Commentary: Is surgical field insufflation with carbon dioxide an antidote for airhead(s)?

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Central Message

CO₂ surgical field insufflation remains controversial. The video clips contained within this manuscript are illustrative and may support specific diffusion devices. Further trials will be necessary.

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Carbon dioxide (CO₂) field insufflation is an attractive adjunct during open heart surgery because of the markedly increased solubility of CO₂ in blood versus air. However, to date this strategy remains unproven. I can recall from the distant past, before the use of CO₂ insufflation, and before the availability of transesophageal echocardiography (TEE), many patients awakening from cardiac surgery experienced confusion and severe agitation but without focal neurologic deficits. These were considered to secondary to air emboli, and such patients were deemed “airheads.”

Fortunately, these symptoms cleared within 3 to 4 days without obvious long-term sequelae. With the advent of TEE, which allowed visualization of gaseous bubbles within cardiac chambers, deairing maneuvers could be more directed, and more complete, and at about the same time, many surgeons added CO₂ insufflation to their routines. With this combined regimen, to my admittedly imperfect recollection, this postoperative agitated state virtually disappeared. However, other than anecdotal reports, is there any valid evidence for improved neuroprotection?

Chaudhuri and colleagues¹ demonstrated significantly more rapid and complete clearing of intracardiac air after left-sided valve procedures in a randomized trial with and without CO₂, as judged by blinded anesthesiologist assessment from the TEE. Herrmann and colleagues² demonstrated significantly lower levels of S100β at 2 and 48 hours after a pump run, suggesting less axonal injury, and Martens and colleagues³ similarly demonstrated less prolonged p300 peak latencies in the CO₂ group versus controls. However, there have been no definitive trials, to my knowledge, demonstrating fewer neurologic deficits or less neurocognitive decline.

So what are we to do? Based on the increased solubility of CO₂ in blood, the trivial added expense, and more efficient

and shortened deairing times, CO₂ could offer additional protection with little downside. The excellent videos and discussion in the manuscript by Vandenberghe and colleagues⁴ highlight marked differences in dispersion patterns with different devices and flow rates, which may affect efficacy with this technique. Going forward, randomized controlled trials using diffusors that can effectively maintain a homogenous CO₂ cloud over the operative field may be necessary to demonstrate a clinical benefit. The prevention of even one “airhead” would seem worth the effort.

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