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A Clue to Pulmonary Embolism Obtained during Swan-Ganz Catheterization

To the Editor:

An unusual clue to pulmonary embolism was noted in our laboratory during a recent right heart catheterization.

CASE REPORT

A 54-year-old woman was admitted with edema of the right arm and dyspnea. Evaluation revealed right subclavian vein thrombosis, malignant left pleural effusion, and a large pericardial effusion. Significant past history included repair of an atrial septal defect eight years previously. Pulmonary hypertension was present at that time. Right heart catheterization and pericardiocentesis was performed to determine the hemodynamic significance of the effusion and to obtain specimens for cytology. Under fluoroscopy, a Swan-Ganz catheter was advanced without difficulty via the right femoral vein to the right pulmonary artery. The pressure recordings were diagnostic of cardiac tamponade (elevated right heart diastolic pressures with equalization of right atrial, right ventricular diastolic, and intrapericardial pressure; 120 mm Hg). The cardiac output (thermodilution) was diminished (3.2 L/min). We were not able to obtain pulmonary capillary wedge pressure. Sanguineous pericardial fluid (1365 ml) was removed with dramatic improvement of the hemodynamic parameters. Within minutes the patient began to experience increasing respiratory difficulty with severe hypoxia unresponsive to mechanical ventilation. Attempts to repeat the measurement of cardiac output by thermodilution after pericardiocentesis were unsuccessful, despite performing the routine tests for catheter and computer malfunction and changing both the Swan-Ganz catheter and the cardiac output computer. Pulmonary angiography confirmed the presence of a massive embolus to the right main pulmonary artery. The patient was immediately placed on femoral-femoral cardiopulmonary bypass in the catheterization laboratory and taken immediately to surgery for emergency pulmonary embolectomy. Carcinomatosis involving the entire right hemithorax, including the pericardial surface, was documented.

The inability to measure cardiac output by thermodilution during Swan-Ganz catheterization may serve as a clue to pulmonary embolism if the usual causes of malfunction have been considered and excluded. Undoubtedly, the thermistor tip was lodged in the region of the clot, preventing accurate measurement of the temperature changes occurring during iced-water injection. Indeed, the Swan-Ganz tip was located in the same pulmonary artery as the massive pulmonary embolus. One should consider pulmonary embolus in similar situations.

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A Complication with Thermodilution Cardiac Outputs in Centrally-Placed Pulmonary Artery Catheters

To the Editor:

The use of side-arm percutaneous central venous pressure introducer sets for the insertion of balloon-tipped pulmonary artery catheters is becoming increasingly popular. In addition to expediting the subclavian or internal jugular insertion of the pulmonary artery catheter, they have the added feature of a side-arm fluid administration port.

Recently, we performed a thermodilution cardiac output study utilizing a 4-lumen Edwards thermodilution Swan-Ganz catheter inserted through a USCI "hemaquet" arterial/venous percutaneous catheter introducer sheath. Using the Edwards 9820A computer and 10 ml of iced injectate, cardiac output values of 24 L/min and 22 L/min were obtained. During the second injection, a retrograde surge of blood-timed intravenous fluid was observed in the line infusing the side-port of the introducer sheath. Closing off the stopcock on this line before the next thermodilution injection resulted in cardiac outputs in the range of 9 L/min. These values were more consistent with the patient's clinical picture.

The in vivo length of the pulmonary artery catheter measured at the hub of the introducer sheath was 42 cm. Since the proximal line exit port is at 30 cm, and the length of the introducer sheath and hub is 15 cm, we concluded that the proximal port was still well within the lumen of the sheath. During injection of the 10 ml iced bolus, a significant portion of this volume was being forced retrograde into the side-arm intravenous line. As a result, a smaller volume of the injectate was actually being added to the venous blood, thus causing erroneously high cardiac output values. Closing off the stopcock to the side-arm intravenous line corrected this problem.

Since pulmonary artery catheters placed either through the subclavian or internal jugular veins tend to have short in vivo catheter lengths, their placement within an introducer sheath increases the likelihood of the above problem occurring. Therefore, when performing thermodilution cardiac output studies through a pulmonary artery catheter utilizing an introducer sheath with a side-arm intravenous line, care must be taken to insure that the proximal port is beyond the tip of the sheath. Otherwise, fluid infusion through the side-arm should be from an infusion pump or the side-arm intravenous line should be temporarily turned off.

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