Секция «Экспериментальные исследования»

Modelling ischemic stroke through anterior cerebral artery occlusion in mini-pigs

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The therapy of acute disorders of cerebral circulation is one of the most urgent medical problems. There is no effective treatment protocol for cerebral stroke in practical medicine. Preclinical trials have results obtained in small animals, i.e. rodents [1], but these cannot be projected onto the humans. Therefore, there is a need in preclinical studies in large animals whose anatomy, physiological and biochemical characteristics are close to humans'. There is no method of recreating a standard cerebral infarction focus of focal volume with abnormalities characteristic of the ischemic brain area in large animals. The development of a model will allow the preclinical testing of new drugs with the assessment of their effectiveness on the recovery of penumbra and skills.

The aim of the study is to create an optimal mini-pigs' model protocol. Mini-pigs (n=4) weighing 15 kg were used to model ischemic cerebral stroke. Animals were anesthetized with Zoletil®100 (Virbac Sante Animale, France), 3 mg/kg IM. Animals were connected to an inhalation anesthesia machine via which isoflurane in 2.0-2.5% mixed with oxygen was administered. All surgical manipulations were performed in accordance with aseptic and antiseptic rules. Then, to reduce the blood flow in the circle of Willis, right carotid artery was ligated. Through trepanation in the left parietal bone, operative access was created to the anterior cerebral artery. After trepanation, the dura mater was dissected and the distal branch of the ACA was cauterized by electrocoagulation under an operating microscope. In the postoperative period, all animals received antibacterial (Ceftriaxone IM 50 mg/kg, once daily) and analgesic therapy (Ketorolol, IM 2.5 mg/kg, three times daily).

Ten days after the modelling stroke, mini-pigs were anaesthetized as previously, the brain was extracted from the cranial cavity and postfixed in 4% paraformaldehyde solution. One day after fixation the brain was delivered, photographed and then was sliced into 3 mm thick slices and each slice was photographed for analysis of infarct area. All morphometric analyses were performed in ImageJ software. Morphological analysis revealed small focal ischemic brain infarction localized in the left parietal lobe. Areas of cortical infarction in pig 1 [U+2012] 2,77 cm^2; pig 2 [U+2012] 3,09 cm^2; pig 3 [U+2012] 7,29 cm^2; pig 4 [U+2012] 5,32 cm^2. Analysis of histological examination revealed characteristic and reproducible morpho-functional brain abnormalities 10 days after surgery.

The results of the study indicate that this method of simulating cerebral stroke in the mini-pigs allows the creation of a focal volume ischemic cerebral infarction affecting the left parietal

lobe in the experimental animals. This study was supported by Russian Science Foundation No 19-75-10030.

References

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