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Neurological Repair after Stroke

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Stroke remains as a major cause of human disability worldwide. Neural repair can be defined as restoring the structure or function of the CNS (central nervous system) after injury or stroke. Patients are usually left with debilitating motor and speech impairments after a stroke or injury [1]. The model is based on the assumptions of neural repair mechanisms inherently involved in the cellular and circuit plasticity, that is a synaptic phenomenon which is mostly stimulus-dependent, and that brain repair required both physical and behavioural interventions which tailor to reorganize specific brain circuits. We believe that by enhancing plasticity at the level of brain network interactions, this neurological model for brain repair could ultimately lead to a cure for stroke [2]. Several categories of therapies based on neural repair are under study. Therapies based on neural repair are based on prevention and to reduce the injury like reperfusion or neuroprotection. Therapies based on neural repair have a treatment time measured in days-weeks or longer typically and the potential to be accessed by large fraction of patients with the stroke, including haemorrhagic stroke. This is an advantage for reducing the heavy burden of individual's disability after stroke.

Neural repair after stroke rises impulsively after stroke and continues for several weeks, years for few behaviors particularly in language and cognition. Understanding the spontaneous repair provides an insight of use for treatment-related repair, a point that is underscored by the fact that treatments promoting repair are often provided in the context of spontaneous repair. Studies of spontaneous neural repair after stroke in individual's subjects rely on the non-invasive methods, in comparison with direct tissue-based preclinical investigations. The most commonly used method includes structural and functional MRI (Magnetic Resonance Imaging), positron emission tomography, single photon emission computed tomography, electroencephalography, magnetoencephalography, TMS (Transcranial Magnetic Stimulation), and near infrared spectroscopy; these methods provide a systems-level perspective on neural repair [3].

Several categories of post-stroke restorative therapy are under study in human trials. Mostly restorative therapy focus on a single agent or intervention with further understanding of monotherapies, combination therapies which are likely to receive attention. Few restorative therapies are introduced within days of stroke onset and interact with the spontaneous neural repair mechanisms, and others are initiated months to years after stroke onset [4].

Erythropoietin also helps to promote neural repair. A preclinical study suggests that administered erythropoietin pass into the brain and improves the acute injury, e.g., 24 after stroke onset (when delivered it as a sole agent). It is also found that Erythropoietin is to be safe in a randomized, placebo-controlled study of 167 patients who received two doses of erythropoietin versus placebo beginning 48 hours after stroke. Other studies are found favourable effects of sequential growth factor administration prior to erythropoietin.

It has also been evaluated that the ability of the large biological molecules, such as monoclonal antibodies promote neural repair. Monoclonal antibodies modulate the activity within the targeted signalling pathways by binding to the specific targets. This method of approach has been revolutionized patient care in several conditions, immunological, including neoplastic, and others. In neural repair after stroke, monoclonocal antibodies have been used to neutralize the molecule that inhibits the growth of CNS (Central Nervous System), with the approach that being to produce a more permissive growth environment [5].

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