Pretreatment with erythropoietin improved the long-term neurological function induced sevoflurane exposure in neonatal rats.

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Introduction

- Erythropoietin (EPO) has been shown to protect neonatal animals from hypoxic ischemic injury. Pediatr Res 74: 658-667, 2013.

Purpose

- EPO administration could ameliorate neurodegeneration triggered by sevoflurane in the developing rat brain and improve cognitive function in the long-term.

Methods

- On P7, rat pups were injected intraperitoneally with saline or 0 -600 U of recombinant human EPO. Group (n=5, each group)
  - EPO 0 U: saline
  - EPO 60 U: EPO 60 U
  - EPO 120 U: EPO 120 U
  - EPO 600 U: EPO 600 U
- After 30 minutes, rats were exposed to 3% sevoflurane anesthesia for 4 hours with 21% oxygen.
- Cognitive function was evaluated using the Morris water maze on P27-P29 (acquisition trial) and P47-P49 (retention trial).
- Fear conditioning test (FC) was conducted 5 weeks (P42) and 6 weeks (P49) after anesthesia exposure.
- Brains were stained with NeuN on P49.
- The number of NeuN-positive cells in a 500 µm × 300 µm area was counted bilaterally in the CA1 hippocampus and cerebral cortical layer 3.
- Data (mean ± SD) were analyzed using one-way and two-way ANOVA.

Results

- Acquisition trials of water maze test (P27-29)
- Retention trials of water maze test (P47)
- Fear conditioning test
- NeuN staining of brain sections

Conclusion

- A single administration of EPO (600 U) before sevoflurane exposure reduced the neurologic impairment.
- Even a small dose of EPO increased the number of intact neurons in the cortex and hippocampus exposed to sevoflurane as infants.
- Pretreatment with EPO is likely to improve long-term cognitive function and ameliorate neuronal degeneration induced by sevoflurane exposure in neonatal rats.