Albin Robertsson
T1 Läkarprogrammet
Al8633ro-s@student.lu.se

Abstract VF2 Article A

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1. Introduction

Increased blood flow in the brain power neural computation and is induced by increased neuronal activity. It is however controversial whether this increase in blood flow is controlled only by arteriole smooth muscle or if capillary pericytes also play a role in regulating capillary blood flow. The paper examines the role of pericytes in capillary blood flow and therefore cerebral blood flow (CBF) regulation.

2. Scientific hypothesis of the paper

The paper puts forward the hypothesis that pericytes play a role in the regulation of CBF by regulating capillary dilation.

3. Chosen methods

To examine this the study investigates slices of the cerebellum in vitro and the somatosensory cortex in vivo of mice and rat. The study uses immunohistological labeling, several kinds of software and imaging techniques and several statistical methods to analyze to obtain and analyze data.

4. Results and conclusions

The study concludes that pericytes play a major role in cerebral blood flow control by inducing active relaxation as the answer to increased neuronal activity and the neurotransmitter glutamate. This effect is estimated by the study to govern 84% of the increased flow in vivo. The signal to dilate is mediated by prostaglandin E2 but also requires NO to suppress vasoconstricting 5-HETE synthesis simultaneously. The study also concludes that pericytes are the first elements to respond to increased neuronal activity and that they die readily in ischemia.

5. Possible strength or weaknesses of the study

The results about signaling chains is obtained in vitro from brain slices while the results for blood flow are obtained in vivo, therefore you cannot conclude for certain that the effects are

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related, also, the signaling chain is examined in cerebellar slices in vitro while blood flow is examined in vivo in the somatosensory cortex. Obviously, these results obtained in rat and mice doesn't prove that the same effects take place in human brains, it only indicates it.

6. Potential ethical considerations related to the two papers

The studies used live animals and animal tissue from rats and mice, which are euthanized before and/or after the study. This means animal ethics must be taken into consideration.

7. Medical data base search of relevance to the two papers

I used the database PubMed and Web of science to conduct a search with the MeSH terms pericytes and cerebrovascular circulation in combination with the term regulation in free text. Doing this I found som interesting articles on the subject, for example the following two:

a) Alarcon-Martinez L, Villafranca-Baughman D, Quintero H, Kacerovsky JB, Dotigny F, Murai KK, Prat A, Drapeau P, Di Polo A. Interpericyte tunnelling nanotubes regulate neurovascular coupling. Nature. 2020 Sep;585(7823):91-95. doi: 10.1038/s41586-020-2589-x. Epub 2020 Aug 12. PMID: 32788726.

b) Khennouf L, Gesslein B, Brazhe A, Octeau JC, Kutuzov N, Khakh BS, Lauritzen M. Active role of capillary pericytes during stimulation-induced activity and spreading depolarization. Brain. 2018 Jul 1;141(7):2032-2046. doi: 10.1093/brain/awy143. PMID: 30053174; PMCID: PMC6022680.