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Historic review – ActiGait

a new FES (Functional Electrical Stimulation) improves gait among patients with apoplectic hemiplegia

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Historic review - ActiGait – a new FES (Functional Electrical Stimulation) improves gait among patients with apoplectic hemiplegia.

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Background: In 1999 the first ActiGait system was created at Aalborg University by prof. Thomas Sinkjaer and Morten Haugland PhD (Sinkjaer et al. Exp Brain Res 1994). Neurodan was in 2005 bought by the Otto Bock Group and a new series of ActiGait-implantations were initiated in Europe (Burridge et al. J.Rehabil Med. 2007). For neurosurgeons walking seems to be a trivial and simple motor-function – but is not (Sinkjaer et al. 1994, Spaich et al. Exp Brain Res 2009). Walking implies precise coordination between legs, arms and body. Sensory input from tendons/and skin are important for the posture and balance during walking. Besides the brain directed walking system, a spinal cord automatic system is thus necessary for the walking (Franceschini et al. Stroke 2009). The ActiGait system serves as an instrument to change the plantar positioned foot (pronated and plantar flexed) found among many hemiplegics into one with a dynamic dorsiflexion. Thereby it changes the walking pattern significantly. We assume this is partly through reflex modulation (Spaich et al. 2009). Automatic within-step sensory feedback regulation and not conscious predictive control is the most important factor for achieving a stable walking (Klint Raf et al. J Physiol 2008) Our patient's claims that they feel safer when walking, and they participate in daily life in a much more independent and secure way than before. It is thus not only the speed of walking that increases, but perhaps mostly it is the balance that is improved.

Results: The first operated series consisted of 15 ActiGait system implantations treating patients with stable hemiparesis due to vascular brain lesions. This series were carried out in Denmark as a phase 2 trial with. All patients benefitted and there were no nerve injuries based on clinical examination and electrophysiological validation. (Burridge et al.2007). It must be noted that among our first operated patients, 8 survivors still uses the system today with success. In the summer 2007 further six patients were operated upon in Germany and Denmark. Due to internal wire problems the operations were stopped. After the first cases operated upon in Europe since august 2008, we realized - to our surprise - two severe peroneal nerve lesions. The project was therefore halted until a thorough review and validation had been undertaken within the Otto Bock Group. In this we included validation of biomechanics related to the ActiGait system and MRI scanning of the tissue in the knee region. Since July 2009 – a further 18 cases have been operated upon in Denmark, Germany, the Netherlands, Luxembourg, Austria and Romania, all awaiting long term follow up's before results are being published. Animations of patients walking without and with ActiGait systems illustrates our results.