

Inadvertent Fracture During the Attempted Removal of Entrapped Swan-Ganz Catheter

Dear Editor,

Pulmonary artery catheter is widely used in cardiovascular surgical practice. Various complications of the Swan-Ganz catheter during insertion, its long-term placement, or removal are well known since its introduction.¹⁻⁵ Herein, we report a case of the inadvertent fracture of an entrapped Swan-Ganz catheter during its attempted removal with moderate external traction.

A 36-year-old man was admitted to our hospital with symptoms of increasing dyspnoea on exertion, fatigue and palpitation for several months. Physical examination, echocardiographic study and cardiac catheterisation showed severe mitral and aortic valve disease. He underwent the operation and a 7 F 110 cm long Swan-Ganz thermodilution catheter (Edwards Lifesciences LLC, Irvine, USA) was easily inserted through a percutaneous haemostasis sheath introducer (8.5 F Fast-Cath™, St. Jude Medical, MN) via the right internal jugular vein. It was successfully guided into the pulmonary artery. There was no immediate complication during the insertion of the catheter.

Aortic and mitral valve replacement with mechanical prosthetic valves (St. Jude Valve, St. Jude Medical Inc., St. Paul, MN) were then performed. Throughout the operation, the Swan-Ganz catheter functioned well and haemodynamic data were obtained intraoperatively without problems. After an uneventful surgery, the patient was transferred to the surgical intensive care unit. The postoperative chest radiography showed the Swan-Ganz catheter in its usual pattern.

Twelve hours after the operation, the patient was extubated smoothly. Four hours later, when he was haemodynamically stable, we tried to remove the Swan-Ganz catheter. During the attempted removal, we noted resistance and were unable to remove the catheter. Chest radiography revealed a normally positioned catheter in the right atrium with the distal portion in the right pulmonary artery. Further attempts with moderate external traction to remove the Swan-Ganz catheter immediately resulted in its fracture at the 40th cm. Chest radiography revealed the proximal end of the fractured catheter within the right atrium (Fig. 1).

The patient was brought to the angiography suite where attempts at looping the free end of the catheter and pulling it by using a 0.14 long guidewire catheter (Boston Scientific, Scimed) by the cardiologist was unsuccessful. We suspected that the catheter was probably entrapped in the left atrial

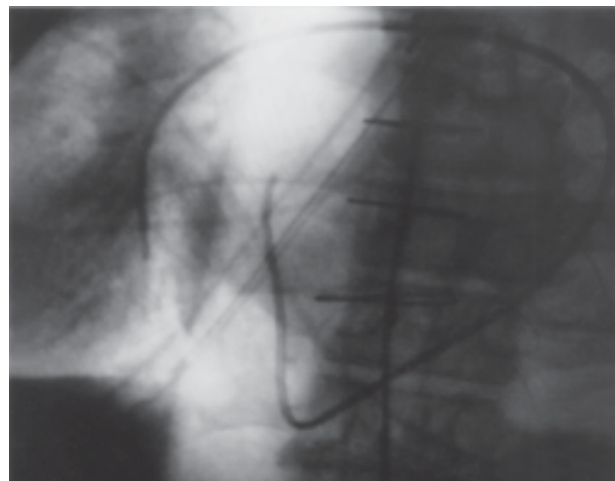


Fig. 1. Postoperative chest radiograph showing the location of the catheter tip which suggested that it was positioned optimally within the right pulmonary artery and fractured tip within the right atrium wall.

closure suture within the right atrium wall.

The patient underwent re-sternotomy for catheter removal. Cardiopulmonary bypass equipment was not used. First, a new purse-string suture was placed to the separate site from the previously placed right atrial stitch. By digital palpation from the outside of the right atrium, the catheter was sensed and the distal portion of the catheter was pulled out with hemostatic forceps. The fractured tip of the catheter from its fixing point within the right atrial wall could not be removed with forceps.

We decided to cut the previously placed left atrial closure sutures in order to release the Swan-Ganz catheter. First, we began to suture again from each end of the previous left atrial incision line with a 3/0 prolene suture. When 2 sides of sutures approached each other and were ready to be tied, we cut the previously tied left atrial closure suture from the midpoint. After that procedure, traction to the fractured part of the catheter was applied with hemostatic forceps from the atrial purse-string suture and we were able to take the catheter out easily. The other needles at the end points were then used to strengthen the atrial closure sutures. The new left atrial closure and the right atrial purse-string suture were tied gently. The postoperative course was smooth and the patient was discharged on postoperative day 7 without complications.

Entrapment of the Swan-Ganz catheter to an intracardiac

structure by suture or other reasons during cardiac operation is a very rare and serious complication.¹⁻⁴ This complication may occur in the right or the left atrial closure suture, the retrograde cardioplegic cannulation suture, the vena cava cannulation suture, or the pulmonary vent site suture.²⁻⁴

Wang et al² have reported a case of entrapment of the Swan-Ganz catheter by suturing the catheter to the right atrial wall at the site of cannulation for retrograde cardioplegia solution infusion. In our case, catheterisation of the pulmonary artery was complicated by its entrapment within the right atrial wall by the suture during the left atriotomy closure following the mitral valve replacement. The Swan-Ganz catheter entrapment may lead to catastrophic complications such as tricuspid cordal or papillary muscle rupture, pulmonary artery rupture, and cardiac rupture resulting in cardiac tamponade.¹⁻³ Huang et al³ described the pulmonary arterial rupture due to accidental suture of the Swan-Ganz catheter during a closure of the vent hole on the pulmonary trunk and the subsequent attempted forced removal of the catheter. In our case, we came across the rare complication of the Swan-Ganz catheter because of its fixing to the right atrium by the left atrial closure suture. Moderate external traction was attempted, but the catheter inadvertently fractured at the 40th cm. This action could have caused the atrial suture line to dehiscence, and that would have been disastrous.

Diagnostic methods include in particular suspicion, chest radiography, fluoroscopy and transesophageal echocardiography.^{1,2} Therapeutic approach may be either non-surgical^{1-3,5} or surgical.^{1,4} One of various non-surgical methods for the removal of fixed or knotted catheter is to pull it against the introducer sheath, thereby reducing the size of the knot, followed by removing both catheter and sheath.¹⁻³ The other approaches are the stone retriever basket, Teflon sleeve and basket snare.^{1,5} Surgical intervention should be considered if there are failures in percutaneous approaches. Kaplan et al⁴ reported 10 patients who precisely underwent resternotomy for removal of the entrapped catheter. In their case, the catheter was released and removed by placing a matrix suture on the proximal and distal part of the left atrial suture line. In our case, the remnant of the Swan-Ganz catheter was successfully removed by a safe but different surgical intervention without using cardiopulmonary bypass as described above.

Early recognition of Swan-Ganz catheter entrapment before sternotomy closing is very important in preventing this complication. We should not leave the Swan-Ganz catheter in the suture while closing the right or left atriotomy or during venous cannulation and should verify its mobility. Huang et al³ even suggest the withdrawal of a Swan-Ganz catheter before the initiation of cardiopulmonary bypass to prevent its entrapment by a suture. The surgeon should be aware of these complications, especially when resistance is encountered during the removal of the catheter. If there is resistance during withdrawal, the catheter should not be pulled anymore.

Herein, the lesson in this communication is to ensure that the suturing must be meticulous and the surgeon should ensure (by palpation) that the Swan-Ganz catheter was not entrapped in the suture line.

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