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COMPARING TWO OXYGNEATORS FOR ARTERIAL OXYGEN CONCENTRATION AND DELIVERY OF OXYGEN DURING CARDIOPULMONARY BYPASS

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The purpose of this clinical analysis was to compare the efficiency of two adult oxygenators, the Affinity Fusion, (Medtronic, Minneapolis MN) and the Sorin Inspire 6F (Sorin Group USA, Arvada, CO) for the arterial oxygen concentration and delivery of oxygen during cardiopulmonary bypass (CPB). This research was conducted at two separate facilities, St. Vincent's Medical Center in Bridgeport, CT, and Dartmouth-Hitchcock Medical Center in Lebanon, NH, with two types and models of heart-lung machines (HLM). The Affinity Fusion oxygenator was used on the Terumo System I HLM (Terumo Medical Corporation, Somerset, NJ) equipped with a roller head; the Inspire 6F was used with a centrifugal CP5 pump (Sorin) at the respective facilities.

To meet the criteria for inclusion in the study, all patients were maintained with a hemoglobin >7 during CPB and were non-smokers.

Each oxygenator was evaluated for delivery of oxygen (DO_2), and arterial oxygen content (CaO_2), to evaluate patient oxygenation during CPB. The patient's lungs ventilated by the anesthesia machine were the control group, with CaO_2 being calculated from an arterial blood gas drawn after intubation. During CPB, arterial and venous blood gas values were measured every thirty minutes to determine CaO_2, venous oxygen content (CvO_2), partial pressure of oxygen in arterial blood (PaO_2), partial pressure of oxygen in venous blood (PvO_2), arterial oxygen saturation (SaO_2), and venous oxygen saturation (SvO_2).

A small sample size of patients was gathered for each oxygenator (n_1=8; n_2=8). Data was entered into Microsoft Excel to organize and calculate DO_2 using the Oxygen Content Equation [(Hb*1.39*SaO_2) + (PaO_2*0.003)] for each patient and case that met criteria. To compare DO_2 and CaO_2 to the patient's lungs during CPB as well as oxygen consumption (VO_2), the oxygen extraction ratio (O_2ER) was determined (VO_2/DO_2).

The results were inconclusive due to the many variables that were not recorded or calculated in the study i.e. individual patient hemoglobin, fraction of inspired oxygen (FiO2), body surface area (BSA), patient age, patient gender, active cooling, drifting, and normothermic temperature procedures. Calculating these variables from the data will guide future research and allow a comparison of oxygenator performance. If a clear difference cannot be demonstrated, then it may be solely the responsibility of the perfusionist to achieve adequate oxygen delivery during CPB.