Balance and gait training through robotic neurorehabilitation with exoskeleton

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Neurorehabilitation (NR) is an interdisciplinary thematic field between Neurology, Neurosurgery, Physical and Rehabilitation Medicine. Rehabilitation is a functional therapy, based on a detailed functional assessment. Gait is an important element of the everyday life functionality of patients in NR-clinical practice and is crucial for their independence in activities of daily living (ADL), respectively for their autonomy and quality of life. The goal of current work is to emphasize the potential of modern NR-methods for balance training and gait recovery, as exoskeletons and robotic rehabilitation. We will present some typical clinical cases-patients with post-stroke hemiparesis (Case-1), with multiple sclerosis (MS) quadriparesis (Case-2), spinal cord injury (SCI) with inferior paraparesis (Case-3) and cauda equine syndrome (Case-4). In all patients we applied detailed neurological exam, functional assessment through classic scales and through the International Classification of Functioning (ICF). For treatment, we created a complex NR-programme (of 20 procedures) with synergic combination of different physical factors: physiotherapy, ergotherapy, functional electrical stimulations (FES) and Exoskeleton-NR using Hybrid Assistive Limb (HAL). In every case we adapted the NR-complex to the concrete patient in the correspondent phase of his disease and disability. In patients with MS-quadriparesis, post-stroke hemiparesis and post-traumatic SCI-central paraparesis we applied a stable method of FES with tetanic pulses - for the muscles extensors (dorsal flexors) of the ankle and toes. In the patient with cauda equine syndrome we applied iontophoresis with low frequency electric currents and a neuro-mediator (the Bulgarian drug Nivalin), and FES for the peripheral nerves of the lower extremities (femoral, peroneal and tibial) and for the correspondent innerved muscles (especially mm.quadriceps femoris, tibialis anterior and triceps surae). In all cases we observed significant functional recovery-reduction of muscle weakness, balance stabilization and gait recovery (with walker or crutches), amelioration of autonomy in ADL.

Biography

Ivet Koleva is a medical doctor, specialist in Physical and Rehabilitation Medicine (PRM) and in Neurology. She published several articles in Bulgarian and international peer-reviewed scientific journals. She is Author of several books and monographs. She defended three scientific theses: for Phylosophy Doctor in Medical Sciences-on the topic Physical Prevention and Rehabilitation of the Diabetic Polyneuropathy; for PhD in Pedagogics-Contemporary Educational Methods in the Rehabilitation Field; for Doctor Es Medical Sciences-Neurorehabilitation algorithms for patients with socially important invalidating neurological diseases.