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 Title : GLOBAL VENTRICULAR FUNCTION AND INTUBATION: RADIONUCLEAR PROFILES
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INTRODUCTION. Recent studies have demonstrated that global left ventricular (LV) performance can be assessed non-invasively on a beat-to-beat basis with radionuclides (radioactive tracers).¹ Externally detected radioactive count rates reflect proportional changes in LV volume. After labeling of the blood pool with technetium 99m (Tc-99m), the computerized nuclear probe (Bios Inc.) can generate high resolution ventricular volume curves for several hours (Figure). This allows calculation of ejection fraction (EF), computed as the ratio of EDC-ESC/EDC (EDC=end diastolic counts, ESC=end systolic counts). Data obtained from the nuclear probe correlates well with those derived from contrast angiography and conventional radionuclear techniques. We used the nuclear probe to help evaluate LV function in response to laryngoscopy and endotracheal intubation in patients with ischemic heart disease.

METHODS. Fifteen (15) patients (mean age 55±2 [SEM]) undergoing elective coronary artery bypass surgery were evaluated. Written informed consent was obtained from each patient in accordance with a Human Investigation Committee approved protocol. Propranolol was continued until six hours prior to surgery (mean dose = 207±38mg/24 hrs). On the day prior to surgery, following in vivo labeling of red blood cells with Tc-99m, EF was obtained with the nuclear probe. On the day of surgery, morphine sulfate (0.15mg/kg) and scopolamine (0.4mg) were administered intramuscularly 90 minutes prior to arrival in the operating room where vascular catheterization (radial artery, pulmonary artery and venous) was performed. In vivo labeling of red blood cells, was repeated with Tc-99m and the nuclear probe was positioned over the precordium. Radionuclear and hemodynamic measurements were made during: steady state (P PREMED); following induction with diazepam 0.3mg/kg i.v., N₂O/O₂ [3/2], enflurane [q.s.] and succinylcholine infusion (Pre-Intubation [PRE INT]); laryngoscopy and oral tracheal intubation (Intubation [INTUBAT.]); and then for 10 min following intubation (RECOVERY). Each set of measurements made at end exhalation include: EF, heart rate (HR), mean arterial blood pressure (BP), mean right atrial pressure (RAP), mean pulmonary artery pressure (PAP), mean pulmonary capillary wedge pressure (PCWP) and thermidilution cardiac output. Derived data included: cardiac index (CI) and systemic vascular resistance (SVR).

RESULTS. (Table) Ejection fraction and hemodynamic performance was maintained during anesthetic induction. Laryngoscopy and oral endotracheal intubation (duration = 13.2 ± 2 sec.) decreased EF from 49% to 32% (p < 0.001). This was accompanied by 31% and 37% increase in HR and BP respectively. For 11/15 patients the EF returned to pre-intubation values (EF=51%) within 3.1±0.4 min. In this

group EF continued to increase to a maximum EF=56% at 5.3 ± 0.7 min. In contrast, in 4/15 patients following intubation, the EF (43%) remained depressed (p < 0.002).

DISCUSSION. Exercise induced stress in patients with symptomatic coronary artery disease results in a decline in left ventricular EF. Similarly, the stress of laryngoscopy and intubation produces a rapid decline in global LV function (EF) within seconds, often exceeding that seen following exercise. In 73% of the patients this decrease in EF was reversed without any evidence of hemodynamic dysfunction. However, in 27% of the patients EF did not return to pre-intubation values and hemodynamic performance remained impaired. Our data indicates that the magnitude of left ventricular dysfunction during laryngoscopy and intubation may not be revealed by conventional hemodynamic monitoring. By allowing beat-to-beat evaluation of LV performance, the nuclear probe may have important clinical applications in studying physiologic changes during events associated with rapid alterations in cardiac performance.

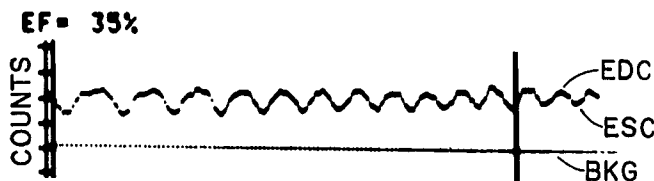
Reference:

1. Berger H et al: Beat to beat assessment of left ventricular performance using a portable computerized nuclear probe: Validation, analysis of variability, and initial study of ectopy. J Nucl Med 21(6), 1980.

RADIONUCLEAR AND HEMODYNAMIC DATA

	(n = 15)					
	EF (%)	HR (BEM)	<u>BP</u> (mmHg)	<u>PCWP</u> (mmHg)	CI (L/m/M ²)	SVR (RU)
PRE-OP	58±2	58±2	96±2	-	-	-
P PREMED	51±3	56±2	95±4	16±2	3.0±0.2	31 ± 3
PRE-INT.	49±3	57±3	83±3	17±2	2.7±0.2	29 ± 4
INTUBAT.	32±3*	75±2†	114±5*	21±3	2.8±0.2	38 ± 3‡
RECOVERY	51±3	64±4	82±4	13±3	2.9±1.0	28 ± 2

*p < 0.001 compared to PRE-INT.
 †p < 0.002 compared to PRE-INT.
 ‡p < 0.005 compared to PRE-INT.



Typical ventricular volume curve obtained with the nuclear probe during laryngoscopy and intubation. In this 12.5 sec sweep, ejection fraction (EF) decreased from 42% to 26% (mean EF=35%). EDC = end diastolic counts; ESC = end systolic counts; BKG = background.