Massive Cerebral Air Embolus after institution of Cardiopulmonary Bypass in a Patient with Sickle Cell Trait treated with Emergent Hyperbaric Oxygen Therapy

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Introduction:

- Cerebral air embolism (CAE) from cardiopulmonary bypass (CPB) is a potentially devastating event that can lead to significant morbidity and mortality
- No specific algorithm derived from literature consensus exists, however, swift identification of the problem followed by institution of neuroprotective strategies are paramount (1)
- Utilization of early hyperbaric oxygen therapy (HBOT) for the treatment of CAE has been utilized to reduce risk of mortality and neurologic sequelae from the event (2)

Case Presentation:

- 65 year-old African American male with severe multi-vessel coronary artery disease, with history of sickle cell trait underwent scheduled three vessel CABG
- Preoperative transthoracic echocardiogram showed an ejection fraction of 52-59%, with no valvulopathy, and bilateral carotid ultrasound was normal
- Due to the patient's history of sickle cell trait, the surgeon's plan was to perform the CABG without cooling the patient
- Upon initiation of cardiopulmonary bypass (CPB), small amounts of air were noted in the left atrium and left ventricle on transesophageal echocardiogram
- After halting the initiation of cardiopulmonary bypass, the surgeon noted air coming out of the arterial cannula in the ascending aorta
- The cardiopulmonary bypass circuit, aorta, and heart were expeditiously cleared of air

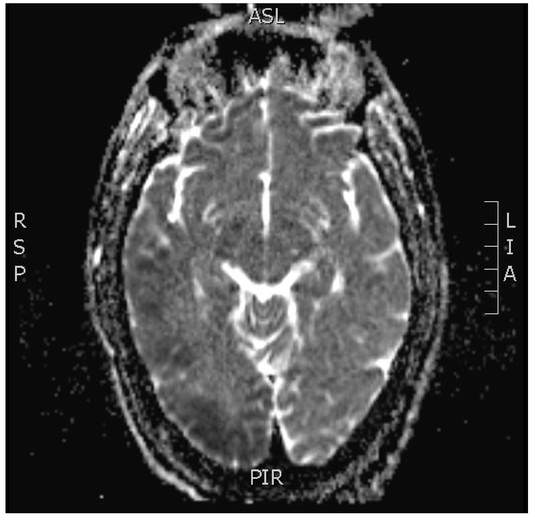

Figure 1: MRI depicting right cerebral hemisphere stroke

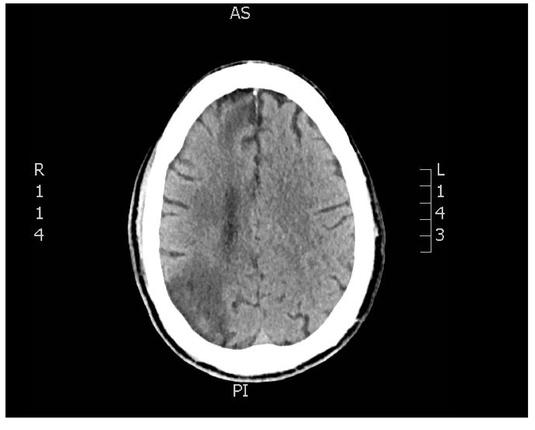

Figure 2: CT Scan depicting right sided stroke

Perioperative Management of Cerebral Air Embolism in Cardiothoracic Surgery:

- HBOT is a known, primary treatment for arterial gas embolism, but there are limited case reports regarding its emergent utilization in the treatment of CAE from CPB
- The timing of this treatment is often delayed as time is spent performing neurological tests and radiological exams on the patient prior to initiation of HBOT. Furthermore, many facilities do not have the capability of providing this therapy for their patients
- This specific patient presented a unique challenge to the operative team after the discovery of the CAE as many case reports illustrate the use of retrograde cerebral perfusion (RCP) and therapeutic cooling, however in patients with sickle cell trait there is controversy regarding how to perform CPB procedures out of concern of precipitating a sickling crisis, which itself could lead to neurologic sequela

Patient Management and Outcome:

- In discussion with the surgeon, a decision was made to expeditiously proceed with the case without cooling or RCP due to the presence of sickle cell trait; the remainder of the case proceeded uneventfully
- Postoperatively, the patient had delayed emergence and due to the high likelihood of CAE, the patient underwent emergent HBOT
- Additional HBOT treatments continued over the following two weeks
- Initial CT scan of the patient was negative, however an MRI on postoperative day 2 revealed a right cerebral hemispheric stroke in discontinuous territories
- The patient was discharged to a skilled nursing facility with some neurologic deficits

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