

NEUROMODULATION BY NON-INVASIVE METHODS IN NEUROREHABILITATION - PHARMACOLOGICAL STRATEGY

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Neurological disorders, especially stroke, traumatic brain injuries, as well as degenerative diseases, represent a leading cause of long term disability all over the world. Many advances have been done in the treatment of these pathologies, mostly confined to acute phase, especially in stroke (e.g. thrombolysis, mechanical recanalization, augmentation of perfusion, etc). The need to identify therapeutic methods, able to limit brain damage or enhance recovery of motor and cognitive functions through neuroprotective and neurorestorative mechanisms when administered at later time points, is desirable. There are many animal and human studies trying to elucidate the cellular and molecular mechanisms of plasticity of the nervous system. Neurorecovery is the positive outcome that produces clinically relevant results with immediate functional and late structural effects.

Neurorecovery depends on the adaptive plasticity of the undamaged nervous tissue, and of the non-affected elements of functional network. The initial size, location of injury and neurocircuitry involved, are the main factors that determine the extent of recovery in brain lesions.

Neurorecovery can be enhanced by pharmacological intervention, physical and cognitive activity, electromagnetic stimulation, psychological support, environmental stimulation or any demonstrated combinations of these factors capable of improving the patient's condition after brain injuries. From the pharmacological perspective, it is clear that the focusing on molecules that are capable of mimic the function of endogenous molecules with multimodal and pleiotropic neuroprotective effects is the best approach in neurorecovery, especially when they are associated with intensive physical, cognitive and emotional training.

Biological agents (e.g., neurotrophic factors and related molecules) with modulating and multimodal effects are better pharmacological agents for brain protection and recovery, because they usually have also pleiotropic neuroprotective effect. That is why they are capable of pharmacologically bridging acute neuroprotective processes with the long-term recovery processes.

A better understanding of the mechanisms underlying the neuroplasticity will reflect in a more efficient and comprehensive treatment. This presentation will focus on the validity of different methods able to stimulate neurorecovery after brain lesions.