STROKE AND COGNITIVE IMPAIRMENT

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Stroke is one of the leading causes of mortality and disability in modern countries. Clinical manifestation of stroke is rapidly developing loss of brain function(s) due to disturbance in the blood supply to the brain. This can be due to ischemia (lack of blood flow) caused by blockage (thrombosis, arterial embolism), or a hemorrhage (leakage of blood).

Neuroplasticity (also known as cortical mapping) challenges the idea that brain functions are fixed in certain time. It refers to ability of the human brain to change as result of one's experience, that the brain is „plastic" and „malleable". The brain consists of nerve cells (neurons) and glial cells which are interconnected, and learning may happen through change in the strength of the connections, by adding or removing connections, or adding cells. This concept is captured in the aphorism, „neurons that fire together, wire together"/"neurons that fire apart, wire apart". Neuroplasticity can act through two possible mechanisms on stroke disability-prevention and treatment of neurological deficit (cognitive impairment). A surprising consequence of neuroplasticity is used in both cases-brain activity associated with a given function can move to a different location. This is fundamental issue that supports the scientific basis for treatment of acquired brain injury with goal directed experiential therapeutic programs in the context of rehabilitation approaches to functional consequences of the injury. Same mechanism are basis for brain „fitness" in order to prevent vascular dementia or to minimize stroke injury when it happens and to prepare better basis for further neurorehabilitation if it is needed. All of these methods include modulation of NMDA receptors, 5-lypoxigenase as a controlling enzyme and cox-2 enzyme products which are involved also in pathomorfological mechanisms of atherosclerosis and stroke as well as mood disorders (depression). Common risk factors for stroke have negative influence on neuroplasticity. They are non modifiable risk factors: age, gender, race/ethnic, genotype, previous myocardial infarction, TIA or stroke and modifiable risk factors: diabetes, hyperlipidemia, arterial hypertension, atrial fibrillation, coronary and or peripheral artery disease, obesity, physical inactivity, stress, alcohol consumption, smoking. One of the important risk factor, but usually underrecognized is modern way of living, therefore we must learn how to recognize bad habits. We must learn how to cope stress with daily relaxation techniques, a personal exercise program, pertinent life style changes, a healthy diet, good sleep and appropriate nutritional habits. One of the important food ingredients which have strong impact on neuroplasticity are flavonoids, ubiquitous polyphenols in plants and vegetables, have been identified as mainly by responsible for these actions. As key regulators of cell reactivity against oxidative aggressions, the flavonoid molecule can become an ideal template for compounds therapeutically active in stroke, dementia

Some of the frequently used methods for enhancing brain plasticity (prevention of cognitive impairment) are:

• Music therapy: Auditory stimulation increases mean blood flow velocity (MBFV) in the middle cerebral artery (MCA) in healthy individuals. Better circulation enables better metabolism of the neurons and consequential neuroplasticity in both, healthy individuals and stroke patients.

• Mirror box- Due to the mirror, the patient sees a reflection of the good hand where the missing limb would be. The patient thus receives artificial visual feedback that the "resurrected" limb is now moving when they move the good hand.

• Brain fitness (multitask games) - demanding and challenging cognitive tasks engage the brain in such a way that it assimilates the new brain cells, strengthening problem solving ability.

• Brain machine interfaces with motor cortical implants are still under investigation in animal models.