FEATURED CASE REPORT

Percutaneous technique for the reduction of knotted coronary catheters

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During coronary angiography knotting of a coronary catheter is a recognised complication. It commonly results through excessive manipulation of a catheter in an attempt to engage the right coronary artery. Although simple manoeuvres of the catheter can often result in resolution of a kink, tighter knots may not be amenable to such measures. There is, however, little published material regarding its best management. We present five cases of cardiac catheterisation complicated by catheter knotting and present a novel percutaneous technique for their reduction.

In coronary angiography knotting of a coronary catheter is a recognised complication. It commonly occurs through excessive manipulation of a catheter in an attempt to intubate the right coronary artery. Although simple manoeuvres of the catheter can often result in resolution of a kink, tighter knots may not be amenable to such measures. Despite being a relatively common complication there is little reported literature regarding its best management.

We present five cases of coronary angiography complicated by right coronary catheter knotting and present a simple percutaneous technique for their reduction. All procedures were elective and performed at a regional cardiac centre. Four of the five procedures were performed by a trainee (specialist registrar) and the fifth by a consultant cardiologist. In all cases initial arterial access was with a 6 French gauge introducer sheath through the right femoral artery. After knot formation was detected standard attempts were used to untie the knot. These included gentle traction of the catheter, anticlockwise or clockwise rotation, and guidewire advancement. When these techniques failed we used a technique that is described below.

CASES

Case 1

A 67 year old woman was admitted for percutaneous coronary intervention of a right coronary vein graft. The vein graft was extensively thrombosed and attempts were made to remove the thrombus with the Excisor 1.5 mm (Microvena, Minnesota, USA). After removal of the Excisor, the guide catheter became dislodged and attempts to reposition it resulted in kinking of the catheter. A resulting knot formed in the right common iliac artery.

Case 2

A 50 year old woman was admitted for coronary angiography. After considerable torquing of the Judkins right coronary catheter (JR4) (Cordis Europa, Roden, Holland) the right coronary artery was engaged and standard views acquired. On withdrawal of the JR4 resistance was encountered and a knot was noted in the lower abdominal aorta.

Case 3

A 72 year old woman was admitted for left heart catheterisation. Her aorta and common iliac vessels were noted to be very tortuous. On attempting intubation of the right coronary artery a knot was tied in the right common iliac artery.

Case 4

A 68 year old man was admitted for left heart catheterisation. Considerable torquing was used to aid intubation of the right coronary artery. On withdrawal of the catheter a knot formed in the right common iliac artery.

Case 5

A 63 year old man was admitted for left heart catheterisation. On withdrawal of the JR4 it became knotted in the right common iliac artery.

TECHNIQUE OF KNOT REDUCTION

In the above cases the same technique was used when standard attempts (see above) failed to resolve the knot (fig 1). Each rescue procedure was performed by the same (consultant) operator.

Arterial access was gained through the left femoral artery. An 8 French introducer sheath (Arrow, 24 cm) (Arrow Deutschland, Erding, Germany) was used. Through the introducer a pair of "grabbing" forceps was passed. The grabbing forceps are made by Olympus-Keymed (Southend, UK) for endoscopic purposes (catalogue number FG-4L-1). The jaws extend about 1 cm beyond the end of the shaft. The ends of the jaws interlock with a W shaped jaws mechanism, thereby providing traction up to about 1.5 kg. At a site above the knot in the descending aorta the coronary catheter was snared and thus fixed in position (fig 2). This permitted effective manipulation of the coronary catheter from its proximal end allowing knot reduction. In all cases the knot was clockwise. In four cases

Figure 1 Knotted Judkins right coronary catheter.

Figure 2 "Grabber" fixating catheter in descending aorta.

Figure 3 Knot unravelled.

simple anticlockwise rotation was sufficient to unravel the knot. In one case (case 1) additional longitudinal manipulation was needed. This was achieved by advancing the grabber device superiorly. In all cases this procedure allowed uncomplicated removal of the knotted catheter (fig 3).

DISCUSSION

Knotting of the right coronary catheter during left heart catheterisation is a recognised complication and has been reported previously.¹⁻³ Knotting is usually the result of excessive torquing of the right coronary catheter, especially in a tortuous aorta.² Applying clockwise or anticlockwise rotation or gentle

traction can result in reduction of simple knots. However, more complex knots may rotate in the direction of torque adding further problems. Sometimes a guidewire can be advanced to the knot and with gentle traction of the catheter the wire may pass through and open the knot.³ Unfortunately, if a knot is too tight the guidewire will not be able to pass through the knot and this technique will be unsuccessful. There is also a risk of perforating the catheter if excessive force is used. A single case report has suggested that a longer introducer sheath can facilitate manipulation of a kinked catheter.²

Chinician and colleagues⁴ described a technique that involves the introduction of a second catheter through the contralateral femoral artery. The second catheter is passed alongside the knotted catheter and directed through the loop of the knot. The knot is then pulled back to the bifurcation of the aorta and moved gently to and fro enabling knot reduction. A further technique with a second catheter has also been described.⁵

Unfortunately, the above techniques are all limited by their dependence on significant knot laxity and would therefore not be successful in the case of tighter knots. This is a great advantage of the technique that we have described. By fixing the knotted catheter distal to the knot this technique is not dependent on either being able to pass a guidewire through the knot or passing another catheter through its loop. In these cases we used the W grabber device, which has the advantage of being open—that is, it can fixate the catheter from the side. Closed snares would require passing the device over the free end of the catheter. Biopsy forceps are too small.

In the case of tight catheter knots that do not respond to standard manoeuvres we would recommend the use of this simple and effective technique, obviating the need for surgical intervention.

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