



Patient Safety Alert: Air Embolism During Cardiac Ablation

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During a cardiac ablation procedure, the catheter irrigation fluid bag emptied and was replaced by staff. While priming the tubing, air was noted in the tube, and the catheter was immediately removed from the patient. The patient experienced a decrease of heart rate and blood pressure requiring a code response.

Radiofrequency cardiac ablation requires the use of heparinized irrigation fluid to cool and anticoagulate the ablation site. If the procedure requires more fluid than originally hung, it requires the bag to be replaced. This introduces an opportunity for air to enter the irrigation tubing. Air emboli can then be infused into the patient, causing cardiac arrhythmia, myocardial infarction, respiratory symptoms, and/or neurologic symptoms, and, potentially, total cardiovascular collapse.

Solutions

- During cardiac ablation procedures, air should be removed from any bags and the pump (or any other pressurized delivery device) tubing should be primed before being connected to a patient.
- Do not bypass alarms that detect air in the pump or tubing systems.
- Do not prime the irrigation line without first disconnecting the tubing set from the patient, regardless of whether a stopcock is in use.
- Review the manufacturer's instructions for how to change fluid bags to ensure safe operations.
- Be aware of potential access points for air to enter the system and mitigate the risk.

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In Other Words...

If you've been diagnosed with a **heart arrhythmia**, a condition in which your heart beats too fast, too slow, or irregularly (skipping a beat),^a one of your treatment options may be cardiac ablation.

Cardiac ablation is recommended when the arrhythmia doesn't respond to medication or involves certain areas of the heart. This is a minimally invasive procedure, performed under anesthesia, in which catheters (thin tubes) are inserted through a tiny cut in your skin and guided inside blood vessels to your heart. There, electrodes on the ends of the catheters are used to locate the source of the arrhythmia, which averages around one-fifth of an inch in size.^b

In **radiofrequency ablation**, the doctor targets this small area with mild heat energy (radiofrequency) to destroy (ablate) the problem tissue that was sending abnormal electrical signals to your heart.^b The catheters in your blood vessels also carry **heparinized irrigation fluid**; this solution helps cool down the ablation site and contains the drug heparin to prevent blood clotting (anticoagulation).

If more fluid is needed, the empty bag is changed for a new one. During fluid bag replacement, air in the bag, pump, or tubing may enter the patient's blood vessels (**air embolism**), potentially resulting in catastrophic harm. This safety alert highlights the risk of air embolism during cardiac ablation procedures, as well as prevention strategies.

About the Authors

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Bruce Hansel joined ECRI in 1984 as a project engineer, bringing extensive experience in science and engineering. His career with ECRI has been focused on managing and investigating accidents involving medical technology of all descriptions—including numerous gas embolism incidents—as well as lecturing on investigative methodology and patient safety.

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^aMayo Clinic. Heart Arrhythmia. Mayo Clinic website. <https://www.mayoclinic.org/diseases-conditions/heart-arrhythmia/symptoms-causes/syc-20350668>. Updated April 30, 2022. Accessed October 12, 2022.

^bJohns Hopkins Medicine. Catheter Ablation. Hopkins website. <https://www.hopkinsmedicine.org/health/treatment-tests-and-therapies/catheter-ablation>. Accessed October 12, 2022.