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A Dynamic Stroke Treatment Paradigm: Advances in Cerebrovascular Reperfusion and Neurorehabilitation

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Stroke is one of the leading causes of death and morbidity in industrialized nations. Nevertheless, this fact continues to alarm us, especially due to the fact that preventative measures and therapeutic management of stroke remain subpar. The American Heart Association's recent statistics tell us that the frequency of new or recurrent stroke is near 800,000 per year-that's someone having a stroke every 40 seconds. As reported by the World Health Organization, globally stroke resembles an epidemic with estimates of over 15 million individuals suffering stroke yearly. Reperfusion strategies aiming to achieve recanalization of vessels have been the main focus in the treatment of acute ischemic-related pathologies in the fields of both cardiology and neurology. Within neurology, the realm of stroke treatment remains very dynamic and has undergone a significant degree of advancement that began with the use of intravenous tissue plasminogen activator (tPA) in 1996 that was shown to be efficacious for the treatment of acute ischemic strokes by the NINDS trial of techniques which focused on achieving a higher degree of revascularization augmented by intra-arterial modalities [1].

Globally, in recent years, widely implemented reperfusion therapies, especially the application of endovascular mechanical thrombectomy, have significantly enhanced the success rate of stroke treatment [2-6]. The year 2015 is pivotal to the world of endovascular surgical neuroradiology/interventional neurology as the results of these aforementioned trials have shown the benefit of combining newer generation endovascular treatment with best medical management for the treatment of acute ischemic strokes [7]. These trials have shown favorable results both short term and during the 90 day follow up. Several exciting breakthroughs, including mechanical thrombectomy, motion image technology and gradually disseminating remote stroke treatment, are all related to protection of cerebral blood flow and revascularization. Revascularization-based neuroprotection is, therefore, the theoretical basis of stroke study and translation, and also a widely accepted treatment model. These progresses and innovations in technology are leading a new concept of neuroprotection in which revascularization-based neuroprotection and prolongation of revascularization time window are emphasized. The new therapeutic theories and strategies might further decrease the side effects, expand indications of treatment and increase the neuroprotective effects of revascularization.

Because of reperfusion injury, revascularization alone may not be the magic bullet therapy for ischemic stroke. The multiple mechanisms of ischemia/reperfusion injury and the differences between species lead to the fact of that single target neuroprotective agents effective in animal experiments failed in clinical testing. Thus, the neuroprotection strategies for stroke seem to be very important as well. However, non-drug neuroprotective therapies, which usually affect multiple targets, such as hypothermia [8,9], hypoxic/ischemic/pharmacologic preconditioning [10-14], ultrasound [15], laser [16], and oxygen therapy [17] showed unique effects on preventing ischemic

brain damage. We expect that the combined therapies of these non-drug methods for multiple targets will open a new paradigm for the study of stroke neuroprotection.

In addition to novel neuroprotective strategies, the degree of collateral circulation is intimately related to the survival of ischemic tissue, especially the penumbra [18-21]. More collateral circulation will lead to bigger size and longer survival of penumbra, as well as better brain functional recovery after revascularization. Previous studies have indicated that many neuroprotective agents have brain protective effects on penumbra through collateral circulation. We expect that the combination of cerebral microcirculation improving agents, which enhance the collateral circulation and neuroprotection, will be effective to rescue ischemic penumbra and to promote the long term functional recovery from stroke.

Focusing on stroke diagnosis, management and mechanisms, future studies should be designed to improve the clinical decision making of ischemic or hemorrhagic stroke patients. Through greater understanding of the underlying mechanisms and novel treatment options for stroke, we will continue to garner momentum in the fight against cerebrovascular diseases.

References

1. Marler JR., *et al*. "Tissue-Plasminogen Activator for Acute Ischemic Stroke". *New England Journal of Medicine* 333.24 (1995): 1581-1587.
2. Ding D. "Endovascular Mechanical Thrombectomy for Acute Ischemic Stroke: A New Standard of Care". *Journal Stroke* 17.2 (2015): 123-126.
3. Berkhemer OA., *et al.* "A randomized trial of intraarterial treatment for acute ischemic stroke". *The New England Journal of Medicine* 372 (2015): 11-20.
4. Campbell BC., *et al*. "Endovascular therapy for ischemic stroke with perfusion-imaging selection". *The New England Journal of Medicine* 372 (2015): 1009-1018.
5. Goyal M., *et al*. "Randomized assessment of rapid endovascular treatment of ischemic stroke". *The New England Journal of Medicine* 372 (2015): 1019-1030.
6. Jovin TG., *et al.* "Thrombectomy within 8 hours after symptom onset in ischemic stroke". *The New England Journal of Medicine* 372 (2015): 2296-2306.
7. Carcora Y., *et al*. "A review of current clinical studies leading to improved outcomes in patients treated with newer-generation thrombectomy devices". *Brain Circulation* 1.1 (2015): 9-13.
8. Hemmen TM., *et al*. "Intravenous thrombolysis plus hypothermia for acute treatment of ischemic stroke (ICTuS-L): final results". Stroke 41.10 (2010): 2265-2270.
9. Kim JY and Yenari MA. "Hypothermia for treatment of stroke". *Brain Circulation* 1.1 (2015): 14-25.
10. Meng R., *et al*. "Upper limb ischemic preconditioning prevents recurrent stroke in intracranial arterial stenosis". *Neurology* 79.18 (2012): 1853-1861.
11. Hess D., *et al.* "Remote ischemic conditioning: A treatment for vascular cognitive impairment". *Brain Circulation*1.2 (2015): 133-139.
12. Ren C., *et al.* "Neural transmission pathways are involved in the neuroprotection induced by post- but not perischemic limb remote conditioning". *Brain Circulation* 1.2 (2015): 159-166.
13. Gidday JM. "Cerebrovascular ischemic protection by pre- and post-conditioning". *Brain Circulation* 1.1 (2015): 97-103.
14. Esposito E., *et al*. "Pharmacologic pre- and post-conditioning for stroke: Basic mechanisms and translational opportunity". *Brain Circulation* 1.1 (2015): 104-113.
15. IMS II Trial Investigators. "The Interventional Management of Stroke (IMS) II Study". *Stroke* 38.7 (2007): 2127-2135.
16. Zivin JA., *et al.* "Effectiveness and safety of transcranial laser therapy for acute ischemic stroke". *Stroke* 40.4 (2009): 1359-1364.
17. Churchill S., *et al*. "A prospective trial of hyperbaric oxygen for chronic sequelae after brain injury (HYBOBI)". *Undersea & Hyperbaric Medical Society* 40.2 (2013): 165-193.

18. Ciccone A., *et al*. "Endovascular treatment for acute ischemic stroke". *The New England Journal of Medicine* 368 (2013): 904-913.
19. Kidwell CS., *et al.* "A trial of imaging selection and endovascular treatment for ischemic stroke". *The New England Journal of Medicine* 368 (2013): 914-923.
20. Liebeskind DS. "Collateral lessons from recent acute ischemic stroke trials". *Neurological Research* 36.5 (2014): 397-402.
21. Liebeskind DS. "The collaterome: A novel conceptual framework of systems biology in cerebrovascular disorders". *Brain Circulation* 1.1 (2015): 3-8.