Isoflurane Protects From Learning Impairment Caused by Brief Hypoxia and Hypotension in Rats.

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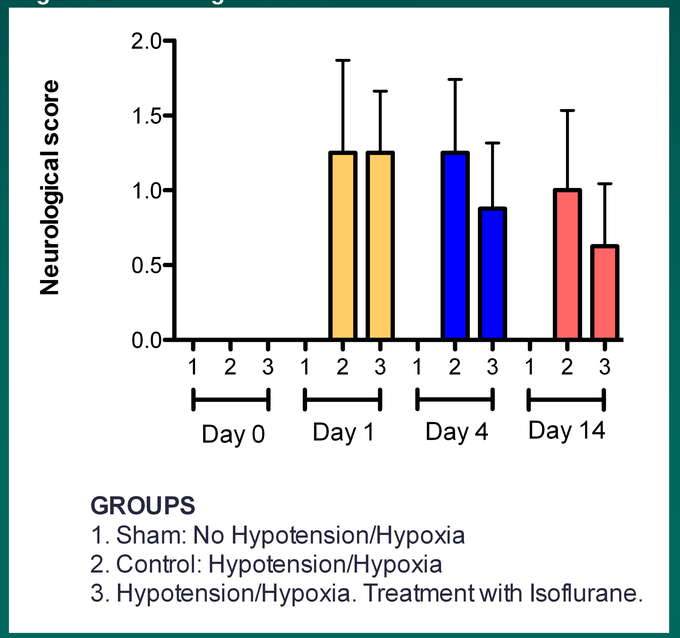
Introduction:

We have previously demonstrated that short periods of hypotension in rats can cause histological changes in the hippocampal CA1 area, while behavior remains unchanged. We tested if a stronger insult may also cause behavioral changes and if an immediate exposure to isoflurane might affect it. We used a rat hemorrhagic shock model plus temporary hypoxia to assess functional outcome.

Methods:

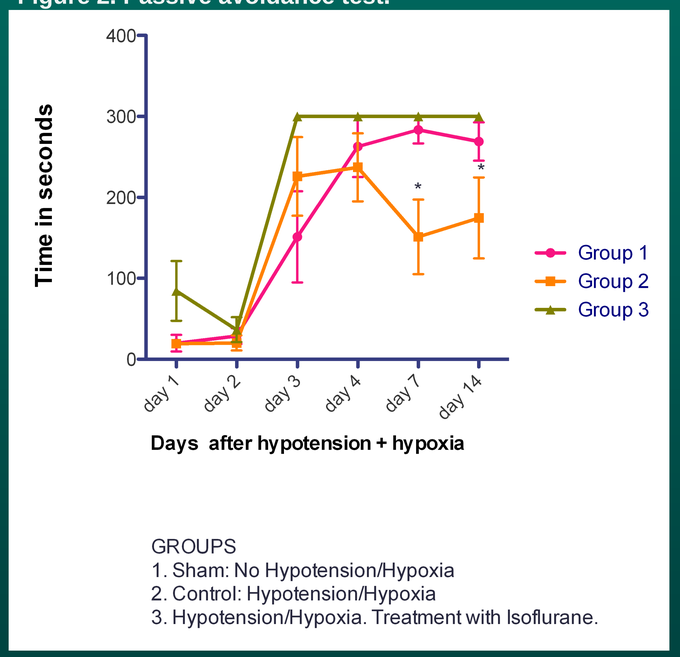
SD rats were subjected to mean arterial blood pressures reduced by 20-30 mmHg for three consecutive minutes, while the animal was breathing 12% O2 in N2. After the 3 minutes shed blood was returned to venous circulation, and returned to breathe room air. Animals were evaluated at different time points. Group 1: Control, normal animals (sham) no injury. Neurological evaluation (NE) at day 0, 1, 4 and 14, passive avoidance (PA) test at day 3, 4, 7 and 14, euthanized at day 14. Group 2: hypotension plus hypoxia: NE before surgery and at day 1, euthanized at day 1; Group 3: hypotension plus hypoxia: NE before surgery and at day 4, euthanized at day 4; and Group 4:hypotension plus hypoxia: NE at day 0, 1, 4 and 14, PA at day 3, 4, 7 and 14, euthanized at day 14. Group 5: hypotension plus hypoxia and was treated with 90 minutes of isoflurane after the insult: NE at day 0, 1, 4 and 14, PA at day 3, 4, 7 and 14, euthanized at day 14.NE used an evaluation scale (3). Histopatologycal analysis with NeuN and Nissl was performed with the quantitative stereologer.

Figure 1. Neurological assessment.



Hypotension plus hypoxia resulted in minor abnormalities

Figure 2. Passive avoidance test.



The use of Isoflurane after the insult showed to protect the animals from memory alterations.

Results:

Neurological assessment showed that hypotension plus hypoxia resulted only in minor abnormalities no statistically significant (fig 1). With the passive avoidance test (Fig 2) we found that new memories were still created after the injuries but animals with no hypotension/hypoxia had a better performance (day 7 and 14) in comparison with the hypotension/hypoxia group. The use of Isoflurane after the insult showed to protect the animals from memory alterations. No histopatological changes were found in any of the groups.

Conclusions:

Isoflurane administration for 90 minutes post-insult is beneficial in restoring the new memories at 7 and 14 days tested with passive avoidance.

Bibliography:

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