Title: COMPARATIVE STUDY OF CHANGES IN TOTAL BODY OXYGEN CONSUMPTION WITH SUFENTANIL AND HALOTHANE ANESTHESIA

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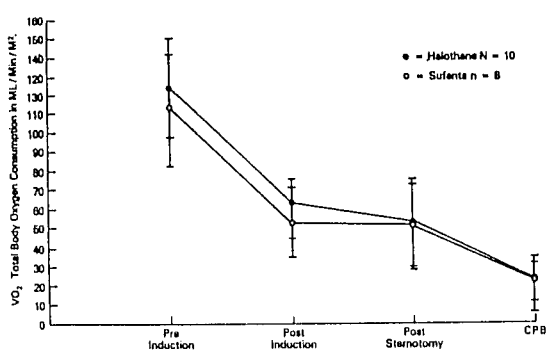
Introduction. The administration of general anesthesia is known to induce changes in total body oxygen consumption (VO_2). Present data in the literature document the anesthetic dose and temperature dependent reduction in VO_2 (1,2,4). The purpose of the study was to compare the VO_2 changes with two different but popular anesthetic agents.

Methods. A total of eighteen patients, ten females and eight males, undergoing various types of cardiac surgical procedures were studied. All patients were premedicated with Lorazepam, morphine and Scopalamine combination, in the usual manner. All monitoring lines, including a radial arterial catheter and the pulmonary artery catheter, were introduced under local anesthesia. Base line hemodynamic data and the blood samples for the measurement of oxygen tension and oxygen saturation were drawn. Oxygen saturation was measured using the radiometer OSM-2 co-oximeter. Anesthesia was induced with sodium thiopental 1-2 mgs/kg following a test dose of 25-50 mgs. Once the patients were unresponsive to verbal commands, pancuronium bromide in increments of 1-2 mgs (total of 0.15 mgs/kg) and sufentanil in increments of 25-50 micrograms (total of 10 micrograms/kg) were given, while ventilation was controlled manually with 100% oxygen by face mask (sufentanil group). A second group (halothane group) were induced similarly but ventilated with 1-2% halothane for 8-10 minutes before laryngoscopy and intubation and maintained with 1% halothane in oxygen. Hemodynamic measurements and blood gas measurements were obtained 5 minutes after intubation, sternotomy, and cardiopulmonary bypass (CPB) with cooling to 25°C.

Results. The patients in both groups were similar in terms of age, sex, and operative procedures. As shown in the graph, the resting VO_2 in our patients in both groups were similar and comparable to earlier reports (1, 4).



After anesthetic induction and achievement of steady state as indicated by hemodynamic stability after endotracheal intubation, the VO_2 was reduced by 51% to 63 ml/min/m^2 body surface area in the halothane group, and by 47% to 54 ml/min/m^2 in the sufentanil group. There was a further reduction in the halothane group to 42% (53 ml/m^2), whereas the sufentanil group was held at the same level of 52 ml/m^2 by the time sternotomy was completed and the sternum was retracted. However, the institution of CPB and induction of total body hypothermia to an esophageal temperature of 25°C was noted to be associated with a further reduction of VO_2 to 21.5 ml/m^2 in the halothane group and 21.8 ml/m^2 in the sufentanil group, thus showing the additive effect of hypothermia. The statistical analysis (students T-test) of the VO_2 values in both groups showed no significant difference during any of the periods for a P value of <0.05. Hemodynamic parameters and arterial blood gases were monitored and maintained at pre-induction levels. Also mixed venous hemoglobin saturation was always noted higher than normal (75%) and no base deficit was noted during anesthesia indicating the adequacy of oxygen delivery.

Discussion. Total body oxygen consumption calculation based on the measured arterial and venous oxygen contents (instead of mass spectrometric analysis) were first reported by Hickey et al in 1983 and Gregoretti et al in 1987. Even though there are no correlative studies comparing the two techniques, the data in both humans (3) and animals (4) show close agreement of the values. This is the first time that VO_2 has been compared in patients using two different but commonly used anesthetic agents under identical pre- and intraoperative conditions. Based on our data we conclude that: (1) the state of general anesthesia is associated with a 50% reduction in VO_2; (2) induction of hypothermia causes a further reduction in the VO_2 within the clinically accepted Q10 ratio of 2; (3) there is no statistically significant difference in VO_2 in these two anesthetic techniques in spite of the inhalation agent being a more potent metabolic and myocardial depressant.

References.

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