

# Transfemoral Technique to Untwist a Knotted Catheter in the Brachial Artery: A Case Report

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## ABSTRACT

Cardiac catheterization using the transradial access has been proven to be safe, but can be complicated in some cases by catheter kinking or knotting. This complication is often the result of excessive manipulations due to the S-shaped configuration of the right subclavian-innominate-aorta axis. When a knot occurs in the brachial artery, regular maneuvers to unknot the catheter can be unsuccessful due to the narrow diameter of the artery or to the failure of the external fixation of the distal part of the catheter. We present a case of a knotted catheter in the brachial artery, untwisted with a snare technique. This endovascular technique is simple and avoids surgical extraction.

**Keywords:** radial access complication, knotted catheter, coronary angiography, snare technique, case report.

## INTRODUCTION

Transradial access has been proven to be a safe approach for cardiac catheterization (1-3). Judkins coronary diagnostic catheters are commonly used for performing coronary angiograms via transradial access, though they were designed for the transfemoral approach. In order to maneuver around the S-shaped configuration of the right subclavian-innominate-aorta axis, those catheters must be rotated, predisposing to kinking or knotting especially when excessive manipu-

lations are performed (4, 5). Knotting of the catheter is a rare complication that has been reported in numerous case reports and small series (5-12). The pain generated increases the onset of radial spasm, and the knotted catheter exposes to the risk of vessel dissection or perforation (13). Regular maneuvers to unknot the catheter might be unsuccessful due to the narrow diameter of the artery or to the failure of the external fixation of the distal part of the catheter (5, 8).

We report a case of a knotted catheter in the brachial artery, untwisted with a triple-loop snare introduced via the femoral access. □

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### CASE REPORT

An 85-year-old man underwent a diagnostic coronary angiography before transcatheter aortic valve implantation for symptomatic severe aortic stenosis. The procedure was performed via the right radial access using a 5 French radial sheath and a 5 French INFINITY® Judkins right coronary diagnostic catheter (Cordis, Miami Lakes, Florida, USA). There was no extreme tortuosity of the right subclavian-innominate-aorta axis, but a springback effect of the diagnostic catheter led to excessive manipulations (numerous rotation movements) in order to reach the ostium of the right coronary artery. This conducted to a knotting of the catheter in the brachial artery, noticed on the inability to move the catheter, a drop down of the pressure curve, and confirmed in fluoroscopy (Figure 1).

We tried standard maneuvers to untwist the catheter from the radial access: gentle counter torque, then external manual fixation of the distal part of the catheter (by applying pressure on the arm) and crossing with a standard 0.035" J wire. After the failure of these attempts, we decided to use a snare to fix the distal part of the catheter that was floating in the ascending aorta and be able to unknot it.

We introduced a 7 French 55 cm hydrophilic sheath via the right femoral artery to bring a triple-loop EN Snare® device (Merit Medical Systems, South Jordan, Utah, USA) to grab the tip of the knotted catheter. While fixing the tip of the



FIGURE 1. Knotted Judkins right coronary catheter



FIGURE 2. Catheter fixating by the snare the in the descending aorta

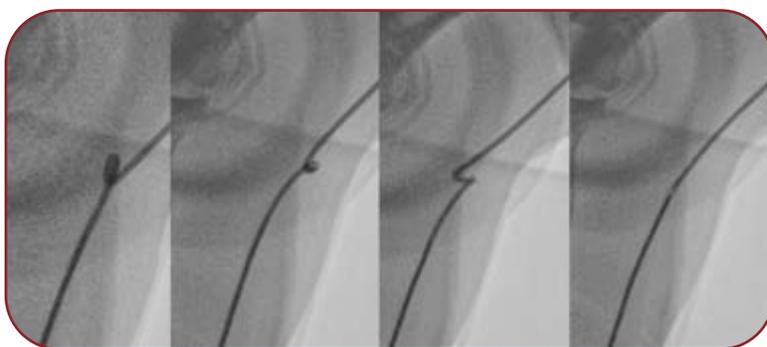


FIGURE 3. Knot unraveled

knotted catheter in the descending aorta with the snare (Figure 2), we counter-torqued the twisted catheter from its outside part to unknot it (Figure 3). We could then easily retrieve it through the radial sheath. The angiographic control of the vessel did not show any perforation or other complication. □

### DISCUSSION

Knotted of the catheter, particularly during the catheterization of the right coronary artery, is a recognized complication (5, 8, 10, 11). Catheter kinking can be prevented by refraining from rotating the catheter more than 180° to prevent buildup of torque proximally that is not transmitted to the catheter tip. In case of catheter loop due to extreme tortuosities, the coronary cannulation can be helped by a regular or a stiff 0,035" wire inside the catheter (5). When an increased subclavian or brachiocephalic artery tortuosity is encountered with an excessive torque experienced, switching to a left radial or femoral access should be considered. The left ra-

dial artery approach could be preferred in elderly patients, as it has an important anatomical advantage due to the vascular anatomy of epiaortic vessels with a straighter route especially to the left coronary ostium (4).

A stepwise endovascular approach for the reduction of catheter knots via radial approach has been recently described by Ben-Dor *et al.* (5). It ranges from untwisting the knot by rotating the catheter in the opposite direction to the initial torque, to external fixation of the distal part of the catheter by applying pressure on the arm (manually or with a sphygmomanometer cuff), hydraulic pressure through the inflator (not for a full knot), encasing the knot with a larger sheath, or grabbing the catheter tip with a snare from femoral access. Percutaneous techniques to retrieve the catheter are successful in most cases, and open surgical extraction by arteriotomy remains the last option (7).

In our case, the extremity of the diagnostic catheter was free and floating in the ascending aorta, making impossible to untwist with standard techniques because no force could be transmitted for unknotting (5, 8). Internal fixation by grasping the knotted catheter with a snare via

the femoral access allowed both ends of the knotted catheter to be rotated in opposite directions and to be untwisted for safe removal via the radial sheath. In this case, we used a triple-loop snare to grab the end of the catheter, but the use of a goose neck snare is also efficient (9). The potential risks of the snare technique are related to the complications of the femoral access (14). This endovascular technique is simple and permits a safe percutaneous removal of the catheter, avoiding a surgical extraction (7). However, it requires two operators: one who takes care of the snare and one who deals with the knotted catheter. □

## CONCLUSIONS

This case illustrates the importance of avoiding excessive manipulations of the catheter and rapidly change strategy if the catheterization of the coronary artery remains challenging. Snare technique can be helpful when the catheter cannot be unraveled via standard maneuvers. □

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