Thermocoagulation induced focal ischemic model

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Abstract

The thermocoagulation model is a type of focal cerebral ischemia with craniectomy. It represents an opportunity to study permanent ischemic brain lesions with good reproducibility and low mortality

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Protocol

Step 1.

A focal ischemic lesion is induced by thermocoagulation of blood in the pial blood vessels of primary motor and somatosensory cortex

Step 2.

The animals are anesthetized with ketamine hydrochloride (90 mg/kg, i.p.) and xylazine hydrochloride (12 mg/kg, i.p.) and place in a stereotaxic apparatus

Step 3.

A craniectomy is made to expose the left somatosensory cortex, region of the left middle cerebral artery (+ 2 mm to -6 mm in anterior-posterior and +2 mm in medial-lateral axis from Bregma), according to the atlas of Paxinos and Watson.

Step 4.

Basal blood perfusion image is acquired in the exposed brain area with a Perfusion Speckle Imager before induction.

Step 5.

Thermocoagulation is performed in three different animal groups at temperatures of 200 °C, 300 °C, or 400°C, respectively, providing a better dynamic evaluation of the lesion in the pial blood vessels of the somatosensory cortex according to the temperature used.

Step 6.

Superficial blood vessels of the left sensorimotor brain area are thermocoagulated transdurally by a

hot probe into the dura matter (2 mm) for 30 minutes.

Step 7.

After 30 min of TCI at 400 °C, vessel lesions are evaluated macroscopically through the color changes in the region targeted, from light red to dark red to indicate complete thermocoagulation of blood. Thus TCI is performed for 30 min at the three temperatures. A decrease in blood perfusion by 75% of the initial measure (before induction) after 30 min of TCI is considered as a parameter for complete ischemic lesion.

Step 8.

The procedure is completed with suturing of the incision tissue and topical application of lidocaine and IV administration of tramadol (5 mg/kg) every 12 h for six days.

Step 9.

Throughout anesthesia, the rats are placed on a heating pad to maintain the rectal temperature at 37.0 °C ± 0.5 ºC.

Step 10.

Animals from the sham group are underwent the whole procedure up to, but not including the TCI. The probe is positioned turned off for 30 min and thereafter, the incision tissue is sutured.