TITLE: COMPARISON OF METHODS OF PREOXYGENATION AND DENITROGENATION

AUTHORS: E.G. Chekan, B.A., S. Weber, M.D., L.J. Wickas, M.D.
AFFILIATION: Division of Anesthesiology, Allegheny General Hosp., Pittsburgh, PA 15212

Denitrogenation of the lungs with 100% O2 increases the safe apnea time before irreversible hypoxic injury occurs. Clinical circumstances sometimes preclude mask application, e.g. facial or nasal trauma, or mask phobia. We determined whether breathing through a plastic respiratory therapy mouthpiece, with nasal occlusion, was comparable to use of an anesthesia airway mask for preoxygenation and denitrogenation. The time required for maximum denitrogenation was measured using a mass spectrometer for end-tidal nitrogen (eTN2) determination.

Ten healthy volunteers were studied (with informed consent and approval by the Institutional Review Board, Allegheny General Hosp., Pgh., PA). Each subject underwent four trials: 1) 4 vital capacity breaths with 100% O2 at 10 L flow; 2) 4 vital capacity breaths with 100% O2 through a mouthpiece (Marquest Med. Products, Englewood, CO.) held between pursed lips with nose occluded; 3) 5 min of normal breathing with 100% O2 through a mask; 4) 5 min of normal breathing with 100% O2 through the mouthpiece. Arterial O2 saturation was monitored by pulse oximeter, and inspired/expired gases were analyzed by mass spectrometer (SARA, PPG Biomedical Systems, Lenexa, KS). Data collected included: change in O2 sat. in each trial group after breathing O2; time to lowest eTN2 in the normal breathing groups (trials 3 and 4); lowest achieved eTN2 in each trial group. Statistical analysis included ANOVA with Bonferroni correction, and student's paired t-test. Statistical significance was accepted at $p<0.05$.

TRIAL	eTN2 (lowest)	Time (min) to eTN2 (lowest)	
1	40.4 (9.3)	-	All data
2	36.0 (14.1)	-	presented as
3	4.9 (2.5)	3.3 (0.7)	MEAN (S.D)
4	6.6 (4.8)	3.3 (1.0)	

The eTN2 values for the four trial groups are significantly different. Trials 1 and 2 show no difference, as do trials 3 and 4, but 1 or 2 are different from 3 or 4. There is no difference in the time to lowest eTN2 in trials 3 and 4. All subjects had initial O2 sat. between 96% and 100%, and all final sats. upon completion of each trial were 100%.

Measurement of O2 sat. is inadequate as an indication of optimal preoxygenation. Gambee et. al. showed that normal breathing of 100% O2 at high flow for 3 min provided better protection against hypoxia than the 4 deep breath method. Using a mass spectrometer for gas analysis, we found that maximum denitrogenation required a mean of 3.3 min. We have shown that 3 min may not always be adequately long for full denitrogenation with normal breathing. We also found that a mouthpiece (with nasal occlusion) is equivalent to an airway mask for preoxygenation. This applies to both the four breath technique and the 3-5 min normal breathing technique.

REFERENCE: ANESTH ANALG 66:468-470, 1987

A443

TITLE: **IS WHOLE BODY OXYGEN UPTAKE A GOOD INDICATOR OF LIVER ALLOGRAFT FUNCTION ?**

AUTHORS: P. ALBALADEJO M.D., E. JUGAN M.D., A. DESCORPS-DECLERE M.D., P. JAYAIS M.D., C. ECOFFEY M.D.
AFFILIATION: Anes. Dept., Université Paris-Sud, Hôpital P.Brousse, 94804-Villejuif, FRANCE

Variations of whole body oxygen uptake (VO2) during orthotopic liver transplantation (OLT) are well described. The return of calculated VO2 to preremoval levels is a possible indicator of immediate function in a grafted liver (1) and the lack of increasing VO2 after reperfusion would be in favor of either irreversible non function or poor graft function (2,3). However, in these studies, variations of VO2 were related to patient clinical evolution or survival and not to parameters of liver function . The present study was designed to assess the evolution of respiratory measured VO2 and indicators of hepatic function.

Eighteen patients aged 43 ±11 yr (mean ± SD) weighing 71.2 ± 18.5 kg and undergoing OLT were studied after approval by our Ethics committee. All were anesthetized with thiopental (5mg.kg-1) followed by midazolam (50 µg.kg-1.h-1), fentanyl (10-12 µg.kg-1.h-1). Pancuronium was given for muscle relaxation. They were mechanically ventilated with a 40% oxygen/air mixture. During the anhepatic stage thirteen patients were connected to a veno-venous bypass. We used a metabolic monitor (DELTATRAC, Datex Corp. Finland) to measure VO2. Twelve values of VO2 were recorded: at incision (1); before (2) and during (3) the trial of clamping; before (4) and after (5) connecting the veno-venous bypass; at the beginning (6) and end (7) of the anhepatic stage; unclamping the vena cava (8) ; unclamping the portal vein (9); 10 min (10) and 1 h (11) after unclamping; at closure (12). Indicators of hepatic function were recorded at 1, 3, 7 ,14 and 21 days postoperatively; i.e. clotting factors (FII, FV) and transaminases. The weight of the grafted liver and the duration of ischemia were noted. ΔVO2 was determined by the equation: ΔVO2=VO2 postanhepatic minus VO2 anhepatic. Results are expressed as mean ± SD. Statistical analysis was performed using repeated measures ANOVA followed by appropriate post-hoc tests ($p < 0.05$ was considered significant).

As described previously, VO2 decreased during either trial of clamping or anhepatic stage (figure) and increased after reperfusion. However no correlation was found between ΔVO2 and FII, FV, transaminases, weight of grafted liver or duration of ischemia (r ranged from 0.018 to 0.497). In addition, one patient had an early graft dysfunction with a major increase of VO2 after reperfusion.

In conclusion, continuous measurements of VO2 cannot predict successfully the immediate liver allograft function following OLT.

References: 1-Transplant.Proc., 19, 56-58, 1987
2-Transplant.Proc., 21, 2279-2281, 1989
3-Anesthesiology 69, A174, 1988