Noninvasive removal of a knotted pulmonary artery catheter

The Editor,

Knotting of pulmonary artery catheter (PAC) is a known complication in few cases where PAC is used, especially in cardiac surgery.\(^1,2\) The diagnosis is generally confirmed by chest radiography, damping of pulmonary artery (PA) trace as seen on the monitor or the inability to inflate the balloon.

A 65-year-old male nondiabetic, hypertensive, weighing 75 kg presented with ischemic heart disease New York Heart Association grade 11/111 with EF10\%. The coronary angiography of the patient had revealed triple vessel disease. Thus, he was scheduled for a coronary artery bypass grafting (CABG). Preoperative hematological profile of the patient was within normal limits, but the electrocardiogram reported changes suggestive of inferior wall hypokinesia.

On the day of the surgery, cardiac drugs were continued along with the required premedication. Anesthetic technique included opioid, midazolam, and isoflurane anesthesia with controlled ventilation. In the operating room, pulmonary arterial pressure was monitored by introducing a 7.5F triple lumen PAC (Edwards Lifesciences, Irvine, California, USA) through the right internal jugular vein (RIJV) using an 8.5F introducer kit (Introflex).

During next 24 h, the patient remained stable in the CICU, extubated maintaining gases requiring cordarone infusion for atrial fibrillation. On the 3\(^{rd}\) postoperative day, it was decided to remove the Swan-Ganz. However, the nursing staff found difficulty in removing the catheter through the sheath and during one of her attempts to remove the PAC the sheath got accidently pulled out. We now were faced with a situation where the sheath was out, and the Swan-Ganz was entrapped inside. A chest radiograph was immediately performed, but it was unable to throw light on the position of the catheter and bedside echo ruled out it being in the cardiac chambers. Hence, the patient was shifted to the catheterization laboratory to aid in location and retrieval of the catheter. Interventional cardiologist and radiologist were called upon to aid in the procedure.

Under fluoroscopic guidance, the knotted catheter was visualized to be in RIJV. An unsuccessful attempt was made to straighten the knot by passing a regular 0.35 Teflon wire. Therefore, a terumo wire was passed through the distal port, but in vain, hence with the help of the terumo wire the catheter was safely parked in the right atrium under fluoroscopic control. An 8F femoral venous sheath was introduced on the right side. A Gemini Dormia basket was introduced through the sheath and the terumo wire was grasped within the sheath, the dormia basket and the catheter were slowly advanced on the wire until it was visualized just at the tip of the femoral venous sheath, the PAC was then guided in the sheath and when the knot was tightened the catheter was retrieved outside the sheath. The terumo wire was pulled back into the PA and proximal to the knot the PAC was cut.

DISCUSSION

Various methods for removal of knotted catheters have been reported. One approach is to pull the catheter against the introducer sheath, thereby reducing the size of the knot, followed by removing both catheter and sheath.

Another method is to attempt to unwire the knot. This may be achieved by inserting a guide wire in the PAC itself or through the femoral vein or antecubital vein and manipulate it to untie the knot. Furthermore, surgical removal can be used, either by venous cut-down or open surgery (i.e., thoracotomy) [Figure 1].
To conclude, interventional radiological techniques have largely replaced open surgical removal of knotted catheters. Surgery is now reserved for large, multiple loops (“bow tie”) knots or knots that are fixed within the cardiac chamber. In these cases, direct withdrawal may lacerate the vein itself or lead to cardiac damage, making thoracotomy mandatory.

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Figure 1: Knotted pulmonary artery catheter removed in two pieces

Kalpana Shah, Arun Mehra, Girish Warawadekar
Breach Candy Hospital and Research Centre, Mumbai, Maharashtra, India

Address for correspondence:
Dr. Kalpana Shah, Breach Candy Hospital and Research Centre, Bhulabhai Desai Road, Mumbai - 400 026, Maharashtra, India.
E-mail: kalps99ana@gmail.com

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