Neuroprotective effects of argon in an in vivo model of transient middle cerebral artery occlusion in rats.

Abstract:
The neuroprotective effects of the noble gas xenon are well known. Argon, in contrast to xenon, is abundant, inexpensive, and therefore widely applicable. In this study, we analyzed the possible neuroprotective role of argon in an in vivo rat model of acute focal cerebral ischemia. Controlled laboratory study. Academic research laboratory. Male adult Sprague-Dawley rats. Twenty-two rats underwent 2 hrs of transient middle cerebral artery occlusion using the endoluminal thread model. One hr after transient middle cerebral artery occlusion induction, spontaneously breathing rats received either 50 vol % argon/50 vol % O2 (argon group, n = 11) or 50 vol % N2/50 vol % O2 (control group, n = 11) for 1 hr through a face mask. Twenty-four hrs after reperfusion, rats were neurologically and behaviorally tested and euthanized. Rat brains were stained with 2,3,5-triphenyltetrazolium chloride and infarct volumes determined by planimetry. After 2 hrs of transient middle cerebral artery occlusion in the rat, we found in the argon group a significant reduction in the overall (p = .004) and after subdivision in the cortical (p = .007) and the basal ganglia (p = .02) infarct volumes. Argon treatment resulted in a significant improvement of the composite adverse outcome (p = .034). However, there was no advantage in acute survival 24 hrs after transient middle cerebral artery occlusion.
occlusion (p = .361). We were able to demonstrate argon's neuroprotective effects in an in vivo experimental rat model of acute focal cerebral ischemia. Animals breathing spontaneously 50 vol % argon 1 hr after induction of transient middle cerebral artery occlusion for 1 hr by face mask showed significantly reduced infarct volumes and composite adverse outcomes.