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Update in Physical Medicine and Rehabilitation: New Technologies and Robots Versus Classical Training in Gait Rehabilitation After Stroke

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Stroke is the leading disability-causing disease all over the world. Two thirds of the survivors have significant limitations in walking and everyday living activities. These determine further limitations of mobility, high risk of falling, life-threatening complications by prolonged immobilization.

An impaired ability to walk is common after stroke. Gait recovery is the most important purpose in rehabilitation treatment after a stroke; we can measure the amount of recovery using the gait parameters. Waking speed is one of the indicators to measure and predict disability. At a walking speed of more than 0.8 m per second, full mobility in the community is possible; if the walking speed is less than 0.4 m per second, the mobility is limited to the home; at a speed between these values, mobility is limited to short supervised walks outside the house (1).

There are a lot of physical therapy interventions for rehabilitation; but we still have to assess the effectiveness of these interventions and to establish optimal methodology: timing, intensity and duration for every post-stroke rehabilitation intervention.

A lot of methods emphasizing different therapeutic exercises programs provided by physical therapists were developed during the last 50-60 years in order to improve the ability to walk. Since the end of the last century, new technologies are rapidly adopted: walking on a treadmill, possibly with some body weight supported, or robot-assisted stepping on a treadmill can be used for gait training. There are many studies that demonstrated the treadmill training was effective for restoration of gait ability and walking velocity. Other motor functions improved steadily during these studies. Treadmill training offers the advantages of task-oriented training with numerous repetitions of a supervised gait pattern. It proved efficiency in gait rehabilitation for patients with chronic hemiparesis. Treadmill training could therefore become an adjunctive tool in regaining walking ability for a shorter period of time (2).

For example, S. Hesse and his colleagues studied treadmill training with partial body weight support compared with physiotherapy in nonambulatory hemiparetic patients; they concluded that treadmill training offers the advantages of task-oriented training with numer-

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ous repetitions of a supervised gait pattern. It proved powerful in gait restoration of nonambulatory patients with chronic hemiparesis; patients could regain walking ability in a shorter period of time.

But, muscle strength did not change and muscle tone varied in an unsystematic way. We also need to use some other methods to improve the strength and coordination for specific muscles of the lower limb (3).

These are the décor for the appearance of the article signed by PW Duncan, KJ Sullivan, BH Dobkin and colleagues in the 2011 May issue of New England Journal of Medicine (4). They developed a protocol for a phase 3 single-blinded randomized controlled trial in order to establish the effectiveness and appropriate timing of body-weight support in treadmill training to improve walking ability after stroke. This type of "Locomotor training" was studied before, but those works were criticized for poor design and outcome measures.

Despite the expectations the Duncan trial, very well conducted and designed, did not establish the superiority of training on a treadmill with body-weight support over the classical physical therapy that emphasized strength and balance; more than that, the last method had fewer risks of falling and the patients were more compliant. So, in fact, the oldies remain the goldies. Near-future studies will enlighten the real outcome of this debate.

References

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