Classic Pages of the *Journal of Extra-Corporeal Technology*

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**Gaseous microemboli: 1983**


[Editorial; 40 references]

With the proliferation of and even preceding many of the early 1980s perfusion studies employing gaseous microemboli (GME) detectors (1,2), Dr. Bruce D. Butler was compelled to write about the principles of gaseous emboli in blood and flowing systems. Prior to penning the editorial, Dr. Butler hailed from the Department of Anesthesiology at the University of Texas Medical School and had published on the topic of underwater air embolism and the removal of GME by the lungs (3).

Dr. Butler’s article is more of a review article and less of an opinion piece especially with 40 references and his skill at distilling the current research in 1983 into five sources of GME in perfusion circuits. He listed five sources: 1) suction of blood and air, 2) cavitation, 3) mechanical blows to the circuit, 4) release of GME with warming blood, and 5) injection or entrainment of GME into the bypass circuit. There has not been any other source of GME identified since one may classify siphon and vacuum venous drainage as “suction of air” into the bypass circuit (4). Of course, there are many sources of systemic GME from non-bypass circuit sources such as insertion of the aortic cannula and removing the aortic cross clamp to just name two (5).

Dr. Butler’s treatment of the five sources of GME includes theory and mathematics making his article an excellent source of information on GME and mandatory reading for students of perfusion. This *JECT* classic had high impact at the time and has been referenced in many articles since its 1983 publication—both signs of an excellent article.

Dr. Butler’s recommendations in this classic editorial have been born out in the bubble detection literature following 1983. He calls for quantification of GME using Doppler-type measurement systems and goes on to warn the reader of the lack of consistency in the devices and the need to validate GME measurement devices—problems that continue to plague us today. As an industry, clinicians and manufacturers have worked to reduce the gaseous microemboli load that a patient receives during cardiac surgical procedures. We have devices that are clinically available to monitor and measure micro (less than 300 micron diameter) gaseous emboli in the circuit and in the patient’s arterial system.

Perhaps the greatest lesson we may learn from this issue’s *JECT* classic is to invest our time and energy to validate the GME measurement systems that are available for use during the surgery. Clinicians must continue to describe the patient dose-response to embolic load in regard to neurologic dysfunction but more importantly, we need to strive to identify the problem areas in devices and to eliminate systemic GME during cardiac surgery (6).

The technology to quantitate and monitor microemboli is available. Our challenge is to apply the technology to build more effective circuit components as prime volume and surface area decrease (7), and to use the GME measurement technology to improve cardiac surgical and perfusion techniques, which will ultimately improve outcome for the patient.

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**REFERENCE**