Novel treatment (new drug/intervention; established drug/procedure in new situation)

Transfemoral contralateral technique to retrieve knotted coronary artery catheter using Amplatz Goose Neck snare catheter

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Summary

Performing coronary angiography in very older patients can prove a challenge due to vessels calcification and tortuosity. Manipulation of coronary catheters to engage the artery ostium may result in over twisting and can result in complications ranging from a minor 'kink' to a complex 'knot'. The authors describe a novel method to retrieve the complex twisted coronary catheter using snare technique, after usual steps to remove the coronary catheter failed.

BACKGROUND

The use of snare technique utilising Amplatz Goose Neck catheter to retrieve objects from vascular system has been well described. To our knowledge, this is the first reported case of using Amplatz Goose Neck snare catheter to retrieve a knotted and immobile diagnostic coronary artery catheter in English language literature. This case highlights the challenges and a rare complication of performing coronary angiography on older patients.

CASE PRESENTATION

We report a case of a patient in late 80s who underwent diagnostic coronary angiography for symptoms of angina. The patient has a prior history of Coronary Artery Bypass Graft surgery using left internal mammary artery (LIMA) graft to left anterior descending artery (LAD) and saphenous vein grafts to obtuse marginal and right coronary artery. The procedure was performed via the right femoral artery approach using a standard 6 French sheath (Cordis Avanti+ 11 cm) with 6 French Judkins coronary catheters. Catheter manipulation proved to be very challenging as the patient had calcified and torturous right common iliac artery, requiring the use of a hydrophilic wire in order to advance the coronary catheter. Despite changing to a long femoral arterial sheath (Cordis Avanti+ 23 cm), we could not engage the coronary ostium due to lack of catheter torque. We defaulted to the left femoral artery approach using a standard 6 French femoral sheath (Cordis Avanti+ 11 cm).

We attempted to manipulate the 6 French Judkins Right 4 (JR4) coronary catheter to left subclavian artery in order to study the LIMA graft to LAD. After prolonged unsuccessful manipulation, we noticed the arterial pressure trace disappeared and the JR4 catheter became very difficult to mobilise.

Fluoroscopy revealed that the JR4 catheter was twisted to form a knot in the left common iliac artery (figure 1). An attempt at 'untwisting' manoeuvre was unsuccessful and had actually made the kinking worse with the catheter now twisted at two segments (figure 2). The JR4 catheter could

not be mobilised at all. Despite using the stiff end of the standard 0.0035 inch guide wire to untwist the knot, it remained.

We then decided to use the Amplatz Goose Neck snare catheter to retrieve this twisted catheter via the right femoral approach. Cordis 23 cm right femoral sheath was exchanged for a Balkin Up & Over Contralateral Flexor with Radiopaque band sheath (Cook medical) (figure 3). This sheath is often used by vascular radiologist to perform vascular intervention over the opposite side of the lower limb. It has a hydrophilic coating, which eased navigation through the calcified artery. Its configuration facilitates positioning over the contra-lateral iliac artery and would be ideal to retrieve the JR4 catheter inserted from the opposite femoral artery. In addition, it is a long sheath with the length from the base to the curve of 40 cm. This allowed it to go beyond the torturous right common iliac artery. A 6 French Amplatz Goose Neck snare catheter was advanced via the Balkin femoral sheath to the ascending aorta. The 'trap' of Amplatz Goose Neck snare was positioned overlying the tip of the JR4 catheter (figure 4). The 'trap' was then closed, gripping the tip of the catheter (figure 5).

The Amplatz Goose Neck catheter was pulled, dragging down the JR4 catheter to the distal descending aorta/right common femoral artery junction (figure 6). Traction was applied to Amplatz catheter to straighten out the twisted JR4 catheter and at the same time, the Balkin sheath was advanced fully into the body, providing counter traction over the Amplatz catheter (figure 7). This countertraction manoeuvre pulled the Amplatz Snare catheter together with the tip and proximal JR4 catheter into the Balkin sheath. It was imperative to ensure that the Amplatz catheter snared the JR4 catheter at the tip to minimise the overlapping thickness, thus allowing entry into the 6 French Balkin sheath (figure 8). The whole snare kit and the proximal part of JR4 catheter was then pulled out of the body via the Balkin sheath.

Figure 1 Knot in coronary catheter.

Figure 3 Balkin up and over contralateral flexor with radio-paque band sheath.

The distal (port) end of the JR4 catheter was cut with scissors to remove the port. This was to allow passage of the distal part of JR4 catheter into the left femoral artery sheath, left iliac arteries, right iliac arteries and out of the body via the right Balkin femoral sheath. The retrieval of the JR4 catheter was completed, with the two twisted segments clearly visible (figure 9).

Figure 2 Two twisted segments.

Figure 4 Snare loop positioned over catheter tip.

We successfully completed the coronary angiography via the right femoral approach using the Balkin sheath.

OUTCOME AND FOLLOW-UP

The patient completed the procedure uneventfully. At 3-month follow-up, the puncture wounds in both groins healed nicely and the patient did not suffer from any long-term adversity from the procedure.

Figure 5 Tip of catheter successfully snared.

Figure 6 Tip of coronary catheter pulled towards the Amplatz snare catheter.

Figure 7 Traction applied to straighten the twisted segments.

Figure 9 The twisted coronary catheter.

DISCUSSION

Knotted coronary catheter can be very difficult to retrieve via femoral arterial route. Any unreasonable force applied may tear the main arteries leading to serious complication. The initial standard approach is usually untwisting the catheter in the opposite direction. A 0.0035 inch guide wire,

Figure 8 The coronary catheter pulled into the Balkin catheter.

often using the stiff end, can be inserted into the lumen of the catheter up to the twisted segment in order to force straightened the catheter.^{1 2} However, if both methods fail, especially when the catheter becomes immobile completely, a different retrieval method has to be used.

The non-surgical retrieval technique of the object from the vascular system can generally be divided into two. The first technique is to use snare method, either with a specialised catheter such as Amplatz Goose Neck and Lassos (Osypka GmbH Medizintechnik, Rheinfelden-Herten, Germany), or using a device normally used for a different purpose such endomyocardial biopsy forceps.^{3 4} The snare technique can be used in both arterial and venous system provided the vessel calibre is large enough to accommodate these devices.

The second technique is to exchange the standard sheath for a larger sheath to allow the insertion of a large calibre retrieving catheter. In some cases, a sheathless retrieving

catheter is used.⁴ This catheter is navigated to the required segment and using countertraction between the object and the tip of the retrieving catheter, the latter effectively ‘swallows’ the object of interest into its large lumen. The catheter together with the ‘swallowed’ object is removed en-block from the body. This method is commonly used to retrieve the object from the venous system or within the right heart chambers such as the knotted Swan–Ganz catheter or dislodged patent foramen ovale closure device. The large size of the sheath, which is usually larger than 18 Fr, limits its use within the arterial system. However, in some cases both the snare technique and the insertion of a large retrieval sheaths have to be used together.⁵

If the non-surgical method failed, then surgical removal, either through conventional approach or minimally invasive technique, is advised.^{4–6}

Learning points

- ▶ During coronary angiography, when manipulating the catheter, the torque should be transmitted all the way to the tip. If this does not happen, it means the catheter is twisted at the shaft and the operator must stop manipulating, otherwise the catheter will kink.
- ▶ Cardiologists who perform coronary angiography must familiarise themselves with at least one type of snare catheter which should be readily available to retrieve fragments of wire or catheter within vascular system.
- ▶ Careful analysis of potential benefit versus harm must be carried out when planning invasive investigation in very older patients with co-morbidity.

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Competing interests None.

Patient consent Obtained.

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