

# Balloon internal fixation- a novel approach to manipulate catheter knot

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March 9, 2021

## Abstract

Trans-radial approach (TRA) is nowadays a more common approach during percutaneous coronary angiography and intervention. Catheter knot is rare but still a matter of concern for a catheterizing cardiologist. Hence, we describe our case of catheter unknotting using balloon internal fixation of angiography catheter.

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**Abstract:** Trans-radial approach (TRA) is nowadays a more common approach during percutaneous coronary angiography and intervention. Catheter knot is rare but still a matter of concern for a catheterizing cardiologist. Hence, we describe our case of catheter unknotting using balloon internal fixation of angiography catheter.

**Keywords** Trans-radial access; catheter knot; balloon internal fixation

## Introduction

TRA has become the first choice for coronary intervention, with few complications and more comfortable for patients [1, 2]. However, this novel access may lead to severe catheter twisting and following manipulation may be required to unravel the catheter and to avoid complications[3]. Re-rotate catheter can handle minor problems, but there were also some cases so severe that can't be handled by this method but surgical intervention. In this report, we describe our technique to handle catheter knot and report its short-term outcome.

## CASE PRESENTATION

A 62-year-old woman with history of hypertension underwent selective coronary angiography because of intermittent chest pain for 10 days. The right radial artery was the access of choice. After easy cannulation, 5 French multifunctional angiography catheter (Terumo Corporation) was introduced into aortic sinus. Initially, subclavian tortuous anatomy made catheter rotation redundancy, and then the pressure curve was partial dampening, and with fluoroscopy it revealed an outright knot within right brachial artery (Fig 1). Gentle traction or rotation did not allow catheter withdrawal. We decided to untwist the catheter knot by balloon internal fixation and the details were as follows: Cut off the tail of discounted catheter and the tip of 6 French EBU3.5 guiding catheter (Medtronic). A 2.0×20mm balloon(Sprinter legend,Medtronic) passed through the cut guiding catheter from tail to tip(Fig 2) and then passed through the cut angiography catheter(Fig 3). When the balloon all passed through the cut angiography catheter, the balloon was given atmospheric pressure of about 14 atm and make sure that the balloon and the angiography catheter contact tightly (Fig 4). The guiding catheter was pushed to the knot point along angiography catheter by left hand. The balloon was pulled out gently under fluoroscopy and the knotted catheter was pulled out successfully

(Fig 5). During the whole traction period, there was no discomfort of patient and the tip of angiography catheter was complete. Contrast was injected from the sheath to confirm patency of the brachial artery. After 10 days' follow up, there was no discomfort in right upper limb of the patient.

## Discussion

There are many reasons that make angiography catheter discount, including vascular tortuosity, vasospasm, abnormal ostial of coronary artery, unskilled manipulation, excessive traction and rotation. Understanding the tortuosity of blood vessels in advance, and avoiding excessive rotation of the catheter, maintaining a guide wire in the catheter lumen can help us to prevent catheter from looping.

Once the catheter was knotted, inadequate manipulation and excessive traction can make catheter fracture or even artery dissection<sup>[4, 5]</sup>. There were several methods to retrieve catheter knot, such as gentle rotation of the catheter to the opposite direction, advancement of a super stiff wire into the loop, external fixation of the distal part of the catheter at the arm level with a blood pressure cuff<sup>[6]</sup>, snare delivery<sup>[7-9]</sup>. In catheter ablation procedure, steerable sheath was also used to untie diagnostic decapolar catheter knot<sup>[10]</sup>.

When it was difficult to withdraw the knotted catheter, we can advance a bigger cut guiding catheter outside the angiography catheter to strengthen the supporting power and exchange the shape of angiography catheter. Pushing the guiding catheter into the knot point and pulling the angiography catheter gently at the same time can help us to withdraw the knotted catheter. In our case, the internal diameter of 6 French EBU guiding catheter was 1.8mm, which was bigger than the external diameter of 5 French angiography catheter, which was 1.7mm, and make sure that the guiding catheter can enclose the angiography catheter. According to Aminian's study<sup>[11]</sup>, the length of guiding catheter was between "Knotted point- Puncture point" distance and "Knotted point- Cut point" distance, and the length of exceeded-guiding catheter part of angiography catheter was too short to fix, so that we make balloon and angiography catheter contact tightly and as a result we prolong the length of exceeded-guiding catheter part of angiography catheter sufficiently in order to facilitate the procedure, which was a bright point of our case.

## Conclusion

The method of balloon internal fixation of angiography catheter was simple, practical and economical, and this method can reduce artery injury also can avoid surgery. It provided us a new method and choice to handle catheter knot.

## FUNDING SOURCE

This article did not receive any specific grant from funding.

## CONFLICT OF INTEREST

We report no competing interest associated with the work reported in this manuscript.

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