

COSBID

*Cooperative Studies On Brain
Injury Depolarisation*

17TH ANNUAL MEETING, **COSBID 2015**

September 9th - 11th



THURSDAY, SEPTEMBER 10TH | SCIENTIFIC SESSIONS

09:40-10:10

Coffee break & exhibitions



10:10-11:50

Hypoxia and ischemia models

Chairs: Jens Dreier and Eszter Farkas

10:10-10:22

The impact of age on the evolution of spreading depolarization triggered during global forebrain ischemia in the rat

Ákos Menyhárt, Péter Hertelendy, Péter Makra, Borbála Szepes, Orsolya M. Tóth, Ferenc Bari, Eszter Farkas.

05

10:29-10:41

Fifteen to 20 minutes of anoxic spreading depolarization (SD) in the brain cortex are fully reversible after middle cerebral artery occlusion (MCAO) in rats.

Janos Lückl, Uldus Khojasteh, Ana I. Oliveira-Ferreira, Sebastian Major, Jens P. Dreier.

06

10:48-11:03

Hemodynamic Polymorphism of Normoxic and Hypoxic Spreading Depolarizations in Clusters in the Gyrencephalic Swine Brain.

Renán Sánchez-Porras, Michael Schöll, Edgar Santos, Humberto Silos, Yuan Gang, Modar Kentar, Daniel Hertle, Andreas W. Unterberg, Oliver W. Sakowitz

07

11:12-11:27

Is focal ischemia necessary for the occurrence of spontaneous spreading depolarizations after subarachnoid hemorrhage?

Fumiaki Oka, Shin-Pin Chen, Ulrike Hoffmann, Jeong-Hyun Lee, Kristen Park Hopson, Izumi Yuzawa, Tao Qin, Cenk Ayata

08

11:50-13:00

Lunch



13:00-14:45

Basic mechanisms and Optical imaging I

Chairs: Cenk Ayata and Kevin Brenman

13:00-13:10

Effects of Magnesium on spreading depolarizations in gyrencephalic brains.

Edgar Santos, Fiorella León, Humberto Silos, Renan Sanchez-Porras, Andreas Unterberg, Oliver W. Sakowitz

09

The impact of age on the evaluation of spreading depolarization triggered during global forebrain ischemia in the rat

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Orsolya M. Tóth, Ferenc Bari, Eszter Farkaš*

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OBJECTIVES

Spreading depolarizations (SD) spontaneously occur in the ischemic brain, and facilitate cell death. Aging is the most important risk factor for the incidence of ischemic stroke; yet, it is not clear how age alters SD evolution. The aim of the recent study was (i) to compare the typical features of K⁺-evoked SDs during cerebral ischemia in young and aged rats and (ii) to assess the impact of age and ischemia on the electrical threshold of SD elicitation.

METHODS

Adult male Sprague-Dawley rats of various ages were anesthetized with isoflurane in N₂O/O₂. Transient global forebrain ischemia was induced by bilateral occlusion of the common carotid arteries (2VO, in young adult and old rats, from 7-week-old to 2-year-old, n=52). Sham-operated rats (SHAM) served as control (n=11). DC potential and local cerebral blood flow (CBF) were acquired via a small craniotomy. SDs were elicited by topical application of 1 or 3M KCl through a second craniotomy (8-week-old group, n=14; 2-year-old group, n=11), or by electrical stimulation for the determination of SD elicitation threshold (7-30-week-old group, n=38). In the latter case, 3 SDs were evoked during baseline and another 3 SDs during ischemia in each experiment. Blood pressure was continuously monitored and blood gases regularly controlled via a femoral artery catheter.

RESULTS

Ischemia elongated the duration of the SD-related negative DC shift, which was augmented further by age. Old age was also associated with reduced slope of depolarization and amplitude

of repolarization. In animals 7-30 weeks old, brain maturation markedly increased the elicitation threshold of SD, and ischemia significantly elevated the threshold of SD elicitation. CBF decreased progressively during ischemia in the 2-year-old animals, and inverse neurovascular coupling with SD evolved in the old but not in the young ischemic groups. The hyperemic CBF responses to SDs were of smaller amplitude but longer duration under ischemia.

CONCLUSIONS

We propose that (mal)adaptation of cerebrovascular function with aging impairs the SD-related CBF response. As a consequence, the aged ischemic brain has scarcer resources to recover from an SD event, which reflects the increased vulnerability of the aged brain to ischemia- and/or SD-related injury. Finally, the threshold to trigger SDs increases with aging and ischemia. The susceptibility of the brain to SD may be determined by the gray matter's biochemistry and cytoarchitecture that undergo adaptational changes with maturation, and ischemia is suggested to inhibit SD elicitation by decreasing tissue pH.

FUNDING

Hungarian Scientific Research Fund (K111923), János Bolyai Research Scholarship of the Hungarian Academy of Sciences, Hungarian Brain Research Program - Grant No. KTIA_13_NAP-A-I/13.