Indication for Use:
For insufflation of CO₂ into the thoracic cavity to reduce the risk of air embolism.6,7 Including the following:

• Valve Surgery
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• Heart Transplantation
• Insertion of LVAD
• Left ventricular reconstruction
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3. Figure 2 in Svernarud et al., median number of microemboli after discontinuation of cardiopulmonary bypass was 0 with CarbonAid at 8 minutes vs. 20 minutes with manual de-airing techniques in 3 areas of interest (left ventricle, left atrium, and proximal part of ascending aorta taken together shown by TEE).
6. Instructions for Use CarbonAid CO₂ Diffuser.

Learn more at: www.CryoLife.com/CarbonAid
Order at: 888.877.7226

Challenges:
• Preventing air embolism with neurological and myocardial complications
• Increased operative time to de-air
• Open-ended tubing is inadequate due to “high outflow velocities” and “the air turbulence the jet generates.”

Solutions: CarbonAid and CarbonMini CO₂ Diffusers
• Reduces risk of air embolism by more effectively de-airing
• Significantly reduces time for microemboli to disappear

*Compared to open-ended tubing CO₂ delivery in an in vitro model.
Challenge: Open-ended Tubing CO₂ Method with Risk of Air Embolism

Open-ended tubing is inadequate due to “high outflow velocities” and “the air turbulence the jet generates” which causes CO₂ to exit the cavity.¹

Open-ended Tubing Challenges:

• Small open-ended tubing = high velocity and turbulence which causes CO₂ to exit cavity¹
• Risk for air embolism¹
• Risk for infections⁴,⁵

Solutions: CarbonAid and CarbonMini CO₂ Diffusers

CarbonAid and CarbonMini CO₂ Diffuser devices have been designed to:

• Reduce the Risk of Air Embolism¹,*
  ° By replacing air with >99% CO₂ (p<0.001)¹,*

CarbonAid and CarbonMini CO₂ Diffuser devices replaces air with CO₂ which:

• Significantly Reduces Time for Microemboli to Disappear²,³
  ° ~12 minutes (p≤0.01)²

• May Prevent Infections
  ° By creating a >99% CO₂ bacteriostatic atmosphere⁴,⁵

Comparison of De-Airing Methods (p<0.001)¹,*

Open-ended tubing

CarbonAid and CarbonMini

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Key Points

Conclusion: “These data imply that de-airing of a cardiothoracic wound by CO₂ insufflation depends on flow and outflow velocity. To compensate for diffusion with ambient air, the CO₂ flow should be > 5 L/min, and the outflow velocity should be about 0.1 meter/second or less to avoid turbulence in the wound. This is only attainable with a [CarbonAid] gas diffuser.”¹

Median number of microemboli after discontinuation of cardiopulmonary bypass was 0 with CarbonAid at 8 minutes vs. 20 minutes in 3 areas of interest (left ventricle, left atrium, and proximal part of ascending aorta taken together shown by TEE).⁵

"CO₂ insufflation at 5 L/min with an open-ended tube resulted in a contamination rate almost four times that of the control (p=0.01); whereas with the gas-diffuser the contamination rate decreased (p=0.01).”¹

Clinical Outcomes: CarbonAid CO₂ Diffuser Device vs. Open-ended Tubing and Without Insufflation

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NR= Not reported. NA= Not applicable. ¹Based on interpretation of Figure 2 in Svernarud et al., Circulation 2004;109:1127-32. ^Average of two control plates. ** Distal and proximal agar plates.

Mean air content in % at 1/2 the depth of model plotted vs. the calculated outflow velocity (m/s)¹

"The [CarbonAid] gas diffuser provided an almost complete de-airing of the model (<0.2% remaining air) at flows of 5 to 10 L/min. This was a result of a uniform distribution of CO₂ with calculated velocities of about 0.1 meter/second […]"

Conventional open-ended tubes provided a poor and varying de-airing of the wound cavity model (18%-96% remaining air) because of CO₂ jets with calculated velocities between 1.3 and 34 meter/second.”¹

¹The mean air content in % (n=80) at half the depth of the model plotted versus the calculated outflow velocity (m/s) of the 2.5mm tube, the 1/4-in tube, and the gas diffuser at CO₂ flows of 2.5, 5, 7.5, and 10 L/min. The 4 values of the gas diffuser are located close to the origin of coordinates because of low air contents caused by low outflow velocities. The curve represents an exponential regression of the data.”¹

Note: Emphasis was added by CryoLife for some elements of graphed data.
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