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TITLE : EXPERIENCE WITH THE PACING PULMONARY ARTERY CATHETER

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INTRODUCTION: The possibility of a need for temporary pacing exists in patients with bifascicular block plus first degree heart block during major non-cardiac surgery associated with extensive blood volume changes. Pacing is required in those post operative cardiac surgical patients who have resultant blocks and arrhythmias. Patients with acute myocardial infarctions and heart block or with bradycardia secondary to drug toxicity occasionally appear for emergency surgery. These patients also require temporary pacing. In certain patients it is desirable also to have knowledge of the wedge pressure and the cardiac output while pacing. By using the multipurpose Swan-Ganz catheter, it is possible to generate central venous pressure, pulmonary artery pressure, pulmonary capillary wedge pressure, and cardiac output while simultaneously pacing. In order to critically evaluate this catheter clinically, the following observations were made.

1. Time, number of attempts, and arrhythmias involved in achieving the wedge position from the 20 cm position without fluoroscopy.
2. Pacing capabilities and ventricular pacing thresholds in milliamps.

METHODS: This study was passed by the Clinical Trials Committee. The study group was composed of 30 patients who were admitted to the operating room with bradycardia ($HR \leq 45$) secondary to β blockade, with a past history of symptoms related to transient heart block, or with first degree heart block. One patient was in Mobitz type II block before the Swan Ganz insertion. One patient was to undergo a cholecystectomy 6 years after double valve replacement, 4 patients required valvular surgery, and 25 patients were to have coronary artery surgery. The catheter was inserted into the right internal jugular vein using the Seldinger technique. The pre-cardiopulmonary bypass (CPB) evaluation was carried out immediately after placement, while the post-CPB pacing evaluation was performed just before leaving the operating room. Arrhythmias during insertion were observed on the EKG monitor. If the catheter did not float to the pulmonary artery by 45 cm, the attempt was considered a failure, and the catheter was withdrawn to 20 cm for another attempt. Intermittent pacing was considered to be a failure. Threshold in milliamps (ma) was determined by setting the pacing generator at 15% above the intrinsic heart rate and increasing the current until capture was sustained for at least two respiratory cycles.

RESULTS: All catheters advanced from the 20 cm position to the pulmonary artery in

20.4±9.5 seconds ($\bar{X} \pm SD$) (range 10-120 seconds) without the aid of fluoroscopy. The mean number of attempts to advance the catheter to the pulmonary artery was 1.3±.7 (range 1-4), with each passage through the right ventricle being associated with 1.8±1.7 premature ventricular beats. One patient developed 2 premature atrial contractions and no PVC's. Only one catheter failed to advance to the wedge position. This catheter paced normally and provided the PA pressure, CVP, and cardiac output. Ventricular current threshold measured in the post CPB period was 7±3 (ma) (range 4-15). Overall, pre CPB AV sequential pacing was possible in 22/30 (73%) patients while post CPB AV sequential pacing was possible in 21/30 (70%) patients. The other pacing possibilities are outline in Table 1.

DISCUSSION: Selected patients who require the Swan Ganz catheter to guide their therapy may also require temporary pacing. Pulmonary artery pressure, central venous pressure, wedge pressure, cardiac output and sequential pacing are all provided in the multipurpose pulmonary artery catheter. It is quickly and easily inserted without fluoroscopy. If pacing fails, considerations are repositioning of the catheter secondary to manipulation of the heart during CPB, warming of the catheter with a consequent shift of position, clot formation around the electrodes, electrode dislodgement, and lead fracture. The multipurpose pulmonary artery catheter has application not only in cardiac anesthesia but also in acute MI patients and other critically ill patients undergoing non-cardiac surgery.

