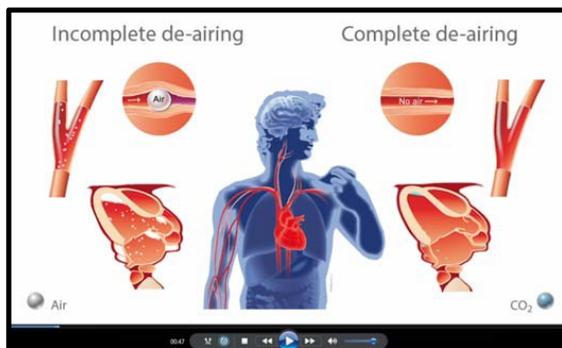


CarbonAid and CarbonMini CO₂ Diffuser device Video Talking points:

1. The CarbonAid and CarbonMini CO₂ Diffuser devices prevent air embolism during open heart surgery: CarbonAid for a full sternotomy opening or CarbonMini for a minimally invasive approach.



2. Air bubbles normally occur during open heart surgery. CarbonAid and CarbonMini provide complete de-airing, thereby preventing air bubbles from developing during open heart surgery. The CO₂ concentration will be close to 100 %.



3. Commonly used de-airing techniques often take 15 – 20 minutes post surgery and in many cases, air bubbles still exist. Utilization of CO₂ properly delivered via the CarbonAid and or CarbonMini CO₂ Diffuser device during the time the heart or large vessels are open, provides complete de-airing, due to the unique properties of CarbonAid, CarbonMini and CO₂.

Properties of CO₂

- 25 times more soluble in blood and tissue than air. CO₂ emboli are therefore much better tolerated than air emboli.
- 50% heavier than air. As a result, if properly delivered, CO₂ easily fills the cavity and lifts up and away the air.

Common de-airing efforts

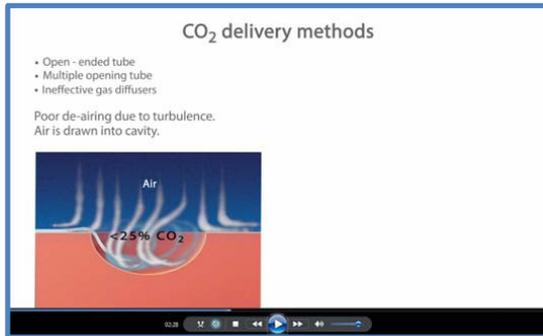
- Venting through needle or syringe
- Shaking and squeezing of the heart
- Trendelenburg position
- Hyperinflation of the lungs

All time consuming but still uncertain de-airing

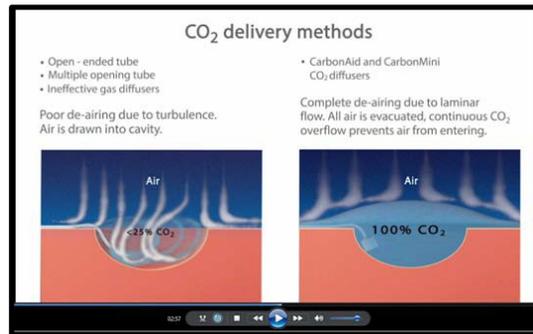
- CO₂ delivery into open thoracic wound cavity

Complete de-airing, if properly delivered

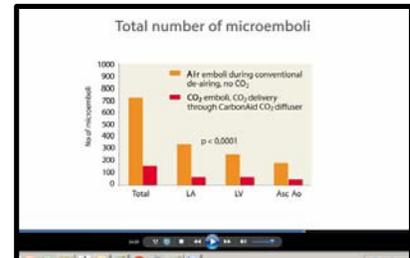
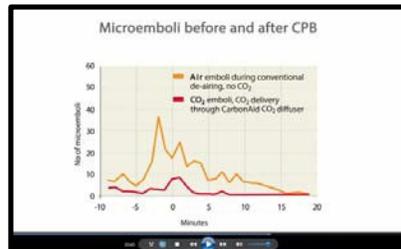
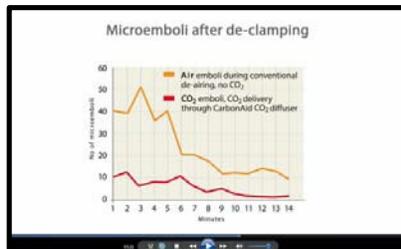
4. Commonly used “home-made” CO₂ delivery devices, such as open-ended tubing, deliver CO₂ with a high velocity, non-diffused manner, causing turbulence resulting in an air concentration above 75% to flow back into the surgical cavity.



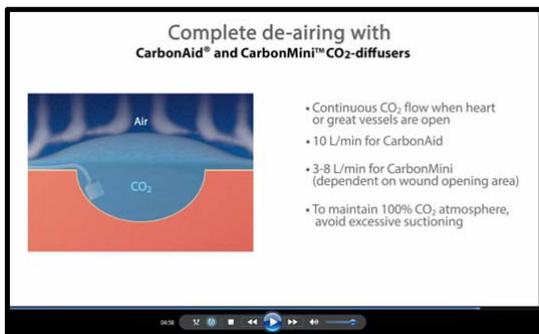
5. The CarbonAid and or CarbonMini Diffuser device deliver CO₂ in an efficient manner keeping close to 100% CO₂ barrier in the cavity preventing air to enter.



6. Rigorous research and field testing have shown that the use of CarbonAid or CarbonMini dramatically reduces micro emboli immediately following de-clamping and when weaning off Cardiopulmonary Bypass. The micro emboli reduction is statistically significant in the Left Atrium, Left Ventricle and the Ascending Aorta. The reduction of micro emboli is a result of the CO₂ atmosphere built up by CarbonAid and CarbonMini. CO₂ bubbles dissolves 25 times more quickly than air bubbles and therefore the total number of CO₂ bubbles will never be as high as the number of air bubbles and will be dissolved before reaching the brain.



7. Quick and complete de-airing can be achieved by utilizing continuous CO₂ flow: 10L/min with CarbonAid or 3 to 8 L/min with CarbonMini and avoiding excessive suctioning.



8. The key to the efficiency of CarbonAid and CarbonMini is that they provide a high CO₂ laminar flow in a diffused low velocity manner.

