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TITLE: PULMONARY ARTERY CATHTER PACING LEADS: AN IN VIVO COMPARISON

AUTHORS: CHRISTINA T. MORA, MD, LEO I. STEMP, MD
AFFILATION: EMORY UNIVERSITY SCHOOL OF MEDICINE, DEPT. OF ANESTHESIOLOGY, ATLANTA, GA.

INTRODUCTION: Some patients requiring a pulmonary artery catheter (PAC) may require emergency cardiac pacing. A PAC with atrial and ventricular pacing electrodes can "rescue" a patient from heart block but foresight and expense are necessary. Several PAC's include a right ventricle (RV) port at 19 cm that accepts a pacing probe. Emergency pacing may be established quickly and reliably using the PAC pacing lead system.[1,2] This study compared ease of use, reliability, and pacing variables of two types of pacing leads.

METHODS: Institutional approval was obtained for study of 36 consenting patients undergoing cardiac surgery. Prior to anesthesia, an oximetry pace-port PAC (Abbott Lab) was placed while monitoring both PA and RV lumen pressures. A study pacing lead (Group A, Abbott, n=10; Group B, Baxter, n=26) was inserted and tested prior to and immediately following cardiopulmonary bypass and 24 h later. Variables assessed included: time to lead placement, arrhythmia generation, pacing lead length in RV, and pacing electrode current, voltage and resistance. Statistical comparisons were made using the Student's t-test.

RESULTS: There were no significant demographic differences between the 2 groups of patients (table). Since the pacing system consisted of both the PAC and study pacing lead, pacing failures that occurred may have been attributable to the PAC rather than the pacing lead. In the combined groups, 10/80 attempts at pacing were unsuccessful because of failure to correctly position the 19 cm pacing port in the RV. In Group A there were no (0/23) pacing lead failures; in Group B, 2/45 pacing attempts were unsuccessful, despite apparent correct pacing lead placement (p=ns). There was no significant difference in the time required to initiate pacing (266 and 231 sec in Group A and B respectively, p=ns). The pacing lead extended 8.4 cm into the RV in Group A and 4.0 cm in Group B ($p<0.01$). The measured pacing variables are listed in the table. All variables were clinically acceptable despite statistically significant differences. There were no significant arrthythmias or complications in either group.

DISCUSSION: Both pacing leads effectively established pacing in this investigation. While there were statistically significant differences in the measured pacing variables, these differences are not clinically important. All currently available PAC's with pacing ports have the RV lumen at 19 cm. Proper RV port positioning was the major limiting factor in establishing pacing. Changing the pace-port position from 19 to 17 cm may facilitate correct RV placement and improve the effectiveness of this type of emergency pacing system.

TABLE*

Demographic Variables	Group A	Group B
age (yrs)	63±9	64±12
weight (kgs)	75±13	79±24
height (cm)	68±4	68±4
Pacing Variables		
output (V)	2.1±0.5	2.1±0.7
current (mA)	5.6±1.5	4.5±2.1▲
resistance (Ohm)	381±105	463±22▲

*-all values mean ±SD, ▲$p<0.01$ vs Group A

REFERENCES
1. J Cardiothorac Anesth 2:303-308, 1988.
2. J Cardiothorac Anesth 3:154-162, 1989.

A427

TITLE: PULMONARY CAPILLARY PRESSURE MEASURED WITH A DOUBLE PA PORT CATHETER IN SURGICAL PATIENTS

AUTHORS: Y. Yamada,M.D., M. Suzukawa,M.D., K. Suzuki,M.D., M. Chinzei, M.D., K. Numata.M.D.
AFFILIATION:Dept. of Anesthesia, Univ. of Tokyo, Tokyo 113, Japan

Measurement of pulmonary capillary pressure (Pc) is superior to simple measurement of pulmonary wedge pressure(PCWP) in patients with lung injury, because Pc, not pulmonary venous pressure, primarily determines the rate of edema formation. Pc has been estimated at the bedside by mathematical analysis of the pressure decay curve following pulmonary artery(PA) occlusion with a Swan-Ganz catheter.(1) However, ambiguous determination of the instant of occlusion in pulsatile PA pressure(Ppa) introduces a significant error in the analysis of this curve. Since this methodological inaccuracy prevents a wide clinical use of Pc, we developed a double PA port catheter technique for the measurement of more reliable Pc and obtained normal control values of pulmonary circulation in surgical patients.

In 7 patients for major abdominal or cardiac surgery, a special PA catheter with the second PA port 1cm proximal to the balloon was inserted via the right internal jugular vein (with informed consent and approval by ethical committee, Univ. of Tokyo, Tokyo, Japan). The two PA ports were connected to identical pressure measuring systems, and adequate frequency responses were ascertained by Gardner's pop off technique. When hemodynamics of the patient became stable under general anesthesia, at least 3 PA occlusion measurements during 10 s of apnea were performed and Ppa from two ports were acquired in a computer with 12 bit A/D converter. A single exponential equation was fitted to the segment of PA pressure tracing starting at 0.3 s after the instant of occlusion. Pc was determined as the value of the exponential fit extrapolated to time 0 (Fig.).

The instant of occlusion could be precisely determined as the time when the two PA traces sharply diverged(Fig.). In 6 out of 7 patients, PA occlusion occurred consistently in the early systolic phase regardless of the timing of balloon inflation. Mean Ppa, Pc and PCWP were 16.6±2(SE), 11.8±2 and 7.6±1 torr. Time constant of the slow decline phase was 0.76±0.08 s and the ratio of venous to total resistance was 0.46 ± 0.02. We conclude that this technique consistently provides accurate measurements of Pc and can be very useful for clinical management of pulmonary edema.

Reference. 1.Anesthesiology 66:614-620,1987