



THE IMPACT OF AGING ON PERI-INFARCT DEPOLARIZATIONS INDUCED BY FOCAL CEREBRAL ISCHEMIA IN THE RAT BRAIN

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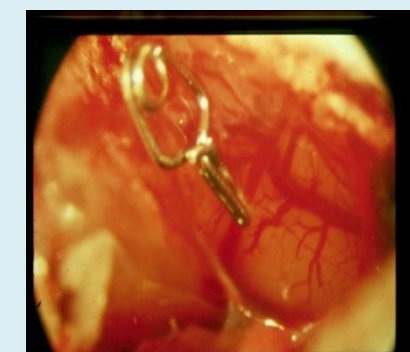
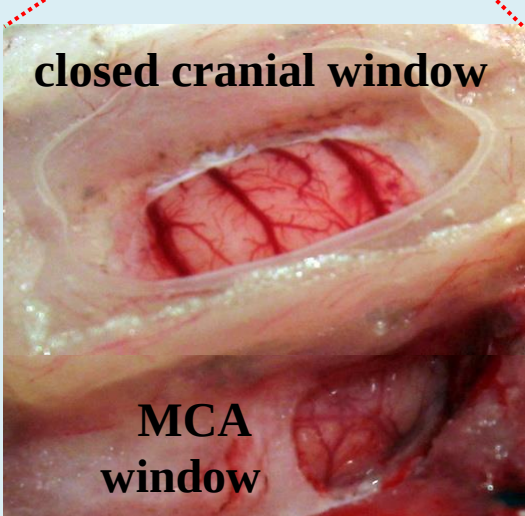
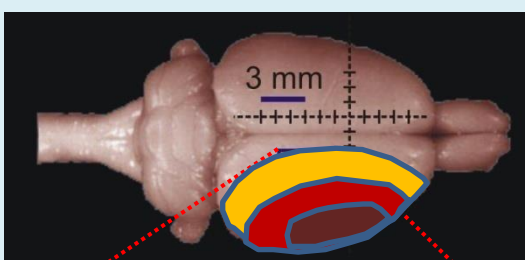
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Introduction

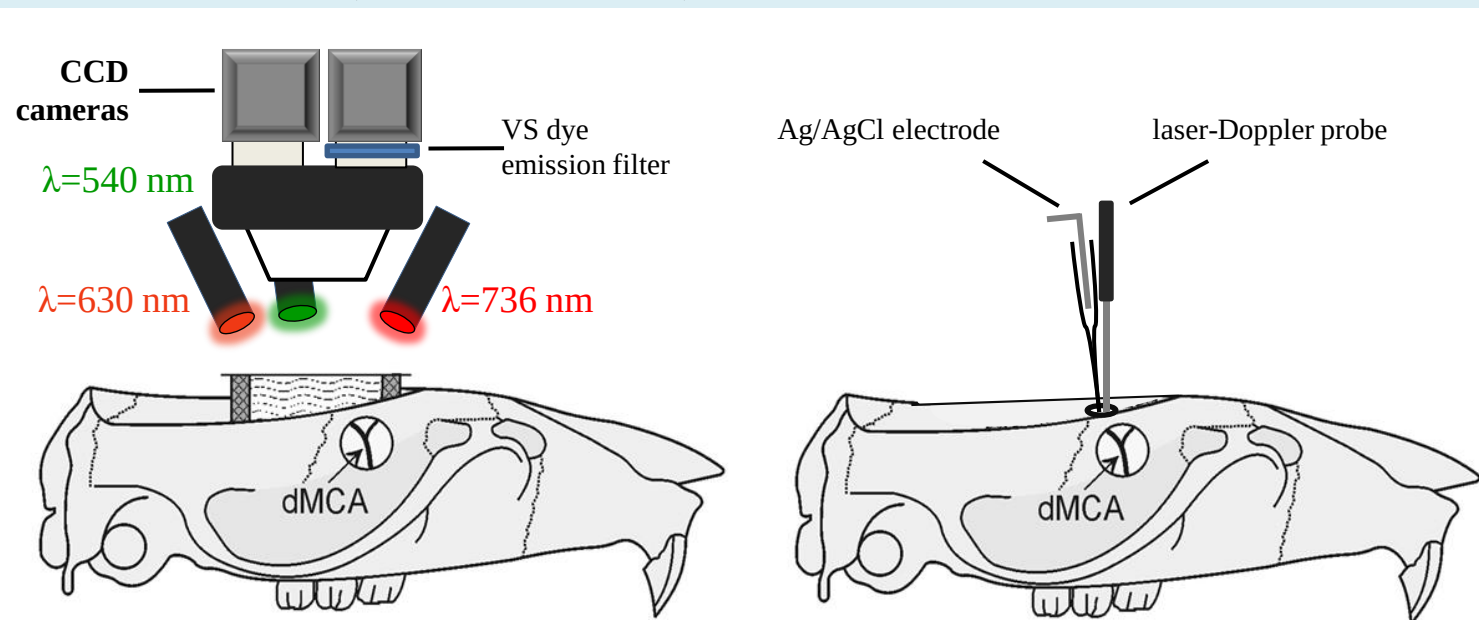
Conversion of ischemic brain tissue into infarction increases with age in humans (Ay *et al.* 2005 *Stroke*). In 18-24 months **old rats** (Petcu *et al.*, 2008 *Gerontology*) compared to young rats: same infarct size after middle cerebral artery occlusion (MCAO) but accelerated infarct development; higher mortality rate, worse functional outcome; slower recovery.

Question: Is there an age-related difference in the electrophysiological and hemodynamic response of the ischemic brain during transient ischemia/reperfusion (30 min tMCAO) in Wistar rats?

Methods

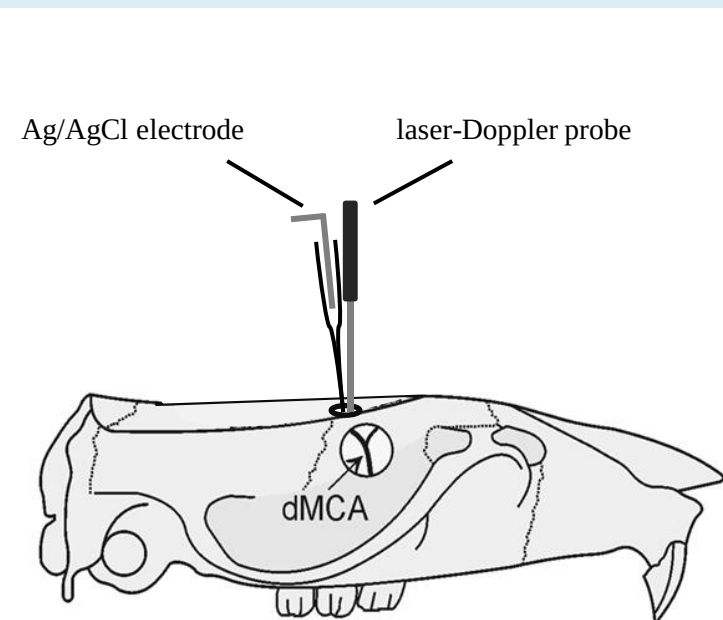


Voltage Sensitive (VS) dye (RH-1838) and laser-speckle contrast imaging in the penumbral region through a closed cranial window (Farkas *et al.*, 2010)



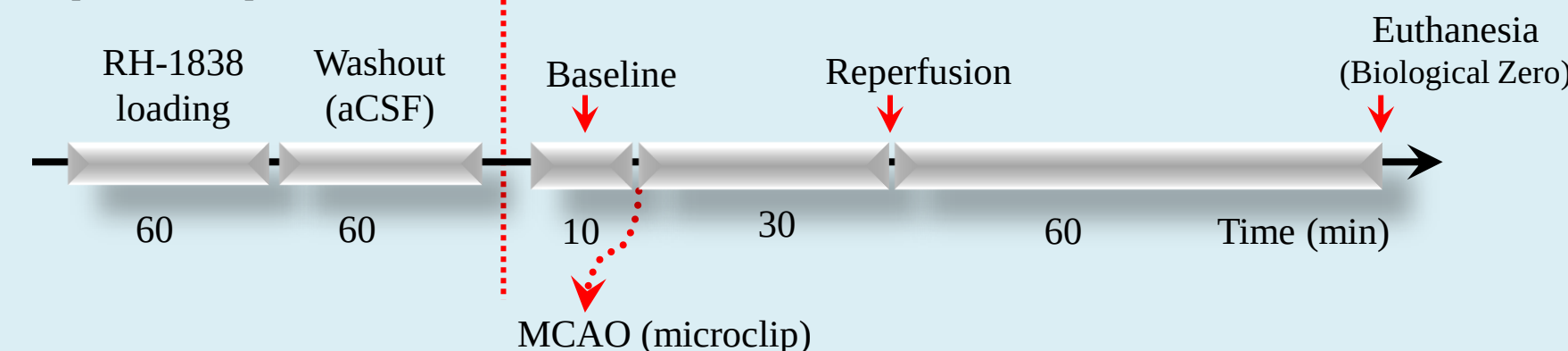
Old rats: 2-years old (n=7)
Middle-aged rats: 9-months old (n=7)
Young rats: 3-months old (n=7)

Direct current (DC), EEG and laser-Doppler flow measurement in the ischemic core through a burr hole

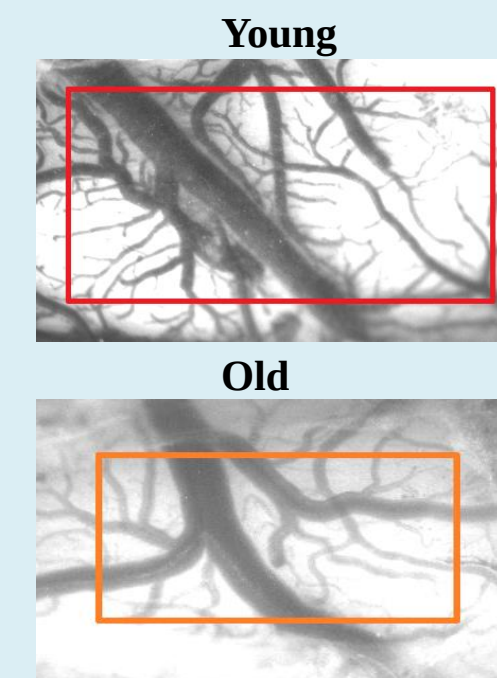
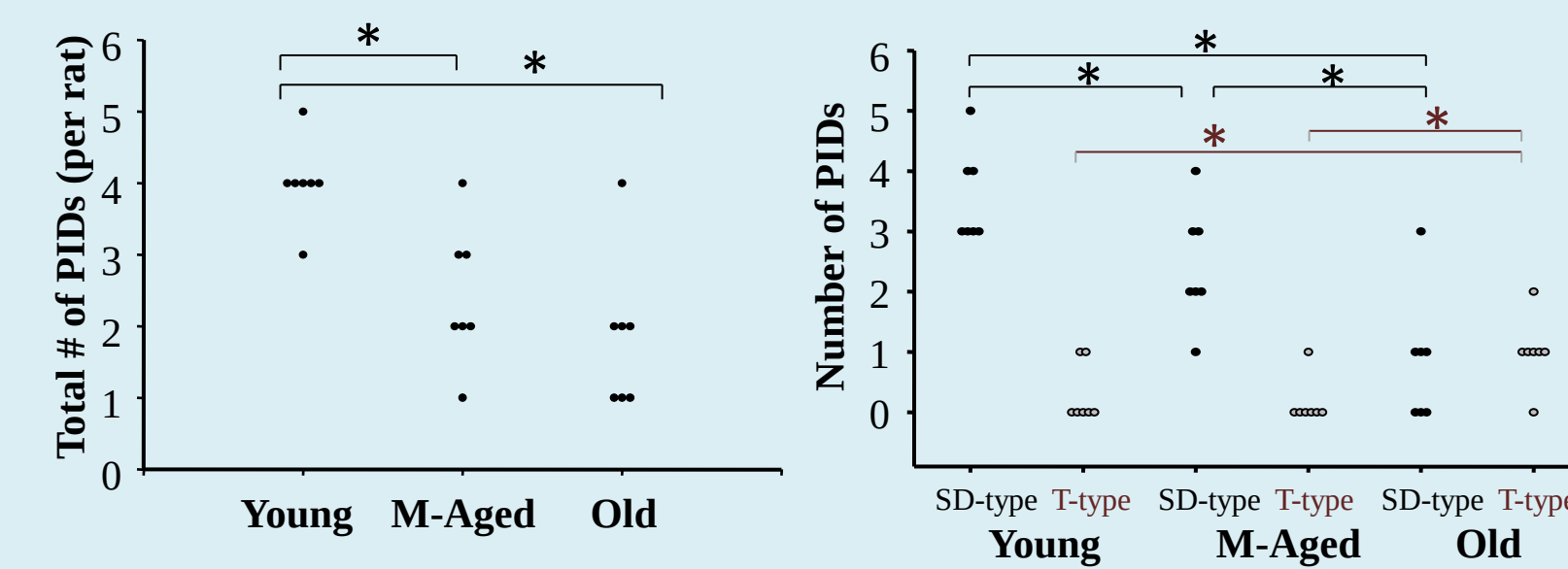
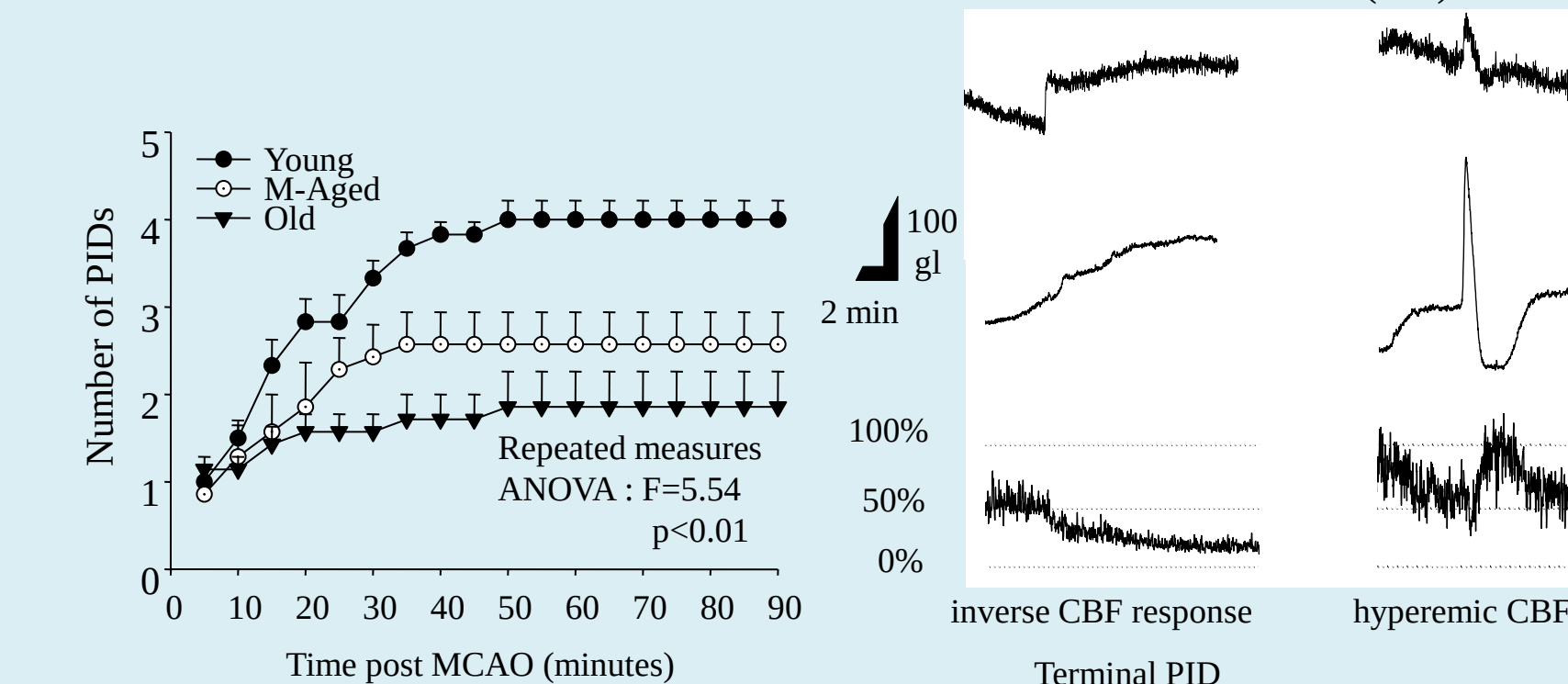
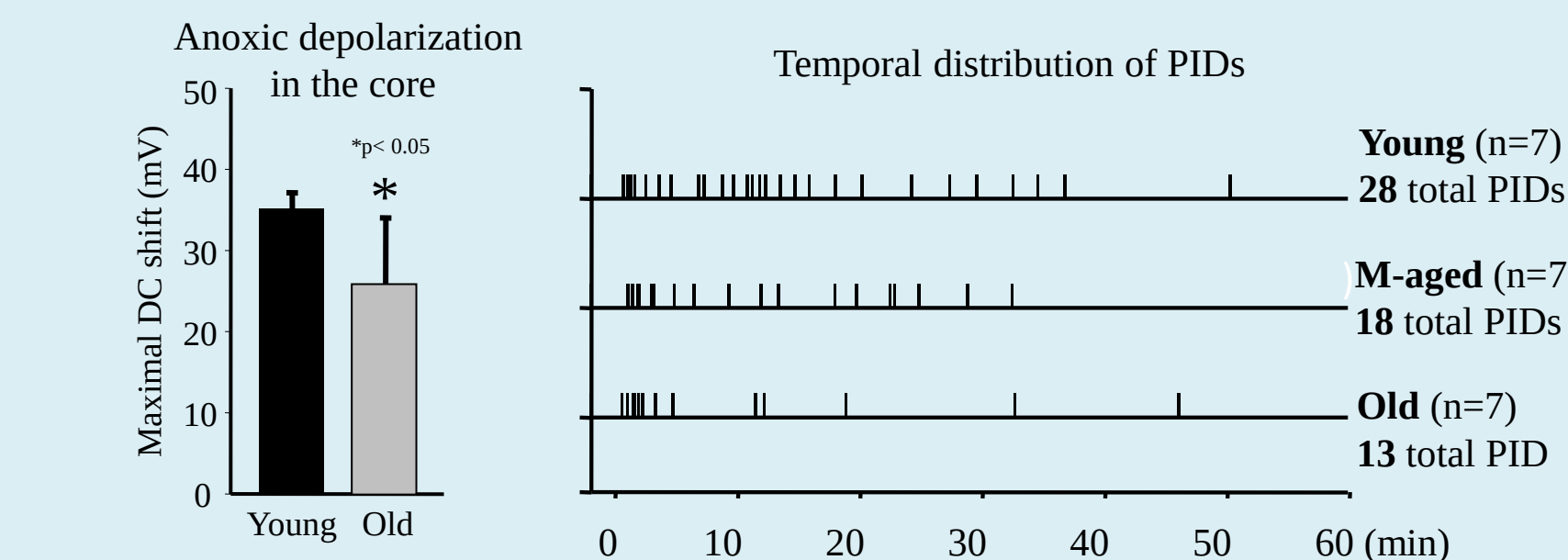
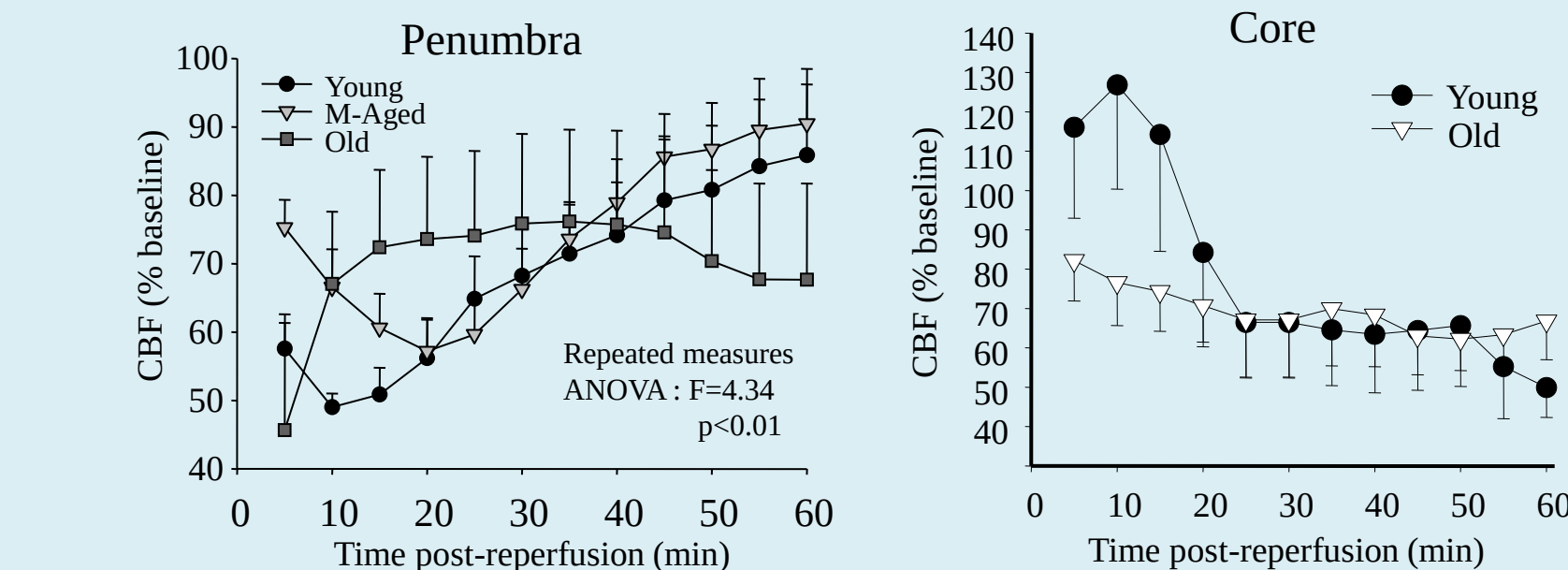
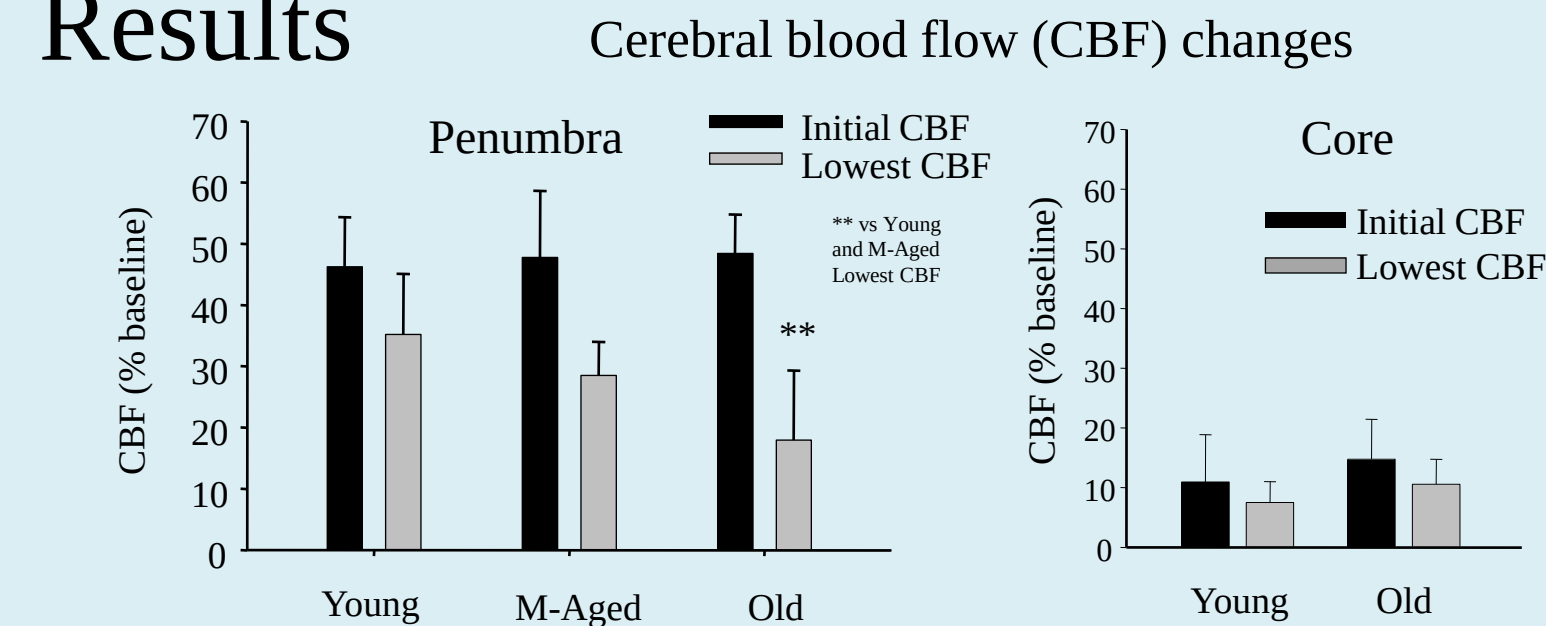


Old rats: 2-years old (n=6)
Young rats: 3-months old (n=6)

Experimental protocol:



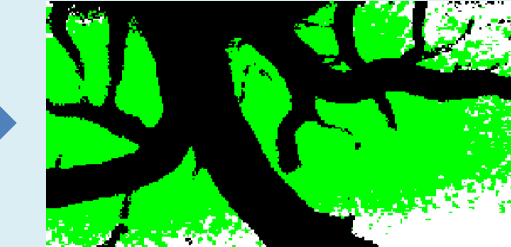
Results



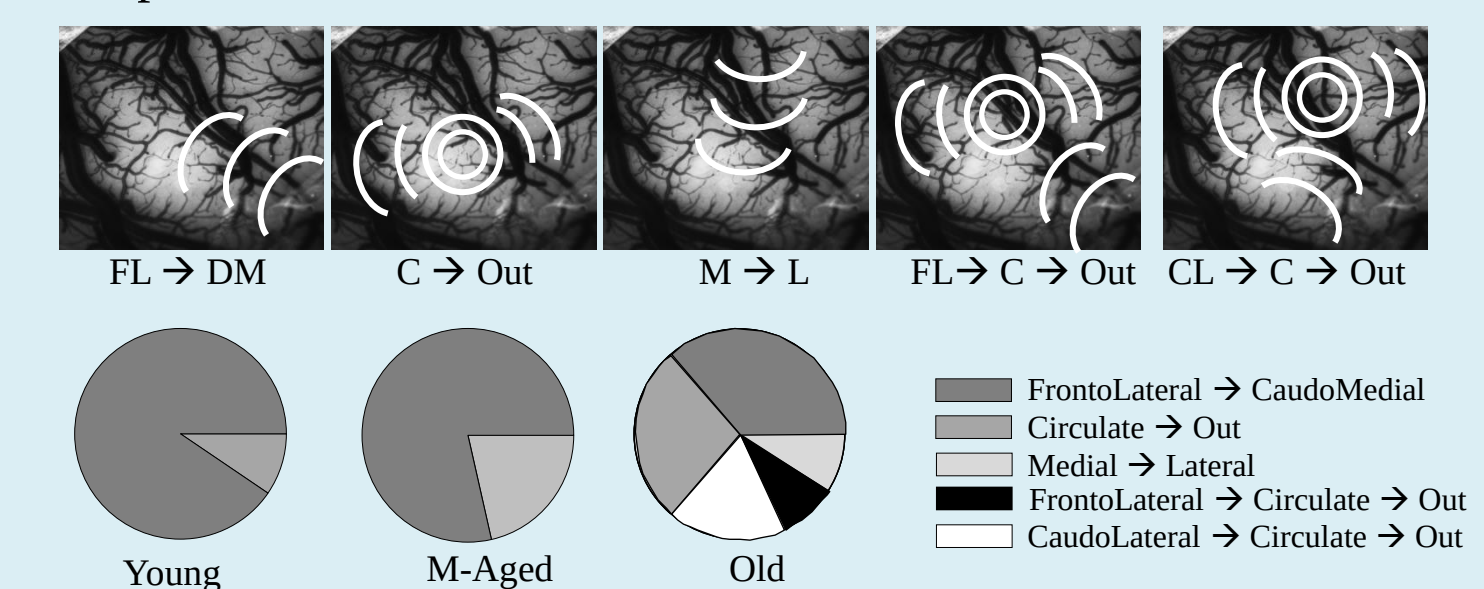
Young- Terminal type PID map



Old- Terminal type PID map



Shape and direction of PIDs



Conclusion: Anoxic depolarization of the ischemic core was reduced in old rats, which might be related to reduced cell number and cortical thickness with age. Age significantly altered the number, shape and hemodynamic responses of PIDs during mild stroke in the penumbra. Young animals had frequent PIDs, mostly associated with membrane repolarization and increased CBF. Terminal depolarizations were often observed in old rats, coupled with a lasting decrease in local blood flow. The occurrence of such depolarization events likely compromises the cortical tissue of aged animals exposed to even a short duration of focal ischemia. Further histological analysis is planned to reveal the degree of damage and the molecular bases of the observed differences.

References: Ay *et al.*, Conversion of ischemic brain tissue into infarction increases with age. *Stroke*. 2005 Dec;36(12):2632-6.; Petcu *et al.*, Cellular and molecular events underlying the dysregulated response of the aged brain to stroke: a mini-review. *Gerontology* 2008;54(1):6-17.; Farkas *et al.*, Multi-modal imaging of anoxic depolarization and hemodynamic changes induced by cardiac arrest in the rat cerebral cortex. *Neuroimage*. 2010 Jun;51(2):734-42.
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