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## Unexpected Pressure Waveform During Pulmonary Artery Catheter Placement

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**A** 40-YEAR-OLD Hispanic man with a history of diabetes mellitus, end-stage renal disease, and hypertension was admitted to the hospital for worsening congestive heart failure and fever. He was dialyzed and started on antibiotic therapy for a suspected catheter sepsis. A cardiology consultation was obtained to evaluate his continued congestive heart failure symptoms despite aggressive fluid removal with dialysis. Cardiac catheterization revealed 4+ mitral regurgitation as well as a significant right coronary artery stenosis. A small fistula between the right atrium and the left ventricle was also noted. The patient was scheduled for mitral valve replacement and right coronary artery bypass graft surgery.

On the day of surgery, a right radial artery catheter was placed, and the patient was then taken to the operating room where general anesthesia was induced using sufentanil, etomidate, and pancuronium. He remained hemodynamically stable throughout induction. A percutaneous introducer sheath was placed in the right internal jugular vein using the standard Seldinger technique. A pulmonary artery (PA) catheter was then advanced through the sheath, central venous pressure, right atrial, and right ventricular waveform morphology

appeared normal. The catheter was then advanced further, and extremely high pressures, equivalent to the radial arterial blood pressure, were noted (Fig 1). The catheter was withdrawn until a right atrial waveform was obtained, the transducer calibrations were verified, and the catheter was readvanced with the same results. What are the possible positions of the PA catheter, and what diagnostic tools can be used to verify its location?

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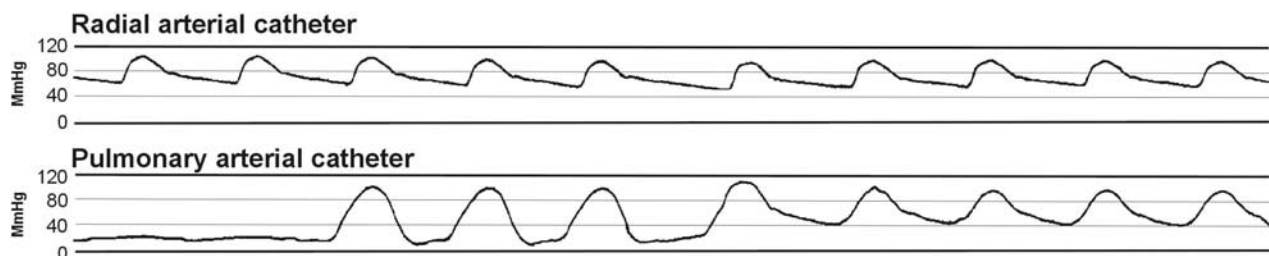
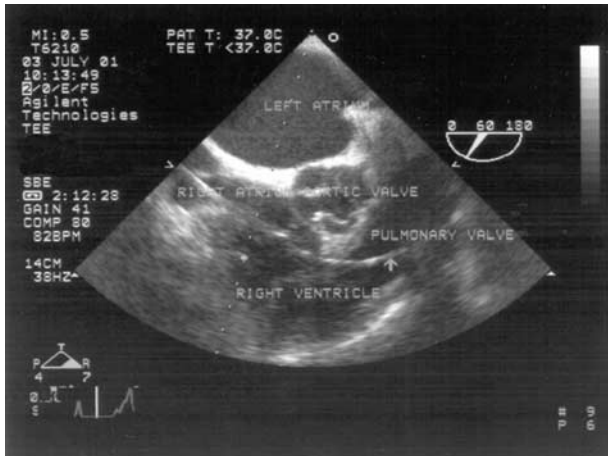


Fig 1. Continuous pressure recordings of the radial arterial pressure (upper tracing) and the distal port of the PA catheter (lower tracing).



**Fig 2. TEE showing the pulmonary artery catheter (single arrow) as it passes through the pulmonic valve.**

**DIAGNOSIS: CORRECT CATHETER LOCATION  
WITHIN THE PA**

Severe pulmonary hypertension was not initially suspected in this patient, and the concern was that the PA catheter had passed through the fistula into the systemic arterial circulation rather than the pulmonary circulation. A transesophageal echocardiography (TEE) probe was placed to obtain the view shown in Fig 2 showing the presence of the PA catheter in the pulmonary artery.

There are multiple indications for intraoperative (TEE) including evaluation of left ventricular function, regional wall motion

(ischemic monitoring), preload and ejection fraction, intracardiac shunts, and cardiac valvular disease. The American College of Cardiology/American Heart Association guidelines for TEE<sup>1</sup> list monitoring placement and function of catheters and assist devices as a category II indication. This means that the use of TEE for this purpose is not routinely indicated but may be useful depending on the individual circumstances. This case showed the utility of the TEE for confirmation of PA catheter placement when abnormal physical measurements were obtained before a mitral valve replacement/coronary artery bypass graft surgery. The severity of this patient's mitral valve and pulmonary disease combined with presence of an RA/LV (right atrial to left ventricular) fistula made visualizing the tip of the PA catheter within the pulmonary artery necessary for its safe continued use during this procedure.

Confirmation of the correct placement of this catheter could have been obtained in other ways. The cannulation was routine. Normal CVP (central venous pressures) and atrial and ventricular waveforms were obtained with advancement of the catheter. This coupled with concurrent blood gas measurements from the radial and pulmonary catheters or a chest radiograph could also have assured proper PA catheter placement.

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