

The Knotted Swan-Ganz Catheter: New Solution to a Vexing Problem

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The Swan-Ganz catheter is used frequently in the intensive care unit for hemodynamic monitoring of critically ill patients. Knot formation at the end of the catheter occurs rarely, and a number of reports have dealt with methods for removing the knotted catheter without resorting to surgery [1-4]. We have had three such cases at our institution within the past 6 months. We describe another method that allowed easy removal of a knotted catheter from the subclavian vein.

Case Report

A 64-year-old man with a fracture dislocation of the cervical spine and resulting quadriplegia after an auto accident had been maintained for 4 weeks on a respirator in the intensive care unit. The patient's clinical problems included respiratory failure, diffuse pneumonia, and renal failure. A 7 French Swan-Ganz catheter was introduced via the right subclavian vein for hemodynamic monitoring. The postinsertion portable chest radiograph showed that the tip of the catheter contained a knot which was directed into the right internal jugular vein.

The patient was taken immediately to the angiography suite for removal of the knotted catheter. Various preliminary maneuvers were unsuccessful. A 0.024 mm guide wire was introduced into the lumen of the catheter, but this maneuver was unsuccessful in opening the knot. A 7 French Mueller catheter and deflecting wire were then introduced via the right femoral vein. The Swan-Ganz catheter could be pulled down with the Mueller tip into the superior vena cava. However, the knot was too tight and could not be opened using this method [5].

The end of the Swan-Ganz catheter was painted with Betadine solution, and a 10 French Teflon dilator from a biliary stent kit (Cook) was introduced over the Swan-Ganz catheter through the skin tract and into the subclavian vein. With the 10 French dilator in place, a 14 French Teflon catheter from the same biliary stent kit was introduced over the 10 French dilator (fig. 1A). The knot was pulled tightly against the 14 French catheter and was observed fluoroscopically to tighten and become smaller. The knot could not be withdrawn into the 14 French catheter. However, the outer diameter of the catheter was roughly the same size as the knot, and both could be withdrawn together out of the subclavian vein and skin tract with only momentary resistance as the knot passed the undersurface of the clavicle (fig. 1B). After 10 min of manual compression at the puncture site, a repeat chest radiograph showed no evidence of hemothorax.

Discussion

A previous report describes the use of an 8 French Desilets-Hoffman sheath to tighten the knotted catheter and allow removal from an internal jugular vein [1]. Our method is similar. However, it differs in that a large 14 French catheter from a biliary stent kit was used. Simply pulling the knot through the puncture site was considered dangerous because of the risk of lacerating the vein and causing hemothorax [6]. Surgery was considered, but the clinical condition of the patient made the surgeons hesitant. By dilating the puncture site with the 14 French catheter and pulling the knot tightly against the end of the catheter, the knot could be easily removed with minimal trauma to the subclavian vein.

The 10 French Teflon catheter will slide easily over the 7 French Swan-Ganz catheter. If the Swan-Ganz catheter has been present and in use for an extended length of time, then it may have enlarged slightly from fluid absorption. In this case, the 12 French Teflon catheter will be required rather than the smaller one. Although these Teflon catheters have been in use as biliary dilators, their excellent strength and stiffness make them ideal for removing knotted Swan-Ganz catheters.

This technique has been applied in two additional patients. In one case a knotted Swan-Ganz catheter was removed via a left subclavian puncture site. A 12 French Teflon catheter was used in the same manner as in the first patient with no postprocedure hemothorax. In the other case, a knotted catheter had been placed via a right internal jugular approach. A 12 French Teflon catheter was again used with no postprocedure hemothorax.

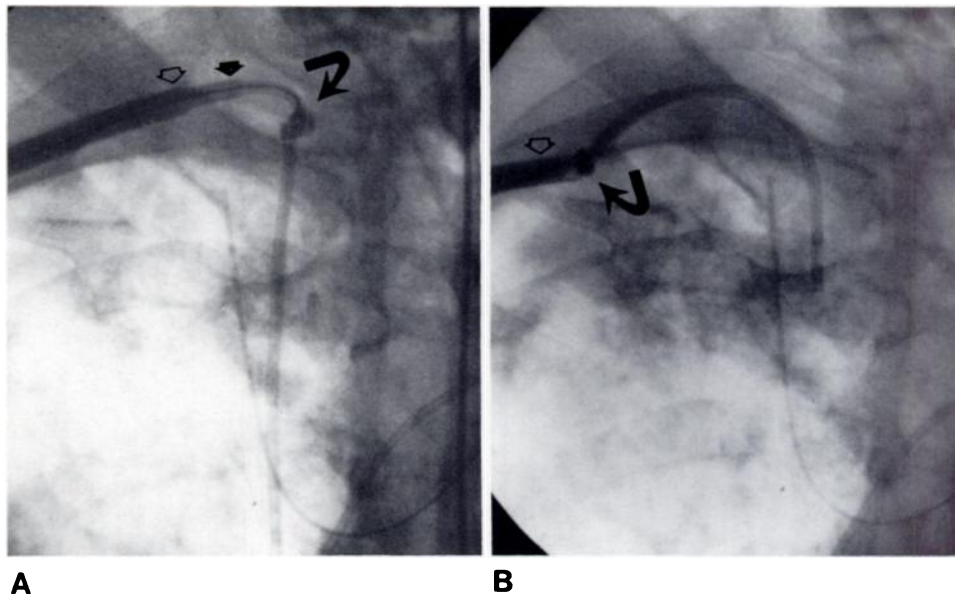
Although there have been no hemothoraces in our three patients, we stress caution in using this technique. The subclavian vein is not amenable to percutaneous compression due to its location behind the clavicle. If used in a large number of patients, one might expect the technique to result in some instances of hemothorax. We therefore recommend that this technique be used in close cooperation with a thoracic surgeon and only as a last resort before thoracotomy for an unyielding knotted catheter.

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Fig. 1.—**A**, 105-mm spot film. Knotted Swan-Ganz catheter (*curved arrow*) extends into superior vena cava. 10 French (*black arrowhead*) and 14 French (*open arrowhead*) biliary dilators have been introduced over Swan-Ganz catheter into right subclavian vein. **B**, Knot decreased in size (*curved arrow*) and pulled tightly against 14 French dilator (*open arrow*). Both easily removed from right subclavian vein.



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