

Title : HEMODYNAMICS AND LV FUNCTION RESPONSE TO PROPOFOL INDUCTION

Authors : M. Ben Ammeur, M.D., P. Coriat, M.D., D. Bruere, M.D., J.F. Baron, M.D., M. Bertrand, M.D., P. Viars, M.D.

Affiliation : Département d'Anesthésie-Réanimation. Groupe Hospitalier Pitié-Salpêtrière.
Université Paris VI, 83, boulevard de l'Hôpital. 75651 Paris Cédex 13 - FRANCE

INTRODUCTION. Propofol (PROP), reformulated in an aqueous emulsion, has an ideal pharmacologic profile for use in short duration procedures. Although, all previous studies on the cardiovascular effects of anesthesia induction with aqueous emulsion of PROP noted a significant decrease in mean arterial pressure (MAP) (1-3), they reported very conflicting interpretations of the potential myocardial depressant effect of such an agent (1-3). To clarify this point, we performed a study to determine hemodynamic and left ventricular (LV) function response to induction with PROP as the sole agent, in patients undergoing vascular surgery. The simultaneous measurements of both hemodynamic parameters and LV function, the latter determined by 2-D transesophageal echocardiography (TEE), allows one to precisely define the fluctuations in the determinants of stroke volume.

METHODS.

Patients. Ten patients (mean age : 67) undergoing general anesthesia for peripheral vascular surgery (n = 6) or abdominal aortic surgery (n = 4) were included in this study which was approved by the subcommittee on Human research. We excluded patients with history or evidence of congestive heart failure, disabling angina and those with preoperative systolic blood pressure (>170 mmHg). Five among the 10 patients studied had a preoperative dipyridamole thallium gammatography and gated radionuclide angiography. Mean EF was 58 %. The 5 thallium scans were abnormal revealing a persistent thallium defect in 2 cases, a redistribution in 3 cases. Six among the 10 patients had a history of hypertension controlled with either nifedipine or clonidine. Preoperative antihypertensive medications were given 3 hours before surgery.

Anesthetic protocol. After IM premedication with morphine 5 mgs and scopolamine 0.5 mg radial artery and thermodilution Swan-Ganz catheters were established. A modified lead V5 ECG was monitored. Thirty minutes later, under topical anesthesia of the pharynx with lidocaine gel, a diasonics 3.5 MHz TEE probe was introduced into the esophagus. While the patients were breathing 100 % oxygen by mask PROP was injected intravenously over 30 sec. at a dose of 2 mg.Kg. Patients who after this amount had a positive lid reflex received an extra 0.5 mg.Kg. After induction ventilation, was assisted by mask with 100 % O₂. Hemodynamic and echocardiographic measurements were performed 5 minutes after the TEE probe was in place with the patients awake and in a quiet state (awake) and repeated 1 min, 2 min, 3 min and 5 min after PROP injection was begun.

Echocardiographic measurements. The ultrasonic transducer was positioned behind the left ventricle (LV) to afford a short axis view of the LV at the level of the papillary muscles. Throughout the study, adjustments were made to maintain the most spherical LV shape. In all patients echocardiogra-

phy images were continuously recorded from before induction until the fifth minute after propofol injection. Retrospectively, echocardiograms were analyzed by an independent observer at the following intervals : before induction (awake), and 1, 2, 3 and 5 minutes after PROP injection. At each set, the recorded images of four successive beats were quantitatively analyzed by a light pen digitizing system (Diasonics) to provide a mean value for cross sectional area at end-diastole (EDa) and end-systole (ESa). Area ejection fraction (EFa) was calculated as (EDa-ESa)/EDa x 100. Data are expressed as mean \pm SEM, and a two way analysis of variance was performed.

RESULTS. A significant decrease in MAP was found as of the first minute following PROP injection. MAP decrease was maximal at the second minute and was significantly lower than the value noted at 1 minute. Heart rate remained stable. The decrease in ESa, PCWP and cardiac index are significant from the first minute following PROP injection.

DISCUSSION. Our study confirms that propofol, in its new oil in water emulsion, is responsible for a marked drop in MAP, associated with a decrease in systemic vascular resistance and cardiac index. When considering LV systolic emptying, the vasodilator effects of propofol, when given as the sole anesthetic agent for induction, overcompensate for an eventual myocardial depression. Thus, the decrease in CI does not result from an impaired function but probably from a decreased venous return. We conclude that the decrease in both afterload and venous return due to PROP are the major determinants of its hemodynamics effects.

Table : AWAKE PROP OFOL INJECTION

	CONTROL	+ 1 min	+ 2 min	+ 3 min	+ 5 min
MAP	103	82 *	75 *	77 *	80 *
mmHg	+2	+4	+4	+4	+4
HR	77	76	74	77	73
b/min	+5	+4	+3	+3	+4
PCWP	9.1	6.5	6.5	6.8	6.9
mmHg	+1.1	+1.3	+1.3	+1.1	+1.5
CI	3.8	3.3 *	3.3 *	3.4 *	3.3 *
l/min/m ²	+0.2	+0.2	+0.2	+0.2	+0.2
SVR	1253	1148	1147	1045 *	1107 *
dyn/s/cm ⁻⁵	+106	+98	+100	+82	+72 *
EDa	15.2	14.6	13.6	14.9	14.5
cm2	+1.4	+1.4	+1.3	+1.4	+1.3
ESa	7.3	6.6 *	5.7 *	6.2 *	6.1 *
cm2	+1.1	+1.0	+1.0	+4	+4
EFa	53	57	58	60	60
%	+5	+4	+5	+4	+4

• p < 0.05 ; * p < 0.01 vs control

REFERENCES

1. GROUNDS RM : ANAESTHESIA. 40 : 735-740, 1985
2. FAHMY NR : ANESTHESIOLOGY 63 : A363, 1985
3. VAN AKEN H : ANESTHESIOLOGY 68 : 157-163, 1988