

NEUROREHABILITATION: NEW THERAPEUTIC AVENUES IN TECHNOLOGY AND PHARMACOLOGY OF RECOVERY

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The better understanding of the mechanisms of recovery after stroke forecast the development of a new restorative therapy approach, more effective than the current ones. The newly proposed therapeutic strategies include Constraint-Induced Movement Therapy for correcting the learned non-use of the compromised arm, Treadmill Training with Partial Body-Weight Support to favor gait by means of retraining locomotor pattern generator(s), and Virtual Reality Based Rehabilitation which may provide subjects with artificially augmented feedback that facilitates the reinstatement of the compromised motor skills. An additional cutting-edge approach exploits the use of drugs that may enhance the natural mechanisms of recovery. The most widely investigated drugs, both in animal model of brain lesion and in small group of post stroke patients, are those that increase noradrenergic and serotonergic neurotransmission such d-amphetamine and antidepressant. Both monoamines favour recovery exploiting multifold mechanisms. Noradrenaline might play an important role in cortical reorganization and motor learning. In addition, noradrenergic drugs restore the stroke-induced noradrenergic hypoactivity in the locus coeruleus- cerebellum- rubro, reticulo and vestibulo-spinal circuits. Serotonin stimulates new synaptic contacts, long-term facilitation in sensory motor synapses, and it favors finalistic motor responses in rats. Moreover, serotonergic drugs may correct stroke-related serotonergic hypofunction. Other neurotransmitter including GABA and dopamine may be harmful to recovery. Post-stroke patients who chronically receive benzodiazepines, antiepileptics, and phenothiazines improve from disability less than those not taking such medicaments. Drugs acting on glutamatergic and cholinergic systems may also be helpful in restorative medicine. However, animal studies indicated that their positive or negative effects on recovery is strictly dependent upon the time of administration after brain injury. Therefore more experimental data are needed before using these medicaments in patients. Different class of drugs that enhances the trophic input in the brain may be relevant to recovery, namely, growth factors may stimulate neurogenesis, neural repair and rewiring. However, the clinical application of such therapy, still in its infancy, represents an attracting but very far strategy for the management of post-stroke lesions.