

学位論文要約

Extended Summary in Lieu of the Full Text of a Doctoral Thesis

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学位論文題目: Endothelium-dependent vasodilation in the cerebral arterioles of rats  
Thesis Title: deteriorates during acute hyperglycemia and then is restored by reducing the glucose level.

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Summary of Thesis

Purpose: Acute hyperglycemia in patients with traumatic brain injury correlates with a poor neurological outcome. We investigated the endothelium function of rat cerebral arterioles during acute hyperglycemia and after reducing the glucose levels using insulin. We also examined whether or not oxidative stress was involved in the cerebral arteriole response to acute hyperglycemia.

Methods: In isoflurane-anesthetized, mechanically ventilated rats, we used closed cranial window preparation to measure the changes in the pial arteriolar diameter following the topical application of acetylcholine (ACh) or adenosine. We examined the pial arteriolar vasodilator response before hyperglycemia, during hyperglycemia, and after reducing the glucose level using insulin. After intravenous pretreatment with an NADPH oxidase inhibitor (apocynin or diphenylene iodonium), we reexamined the pial arteriolar vasodilator response following the topical application of ACh.

Results: Under control conditions, the topical application of ACh dose-dependently dilated the cerebral arterioles. The vasodilatory responses to topical ACh were impaired during hyperglycemia and improved after the administration of insulin. The vasodilatory responses to topical adenosine were not affected by the glucose levels. In the apocynin or diphenylene iodonium pretreatment group, the topical application of ACh dilated the cerebral arterioles during hyperglycemia.

Conclusion: Acute hyperglycemia induces a dysfunction of the endothelium-dependent vasodilation of rat cerebral arterioles. The dysfunction can be reversed by improving the acute hyperglycemia and it can be prevented entirely by the administration of NADPH oxidase inhibitors. These results could suggest that controlling the glucose levels work protectively to endothelium function of cerebral arterioles.