Knotted continuous cardiac output thermidilution catheter diagnosed by intraoperative transoesophageal echocardiography

Editor—Knotting of a conventional pulmonary artery (PA) catheter on insertion is occasionally encountered, but it is rare for a continuous cardiac output (CCO) catheter to do so in our experience. We report a knotted CCO catheter that was diagnosed by transoesophageal echocardiography (TOE) during cardiac surgery.

A 51-yr-old woman who had had a recent myocardial infarction underwent myocardial revascularization. After induction of anaesthesia, a 5.0 MHz multiplane TOE probe (Hewlett-Packard, Andover, MA) was inserted. Baseline TOE revealed moderate mitral regurgitation, generalized hypokinesia of the left ventricle, and akinesis of the inferior wall. An 8.5 Fr percutaneous sheath introducer was then placed through the right internal jugular vein and an 8.5 Fr CCO thermodilution catheter (CCO/SvO catheter; Baxter, Irvine, CA) was inserted to a distance of 20 cm. The balloon was inflated and the catheter had progressed well through the right atrium to the right ventricle by 35 cm using pressure monitoring. However, no PA tracing was obtained despite advancing the catheter by a further 10–15 cm repeatedly. The catheter may have been inadvertently inserted beyond the estimated distance of the PA to 40–45 cm in our attempts. During the last attempt, we encountered increasing resistance on withdrawing the catheter back to 20 cm. Nevertheless, the catheter could be advanced freely and the pressure monitor showed a right atrium waveform. Using TOE, a mid-oesophageal four-chamber view identified a bent catheter with a knot toward its end (Fig. 1). There was no loop in the catheter nor was it attached to any cardiac structure. No newly developed tricuspid regurgitation was noted.

An aortic line and two additional venous lines were inserted after the sternotomy. After palpation of the right atrium, a loosely knotted catheter was removed through an atriotomy (Fig. 2). The operation was uneventful and a 7.5 Fr PA catheter was inserted smoothly under TOE guidance before termination of cardiopulmonary bypass.

Repeated attempts to advance a catheter over an estimated distance to obtain a PA trace, can cause a catheter to coil and may result in catheter knotting. Coiling or knotting of a PA catheter is usually detected by radiography. However, a chest radiograph is not always available immediately in the operating theatre. Our report demonstrates a knotted CCO catheter, immediately diagnosed by TOE visualization. TOE provides a fast and real-time method of detecting and resolving the problems associated with PA catheter insertion, in contrast to radiography.

The CCO monitoring system was introduced into clinical practice in 1992. A special PA catheter with a heating filament attached is used. The catheter is made of relatively stiffer and less-flexible material than a conventional PA catheter. Theoretically, these characteristics facilitate floating of the catheter and decrease the risk of coiling or knotting. Indeed, excessive manipulation of the catheter during floating may increase the risk of injury to cardiac structures. In this case, TOE not only demonstrated the knotted catheter but also showed that cardiac structure and function had been preserved.

Methods of removing a knotted catheter include simple traction, extraction into a larger sheath, the guide wire method, a cut down technique, removal under fluoroscopy using a snare, and open surgery. A knotted intracardiac catheter during cardiac surgery can be removed easily through a cardiotomy. On examining the removed knot, we found that it was not tightly knotted even though the catheter had been pulled with some effort when we encountered resistance. The stiffer material of the CCO catheter prevents it from knotting tightly. Simple traction of the catheter may however cause venous and subcutaneous tissue trauma.

To minimize the risk of PA catheter knotting, it is advised not to advance the catheter any further if a change in waveform does not occur at 10 cm intervals after the right atrium has been entered. Once problems floating a catheter have been encountered or in patients at risk of such problems, we suggest routine examination with a multiplane TOE or catheterization under TOE guidance.

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Circuit obstruction

Editor—Further to the recent reports of obstructions in airway circuits,1±3 we write to warn of another cause of circuit obstruction. A 3-year-old child required a second anaesthetic after a perforated eye injury. At gaseous induction, he sucked his dummy. Once asleep, the facemask was applied more tightly and it was clinically obvious that the airway had obstructed. On checking the tubing system, the base of the dummy had jammed in the opening of the facemask (Fig. 1). It was detached uneventfully before any arterial desaturation occurred.

Allowing a child to suck their comforting dummy is normally beneficial, reducing crying and also dead space. However, one needs to be aware of the potential danger of such a perfect fit into the facemask, and remove the dummy as soon as the child is asleep.

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1 Hall C. Staff error, not sabotage, to blame for boy’s death. Daily Telegraph, July 23, 2002
2 Meikle J. Third patient at risk from ‘oxygen block’. Guardian, August 10, 2002

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