Knotting of Intracardiac Flow-Directed Balloon Catheter*

Simple Surgical Method of Removal

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A complete knot occurred in a 7F flow-directed balloon catheter inserted through the right internal jugular vein. The patient was intubated and placed under positive pressure ventilation. After gaining surgical exposure of the venipuncture site, a purse-string of Prolene 4-0 suture was placed around it. The patient was placed in the Trendelenburg position and the knotted catheter withdrawn, while the purse-string suture was immediately tightened avoiding uncontrollable hemorrhage or massive air embolism.

The benefits obtained from placing a flow-directed balloon catheter must be weighed against the complications of this invasive procedure. Knotting and looping of a Swan-Ganz catheter are among those complications. We report a case of complete knotting of a multichannel 7F model that was safely removed by a simple surgical approach.

CASE REPORT

A 75-year-old obese woman was admitted to the Intensive Care Unit with a diagnosis of acute myocardial infarct. As part of her management, a 7F Swan-Ganz flow-directed thermomodulation catheter (USCI) was introduced in the pulmonary artery via the right internal jugular vein. Catheter placement was done without technical problem and the radiologic and fluoroscopic assessment of catheter positioning was perfect.

After three days and considering the clinical improvement, decision was made to remove the catheter. In the meantime, the catheter had to be repositioned at least once, as a continuous wedge tracing indicated that the catheter had migrated too distally.

The junior-staff physician who removed the catheter encountered a resistance when trying to withdraw the last 15 cm of the catheter. Therefore, he wisely decided not to try to pull out the catheter any further. Actually, retrospective review of the chest x-ray film done earlier the same day demonstrated a knot in the flow-directed balloon catheter approximately 15 cm from its tip (Fig 1). Unknotting the knot by the guidewire technique was impossible at this stage, because the knot was tight inside the internal jugular vein.

The direct withdrawal of the knotted catheter through the venipuncture site was not indicated considering the risk of tearing the vein and subsequent severe bleeding in a patient receiving heparin. Furthermore, the knot, done in a 7F catheter, now reached a 15F size or 5 mm width.

In order to avoid those potential complications of blind catheter removal and to prevent air embolism through the enlarged venipuncture site, it was decided to remove it surgically. A 4-cm long incision was made at the anterior border of the right sterno-cleidomastoid muscle to allow direct vision of the puncture site. A purse-string of Prolene 4-0 suture was placed around the entry site of the catheter in the vein.

The patient was placed in Trendelenburg position, her lungs kept inflated by the anesthetist. Then the catheter was pulled out (Fig 2) of the vein and the purse-string suture immediately tied, closing the hole in the vein without any risk of air embolism. Recovery was uneventful.

DISCUSSION

The occurrence of knots and loops is a potential hazard of Swan-Ganz catheter placement if excessive catheter length is passed into the right atrium or ventricle. In fact, the right ventricle should be entered by the time 35 to 40 cm of catheter has been introduced from an internal jugular vein entry site.

No more than 15 cm should be required for passage from the right ventricle to the pulmonary artery position. Those numbers should be kept in mind when placing or reposition-

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Prolonged Bradycardia following Release of Cardiac Tamponade

Hypothesis for Reflex Control

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A 58-year-old patient with chronic renal failure presented for routine hemodialysis, and was noted to have severe hypotension and findings on examination compatible with cardiac tamponade. The patient had emergency construction of a pericardial window. At the time of surgery, rapid evacuation of the pericardial space resulted in rebound hypertension associated with marked bradycardia. The features of the patient’s case were analogous to the cardiac vascular and reflex adjustments that normally occur during the Valsalva maneuver. These findings suggest that the cardiovascular changes occurring during the rapid decompression of cardiac tamponade may be reflexly-mediated, and gradual decompression of the pericardial space is therefore recommended to avoid reflex hypertension and bradycardia.

The predominant reason for emergent drainage of a pericardial effusion is cardiac tamponade, the state of markedly reduced cardiac output, hypotension, low pulse pressure and target organ underperfusion. The two established methods for decompression of such effusions, percutaneous needle drainage and open thoracotomy with creation of a pericardial window, have been compared extensively in the literature. Herein we describe a previously unmentioned neurovascular phenomenon, similar if not identical to phase 4 of the Valsalva maneuver, which occurred in the setting of rapid surgical decompression of the pericardial space in a patient with cardiac tamponade.

Case Report

The patient is a 58-year-old white man with long history of adult onset diabetes mellitus who originally presented with acute pulmonary edema, acidemia, uremia and hyperkalemia. His chronic renal insufficiency was presumed to be of diabetic origin and he has been maintained on thrice weekly hemodialysis.

One week prior to his major episode, the patient presented with the complaint of chest pain aggravated by deep inspiration. Physical examination showed blood pressure of 140/80 mm Hg with no paradox or orthostatic changes, pulse rate of 80, clear lung fields with distinct heart sounds, and grade 2/6 systolic murmur at the lower left sternal border. Extremities revealed 2+ bilateral chronic edema. Laboratory data indicated hyponatremia and hyperkalemia (S₄⁺ + 127, S₅⁺ + 6.4 respectively), azotemia with serum creatinine of 9.8 mg percent and blood urea nitrogen of 132 mg percent and a normocytic, normochromic anemia. Chest x-ray examination revealed mild cardiomegaly and clear lung fields. The electrocardiogram was interpreted as normal sinus rhythm, first degree AV block, decreased R wave in V₅ and V₆ and diffuse ST/T wave changes. An echocardiogram revealed mildly diminished mitral valve E-F slope with small to moderate posterior pericardial effusion. Myocardial infarction was ruled out, and hemodialysis was performed to correct the above metabolic parameters. The patient was discharged in good condition.

Seven days following discharge, an episode of prolonged hypotension occurred, despite discontinuance of his antihypertensive medication during the prior admission. The hypotension initially responded to fluid resuscitation, only to recur when the rate of fluid administration was decreased. Physical examination at this time revealed blood pressure of 90/65 mm Hg with 20 mm Hg pulse pressure, pulse rate of 90 and temperature of 37°C. Mild jugular venous distension, clear lung fields, distant heart sounds, and cool, hypoperfused extremities were the significant physical findings. His chest x-ray film revealed no appreciable increase in cardiac size, and an electrocardiogram revealed normal sinus rhythm with decreased voltage in all leads and electrical alternans. An echocardiogram revealed a large anterior and posterior pericardial effusion. After premedication with pentobarbital 50 mg and atropine 0.4 mg, the patient was taken to the operating room for emergency pericardial decompression. At the time of thoracotomy, a tensely distended pericardial sac was noted. An incision into the pericardium was made with rapid removal of 800 ml of serosanguineous fluid. Commensurate with this maneuver, the blood pressure and heart rate response were

References
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