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1: J Vasc Interv Radiol. 2005 May;16(5):713-26.

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J Vasc Interv Radiol

**Adverse cerebrovascular effects of intraarterial CO<sub>2</sub> injections: development of an in vitro/in vivo model for assessment of gas-based toxicity.**






**Kozlov DB, Lang EV, Barnhart W, Gossler A, De Girolami U.**

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**PURPOSE:** To assess whether and how CO<sub>2</sub> can cause ischemic injury in the central nervous system after internal carotid artery injection. **MATERIALS AND METHODS:** In 14 adult pigs, both internal carotid arteries were catheterized via a transfemoral approach. One carotid artery served as control and the other was injected via a prototype gas injector with defined volumes and pressures of gas. Effects were assessed by clinical observation, repeated magnetic resonance (MR) imaging, histopathology, and vital staining. An in vitro flow circuit was used to model injection parameters. **RESULTS:** Single injections of CO<sub>2</sub> did not produce persistent clinical symptomatology. In vitro conditions were created in which bubbles adhered to the tubing of the circuit, creating functional stenoses, or coalesced into larger bubbles that became trapped, thereby reducing flow and augmenting potential embologenic effects of subsequent injections. With in vitro-derived dual injection parameters, seven pigs underwent two sequential injections of CO<sub>2</sub>. All did well after the first injections, but all had adverse effects after the second injections, including involuntary tonic-clonic muscular movements, cardiopulmonary arrest, recurrent intractable seizure activity during recovery, hemorrhagic venous infarcts on gross and histopathologic examination, and blood-brain barrier breakdown on vital staining. MR imaging was not sensitive even after symptomatic intraarterial air injection. **CONCLUSIONS:** Absence of adverse effects after single bolus injections in pigs does not prove the safety of intracranial CO<sub>2</sub> injections in human patients. Considering the possible deleterious effects of repeat intravascular injections in the highly sensitive system of the brain, it may be prudent for clinical application at other approved sites to let time pass between boluses sufficient to permit absorption of wall-adherent and coalescent bubbles that could cause gas embolic events.

PMID: 15872327 [PubMed - indexed for MEDLINE]

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