injured and comatose patients.»

Prof. Dr. Leopold Saltuari, Medical Director Department of Neurology, State Hospital Hochzirl, Austria

Erigo[®] Functional Electrical Stimulation (FES)

The electrical stimulation is an established method for targeted muscle activation. Integrated into a robotic device for early rehabilitation for the first time, the Erigo FES offers further benefits and therapy options in clinical routine.

Electrical Stimulation

By adhering electrodes to the skin, nerve endings are stimulated with electricity causing a contraction and activation of muscles that cannot be controlled actively due to a neurological disfunction. Besides the positive effects on the cardiovascular system and the metabolism, electrical stimulation reduces long term consequences due to lack of muscle activity. Furthermore, it helps to decrease spasticity and improve the muscle tone. Synchronous stimulation of several muscles can further increase the physiological effects connected to muscle activity and induce functional movements. This is referred to as functional electrical stimulation (FES).^{4,5}

Erigo FES

The Erigo FES supports the stimulation of the patient and thereby also their cardiovascular stability during the early verticalization. It efficiently supports the increase of blood flow in the patient's lower extremities, which helps to maintain the stroke volume and blood pressure, therefore further improving the orthostatic tolerance (fig. 1 and 2). It has also been shown that the therapy with the Erigo FES improves the cerebral blood flow and the muscle strength in lower extremities (fig. 3 and 4). This can specifically support recovery of leg muscle function.

The Erigo FES is fully synchronized with the robotic leg movements. Up to eight FES channels can be operated easily by the therapist on the touchscreen of the Erigo and adjusted according to the patient's motor abilities.

Fig. 3: Increase of muscle strength after 30 days of intensive early rehabilitation. Measured according to British Medical Research Council (MRC) scale.⁶

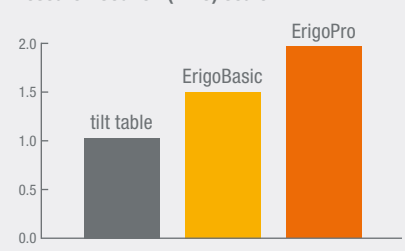
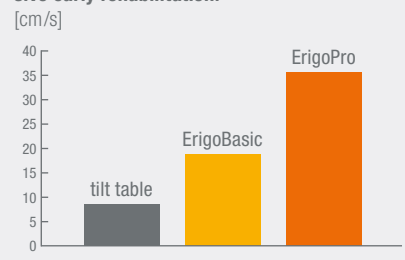


Fig. 4: Increase of systolic cerebral blood flow velocity (CBFV) after 30 days of intensive early rehabilitation.⁶



4 Mohr T et al (1997). Long-term adaptation to electrically induced cycle training in severe spinal cord injured individuals. *Spinal Cord* 35(1):1-16.

5 Krause P, Szecsi J, Straube A (2008). Changes in spastic muscle tone increase in patients with spinal cord injury using functional electrical stimulation and passive leg movements. *Clin Rehabil* 22(7):627-634.

6 Kuznetsov AN, Rybalko NV, Daminov VD, Luft AR (2013). Early poststroke rehabilitation using a robotic tilt-table stepper and functional electrical stimulation. *Stroke Res Treat*. 2013;2013:946056.



Patient Story

Daniel Petithuguenin – Returning to Daily Life

After an ischemic stroke damaged a part of his right hemisphere, Mr. Petithuguenin had a light paresis and a left-sided ataxia. During the 20 days he spent at the CHUV he trained with the Erigo and received physical as well as occupational therapy that helped him improve his coordination and movement control. Regaining some of his independence, Mr. Petithuguenin was able to return home with his wife and to actively participate in daily life again.

«We note a direct link between the sensorimotor stimulation by the Erigo during therapy and the recovery process of our neurological patients», explains Dr. Karin Diserens, Head of Unit of Acute Neurorehabilitation and specialist in neurology and neurorehabilitation at the CHUV.

Increased Awareness and Faster Recovery

The therapy with the Erigo does not only show positive effects on the patient's consciousness but also reduces complications associated with immobility in general. Hence it supports a faster recovery and therapy progress.

Increased Patient's Awareness

Clinical experience has shown that the unique afferent input provided by the Erigo can have a positive effect on the patient's consciousness, body awareness and intestinal activity. Having an increased awareness, the patient can actively participate in the therapy with the Erigo as well as in those that can be combined with it, such as speech therapy or mobilization of upper extremities. This leads to a faster recovery of communication and cooperation skills, which are important for further rehabilitation.

Reduced Time in Acute Care

An early mobilization supports not only the recovery of patients, but also has a positive effect on the cost-efficiency by reducing the time spent in acute and hospital care. It has been shown that early physical therapy reduces time spent in intensive care, the length of hospitalization and hence in average the overall therapy costs.^{7,8} These effects can be further increased with the Erigo, as it helps in reducing medical complications associated with immobility and relieves the strain on the therapist.⁹



Centre Hospitalier Universitaire Vaudois (CHUV), Switzerland

In its department of clinical neurosciences, the Centre Hospitalier Universitaire Vaudois (CHUV) treats different health problems, traumas and diseases associated with the brain, spinal cord and nerves. Its Unit of Acute Neurorehabilitation is formed by an interprofessional team of experts who treat these patients within a specific neurosensory rehabilitation program. All patients with neurologic lesions are supported according to an assessment of their potential for rehabilitation and their therapy goals following the acute care. The Erigo is used during the whole treatment process, starting in acute care, to improve the patient's awareness as well as sensorimotor function by intensive early mobilization. The CHUV is one of the international clinical partners, who provide Hocoma with important clinical expertise and scientific insights in order to help improve the Erigo.

7 Morris PE et al (2008). Early intensive care unit mobility therapy in the treatment of acute respiratory failure. *Crit Care Med* 36(8):2238-2243.

8 Berney L et al (2011). Early neurorehabilitation in an acute university hospital: from dream to reality. *Revue Médicale Suisse* 7(293):952-956.

9 Isaeva T, Sidiyakina I, Shapovalenko T, Lyadov K (2013). Features of early rehabilitation of the patients with the cardioembolic stroke (CES) and coronary heart failure (CHF). *J Rehabil Med Suppl* 53:110.

Easy Integration into Clinical Routine

Due to its compact and flexible design, the Erigo is a mobile device that can be used for training in intensive care, high dependency units as well as in the usual patient or therapy rooms.

Excellent Clinical Usability

The Erigo offers a safe training with direct contact and the possibility of constant interaction with the patient. Hospital equipment such as patient monitoring systems can be safely attached to the included standard rails. Further benefits include therapy control via an intuitive user interface on a touchscreen, adjustable height of the Erigo for a safe patient transfer, electronic adjustment of leg length as well as the flexible one-sized patient harness system.



Intuitive user interface allows for an easy and fast therapy setup.



Flexible and comfortable patient harness system.

Erigo® Product Line

The Erigo product line includes two different products, the ErigoPro and the ErigoBasic, both covering individual needs of patients, therapists and hospitals.

		Erigo®Basic	Erigo®Pro
Therapy Enhancement	Progressive verticalization up to 90°	•	•
	Robotic leg movement	•	•
	Cyclic leg loading	•	•
	Erigo FES (by Hasomed®)		•
	Hip extension function		•
	Selection of different movement patterns		•
Safety and Comfort	Height adjustment for patient transfer	•	•
	Flexible patient harness	•	•
	Head elevation function		•
	Armrests	accessory	•
Usability	Full therapy control via intuitive user interface	•	•
	Intelligent leg loading indicator		•



Patient Story

Peter Häberli – First Steps Towards Independence

After a hemorrhagic stroke in September 2012, Peter Häberli was hemiplegic and spent several weeks in an artificial coma. In November 2012 he was transferred to the Rehaklinik Zihlschlacht in Switzerland, where he trained with the Erigo several times per week. At the beginning he was only able to move from lying into sitting position with the help of two therapists. A transfer into a wheelchair was not possible. He had no head control and was only able to communicate through light nodding.

While being monitored, Mr. Häberli was safely mobilized with the Erigo, which made it possible for him to get a feel for standing upright and walking as well as to activate physiological gait patterns. His progress could be seen soon after: He was able to sit for a longer time, communicate more easily and, due to the improved trunk and head control, participate actively. Just after a month of therapy with the Erigo, he was able to begin the therapy with the Lokomat, thereby regaining his gait function and taking his first steps towards independence.



Hocoma is the global market leader providing most advanced devices for functional movement therapy. Our mission is to enable recovery with products that stand for efficacy and efficiency.

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With the compliments of:

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* The ErigoPro is not yet available in the USA.