

Spontaneous Absorption of Cerebral Air Emboli

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TO THE EDITOR

I read with interest the recent report by Dr. Yang describing two cases of cerebral arterial air embolism (AGE) occurring during cerebral angiography in which the emboli appeared to be spontaneously absorbed into the bloodstream.¹⁾ Indeed there are at least two mechanisms for air bubbles within blood to resolve spontaneously, as evidenced by case series of arterial gas embolism without detectable gas on brain imaging.²⁾ Gases within a bubble will diffuse into the surrounding medium at a rate depending on their partial pressure gradients. If the patient is breathing air the partial pressure gradient for nitrogen is fairly small. However it increases significantly if the patient is breathing supplemental oxygen, causing bubbles in blood and tissues to resolve more quickly.³⁾⁷⁻⁹⁾

Another explanation for the bubble disappearance is distal progression and passage via the capillaries into

the cerebral veins. In anesthetized rabbits it has been shown that arterial air bubbles often do not remain trapped in the arterial circulation, but rather progress distally and can be recovered on the venous side.⁴⁻⁶⁾ Despite their lack of persistence, the presence of cerebral arterial bubbles causes a progressive decrease in regional cerebral blood flow that can persist for several hours.⁴⁻⁶⁾

As Dr. Yang and colleagues point out, hyperbaric oxygen (HBO₂) does result in rapid resolution of intravascular bubbles. However it has other pharmacological properties that are beneficial in AGE. HBO₂ tends to inhibit the endothelial binding of leukocytes that occurs after tissue ischemia, and thus reduces mechanical obstruction in the microvasculature caused by adherent leukocytes.¹⁾¹²⁾ This is supported by clinical observations, showing improvement that occurs after HBO₂ treatment of AGE even in the absence of radiographically visible bubbles.²⁾¹⁰⁾

In summary, spontaneous resolution of cerebral AGE reported by Dr. Yang is supported by other clinical observations. However, in managing these patients it is important to realize that AGE can initiate secondary phenomena such as regional hypoperfusion, which can sustain neurological injury. HBO₂ not only can facilitate bubble resolution but also ameliorate some of these secondary phenomena and facilitate clinical improvement even when bubbles have resolved. It is therefore important not to withhold HBO₂ merely on the basis of the absence of bubbles.

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