TITLE: Unusual Immediate Pulmonary Complications of Cardiopulmonary Bypass

AUTHOR(S): Govind R Rajan

AFFILIATION(S): Saint Louis University, St. Louis, MO 63110

ABSTRACT BODY:

Pulmonary complications following cardiopulmonary bypass (CPB) are frequently caused by problems of diffusion, high airway pressures due to non-compliant lung parenchyma, pulmonary hypertension due to both elevated pulmonary vascular resistance and elevated left atrial pressures are well documented. But, total inability to ventilate as one prepares to come off CPB is not common. We share our experience in two patients where we were not able to ventilate the lungs at all as we prepared come off CPB and delineate the management.

1: An elderly man with DeBakey type 1 dissection & aortic regurgitation underwent replacement of aortic valve and ascending aorta under deep hypothermic circulatory arrest (38 min) and CPB (210mins). High peek pressures were encountered when we attempted to ventilate as we prepared to come off CPB. Quickly became hyper-distended and prolapsed through the sternotomy (Fig 1). Fiberoptic bronchoscope (FOB) showed normal tracheobronchial tree. Bronchospasm was suspected. Bronchodilators and steroids were administered without effect. Finally epinephrine infusion was started but with no avail. Since, the patient was still on CPB, we hypothesized that absent pulmonary circulation could have been the reason why epinephrine infusion was not effective. Patient was weaned partially from CPB to re-established pulmonary perfusion and epinephrine was continued. After 20min both the lungs started to deflate. Ventilation was re-established and the patient was eventually successfully weaned off CPB.

2: A 62yo woman (BMI 36kg/m²) with coronary occlusive disease and ischemic mitral regurgitation underwent coronary revascularization and mitral annuloplasty with CPB for 186mins. Attempts to ventilate lungs as we prepared to come off CPB were impossible. FOB showed edematous mucosa with complete collapse and herniation of the posterior membranous portion of the trachea just above the carina totally obliterating tracheal lumen Fig 2. Incremental Positive end-expiratory pressure (PEEP) to applied (15cms of H₂O) opened up the tracheal lumen. Now, ventilation was possible. Plateau pressure was only 25cms of H₂O. Patient was successfully weaned off CPB and transferred to ICU with a PEEP of 10cms of H₂O.

Discussion: Difficulty to ventilate lungs after prolonged CPB is frequently caused by thick secretions, bleeding or tube migration. Adequate suction, tube positioning and bronchodilators are usually adequate. When it is impossible to ventilate after these measures, FOB is mandatory. CPB triggers several humoral cascades: inflammation, coagulation & fibrinolysis (1). Blood transfusion, general anesthesia and surgical trauma add to it. Several of these mediators can induce and worsen bronchospasm particularly in people with reactive airway disease (2). It is interesting to note bronchospasm was relieved only after partial pulmonary circulation was established.

Severe mucosal edema obliterating tracheal lumen during CPB is not common. We theorize that prolonged cardiac surgery with CPB in a short obese patient with difficult exposure could have lead to mediastinal and tracheal edema. FOB confirmed the diagnosis and high PEEP ameliorated the problem.

References:

