Magnetic inductive phase shift: a new method to differentiate hemorrhagic stroke from ischemic stroke on rabbit

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Abstract

Background: The major therapy for ischemic stroke is thrombolytic treatment, but severe consequences occur when this method is used to treat hemorrhagic stroke. Currently, computed tomography and magnetic resonance imaging are used to differentiate between two types of stroke, but these two methods are ineffective for pre-hospital care.

Methods: We developed a new brain diagnostic device for rabbits based on electromagnetic induction to non-invasively differentiate two types of stroke. The device includes two coils and a phase difference measurement system that detects the magnetic inductive phase shift (MIPS) value to reflect the tissue's condition. The hemorrhage model was established through the injection of autologous blood into the internal capsule of a rabbit's brain. Ischemia was induced in the brain of a rabbit by bilateral carotid artery occlusion. Two types of animal models were measured with our device.

Results: The MIPS value gradually decreased with increasing injected blood and increased with ischemia time. The MIPS changes induced by the two types of strokes were exact opposites, and the absolute values of MIPS variation in the hemorrhagic and the ischemic groups were significantly larger than those of the normal control group (P ¡ 0.05).

Conclusions: The tested technique can differentiate ischemic stroke from hemorrhagic stroke on rabbit brain in a non-invasive, continuous, and bulk monitoring manner by using a simple and inexpensive apparatus.

Keywords: Magnetic inductive phase shift (MIPS), Hemorrhagic stroke, Ischemic stroke

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