SIII4: CO_2-PNEUMOTHORAX DO NOT ALTER THE SURVIVAL OF NEWBORN NEURONS IN THE DORSAL HIPPOCAMPUS: STUDY IN A NEONATAL RODENT MODEL

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Background Concerns about the safety of the CO_2-pneumothorax have been drawing the attention of health professionals, being the effects over brain oxygenation and perfusion the most investigated events [1–4]. The neonatal period is a fundamental phase in normal brain development, and early life events can induce permanent changes in neurogenesis, synaptogenesis and neuronal connectivity in neonatal hippocampus. The hippocampus is highly involved in cognitive functions and the birth of new granule neurons in the dentate gyrus (DG) is important for maintaining memory function throughout life. With the help of a neonatal rodent model, this work aims to investigate the effect of CO_2-pneumothorax on the survival of hippocampal cells undergoing division prior the CO_2-insufflation event.

Materials and methods Neonatal rats on postnatal day 9 (PND 9) received an intraperitoneal injection of a thymidine analog (BrdU) that incorporates into dividing cells during DNA synthesis. At PND 10, animals were anesthetized, mechanically ventilated and submitted to CO_2-pneumothorax. Twenty-eight days after BrdU injection, brains were collected and brain sections of 20 µm thick were cut in a frozen section cryostat. Every 8th section throughout the hippocampus was processed for BrdU immunohistochemistry. Cell survival was estimated in the subgranular zone (SGZ) and granular cell layer (GCL) of the hippocampal DG by estimating cell density of BrdU positive cells (ratio between the total number of immunostained cells and the area of the SGZ and GCL). Statistical significance was set at $P \leq 0.05$. This animal study was performed following the EU Directive 2010/63/EU and was approved by national competent authority.

Results Four weeks after the injection, the density of BrdU-positive cells in SHAM animals revealed to be non-significantly different than animals exposed to mechanical ventilation (PT0) or thoracic CO_2-insufflation (PT2) ($F_{2,12} = 0.07603$; $p = 0.9273$).

Conclusions It has become of utmost importance the investment in research studies to unravel the acute and long-term effects of CO_2-insufflation in neonatal patients. The long-term human studies are far from being completed and the use of altricial neonatal animal models may in the meanwhile contribute to clarify some of those concerning issues. At the cellular level, CO_2-pneumothorax did not alter the survival of newborn cells undergoing division in the hippocampal dentate gyrus. Although no effect was observed over cell survival, further studies in which BrdU is injected after the CO_2-insufflation may additionally help to clarify if the rate of cell proliferation is altered after the CO_2-pneumothorax.

Keywords CO_2-pneumothorax, neonate, hippocampus, proliferation

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