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Detection of Cerebral Metabolites in Canine Model of Ischemic Stroke by 1H Magnetic Resonance Spectroscopy

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Proton magnetic resonance spectroscopy (^{1}H MRS) provides *in vivo* biochemical information on tissue metabolites and a powerful tool to study cerebral metabolism in a noninvasive and longitudinal manner. Cerebral ischemia represents one of the major application areas of ^{1}H MRS in neurological research and human medicine. Thus we hypothesized that ^{1}H MRS can be applied to the ischemic stroke of dogs by its ability to quantify neuronal loss and to demonstrate reversible neuronal damage.

Five healthy laboratory Beagle dogs were studied. Ischemic stroke was induced by permanent middle cerebral artery occlusion using silicone plug. ^{1}H MRS was serially performed three times with a 1.5-tesla MR system: before, at 3 days after, and at 10 days after the stroke. Immunohistochemial staining was performed to determine expression of neuronal nuclei (NeuN) and glial fibrillary acidic protein (GFAP) in both ipsilateral and contralateral cerebral cortex.

Reduced levels of *N*-acetyl-asparate (NAA) ($P < .05$), choline (Cho), creatine (Cr) and myo-inositol (mI), and marked increase of the lactate (Lac) level ($P < .01$) were found at 3 days after the stroke. At 10 days after the stroke the change of Lac ($P < .01$) was maintained with time, other metabolites were partially recovered. The changes of Cr, Cho, and mI were not statistically significant ($P > .05$). There was significant loss of NeuN and GFAP immunoreactivity in the ischemic core.

Because dogs with ischemic stroke have the prominent features of ^{1}H MRS obtained from ischemic human brain, ^{1}H MRS may be to a useful diagnostic tool for the evaluation of ischemic stroke of dogs as well as humans.

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