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EHMTI-0125. Studying the permeability of the blood-brain barrier during migraine attacks using [11C]-dihydroergotamine

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Introduction

Due to unfavorable molecular size and lipophilicity, migraine-specific medications such as dihydroergotamine (DHE) are not expected to penetrate the blood-brain barrier (BBB). A breakdown of the BBB during migraine attacks has been postulated as the mechanism in which DHE accesses postulated central sites of action.

Aim

To demonstrate whether the permeability of the BBB increases for DHE during migraine attacks.

Methods

As a measure of parenchymal binding in the brain and thus BBB penetration, we calculated the influx rate constant Ki for the radioligand [11C]-dihydroergotamine ([11C]-DHE) using arterial blood input function over the course of dynamic positron emission tomography (PET). The influence of migraine on the Ki maps, i.e. the BBB was assessed in a second [11C]-DHE scan during glyceryl trinitrate (GTN)-induced migraine attacks.

Results

Independent from the presence of migraine headache, six migraineurs and six age- and gender-matched control subjects showed identical binding of [11C]-DHE at the choroid plexus, the pituitary gland, and the venous sinuses. There was no binding (Ki = 0/min) in the brain parenchyma, including the candidate brainstem sites of action during migraine (periaqueductal grey, raphe nuclei) and the area with the highest density of the highest-affinity DHE receptors (hippocampus).

Conclusions

The lack of ictal binding of [11C]-DHE to the brain parenchyma suggests that the BBB remains intact for DHE during migraine attacks. The efficacy of DHE in treating an acute migraine attack may have a peripheral component although some implicated structures remain outside the BBB.

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