

## CASE REPORT

## Untangling a Knotted Angiographic Catheter Using a Balloon Catheter: A Case Report

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**Abstract:**

When a 66-year-old man with hepatocellular carcinoma underwent an angiographic examination, a 4-Fr catheter was inserted from the right femoral artery. It became tightly knotted in the descending aorta. To untangle the knotted catheter, a noncompliant balloon catheter was delivered into the knotted loop from the contralateral femoral artery. After the balloon catheter was inflated from the inside of the knotted loop, the knot became loose. Finally, the knotted catheter was untangled. Subsequently, the remainder of the examination was performed as initially planned.

**Keywords:**

balloon catheter, knotted catheter, kinked catheter, tangled catheter, rescue technique

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**Introduction**

A knotted catheter is not a rare complication that occurs during endovascular therapy. In most cases, insertion of a guidewire or twisting in the opposite direction might help untangle it. If these techniques do not work, more invasive maneuvers using a long sheath or a snare catheter must be applied [1-3]. This case report presents a technique of using a balloon catheter to untangle a tightly knotted catheter.

**Case Report**

The patient was informed of the details of this case report and provided written consent for the use of his medical records for research purposes. Ethics committee approval is not necessary for this type of research at our facility.

When a 66-year-old man with hepatocellular carcinoma underwent abdominal angiographic examination for transarterial therapy, his right femoral artery was punctured and a 4-Fr sheath with a length of 25 cm was inserted. A 4-Fr hook-shaped catheter (CNS1<sup>®</sup>; Hanako Medical Co., Ltd., Saitama, Japan) was used to engage the celiac artery (**Fig. 1**). While the catheter was inserted into the descending aorta, the catheter became knotted (**Fig. 2a**). Because the knot was tight, attempts using insertion of a guidewire into

the knotted catheter lumen and using rotation to the opposite direction failed. Therefore, another technique using a balloon catheter was attempted.

First, an 8-Fr sheath was inserted into the left femoral artery. After the tip of the knotted catheter was positioned at the terminal aorta, a 0.035" hydrophilic guidewire (Radifocus<sup>®</sup>; Terumo Corp., Tokyo, Japan) from the left femoral sheath was inserted into the loop of the knotted catheter (**Fig. 2b**). Then, a 6-Fr compliant balloon for arterial occlusion with a 20-mm maximum balloon diameter (Selecon MP balloon catheter II<sup>®</sup>; Terumo Corp., Tokyo, Japan) was delivered into the loop of the knotted catheter and inflated. Still, the knot did not loosen, possibly because the knot was tight. Therefore, alternatively, an 8-Fr noncompliant balloon catheter for percutaneous transluminal angioplasty with a 14-mm maximum balloon diameter (Gekira<sup>®</sup>; Cosmotec Co., Ltd., Tokyo, Japan) was used. After the inflation of the noncompliant balloon catheter, the loop of the knotted angiographic catheter became loose (**Fig. 2c**). Balloon inflation was performed manually, and no inflation device was used. After the knotted loop had loosened, it was possible to insert the guidewire into the catheter lumen beyond the knotted part. Finally, the knotted catheter was spontaneously untangled. A schema of the procedure is presented in **Fig. 3**. The knotted catheter was retrieved from the body. Subse-

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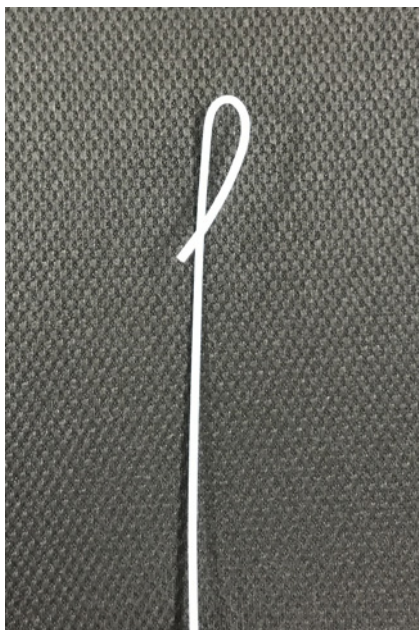
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quently, the initially planned procedure was continued with no other complication.

## Discussion

As rescue techniques for a knotted catheter, several untangling techniques, including guidewire insertion, opposite rotation maneuver, long sheath technique, and snare technique, have been reported [1-3]. Here, we first tried the insertion of a guidewire into the catheter lumen and rotation to the opposite direction, but these were ineffective. Most of the abovedescribed techniques are for cases with just “twisted or kinked” and not for literally “knotted;” thus, other optimal options must be considered. The usage of the snare catheter to remove the kinked catheter from another catheter [4] was a choice but was regarded as having little probab-



**Figure 1.** Image of a 4-Fr hook-shaped catheter (CNS1®) before knotting.

ity of success because the bore of the sheath had to be sufficiently large to pass the knotted catheter. The parallel crossing wire technique [5] also came up as an option, but we could not think of it at the time. Therefore, we assigned priority to an untangling technique using a balloon catheter [6], and it could successfully untangle the knotted catheter.

A few tips might be provided for a successful procedure using this technique. First, the knotted catheter position should be chosen appropriately so that the insertion of the guidewire and the balloon catheter into the knotted loop can easily be performed. Here, the loop of the knotted catheter was placed at the terminal aorta. Therefore, inserting the guidewire into the knot loop was easy. Another tip is the selection of a balloon catheter. Here, the noncompliant balloon can loosen the knot, even though its diameter was less than that of the compliant balloon. This finding suggests that the compliant balloon could not apply sufficient pressure to loosen the knot and that a noncompliant balloon is better suited for use with this technique.

## Conclusion

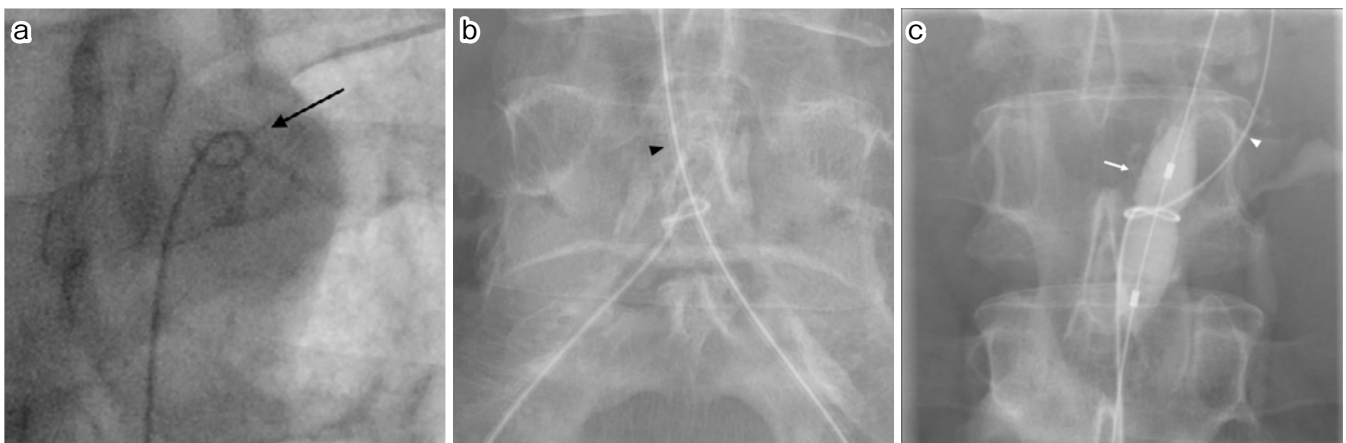
A tightly knotted angiographic catheter was untangled by inflating a noncompliant balloon catheter inside the knotted loop.

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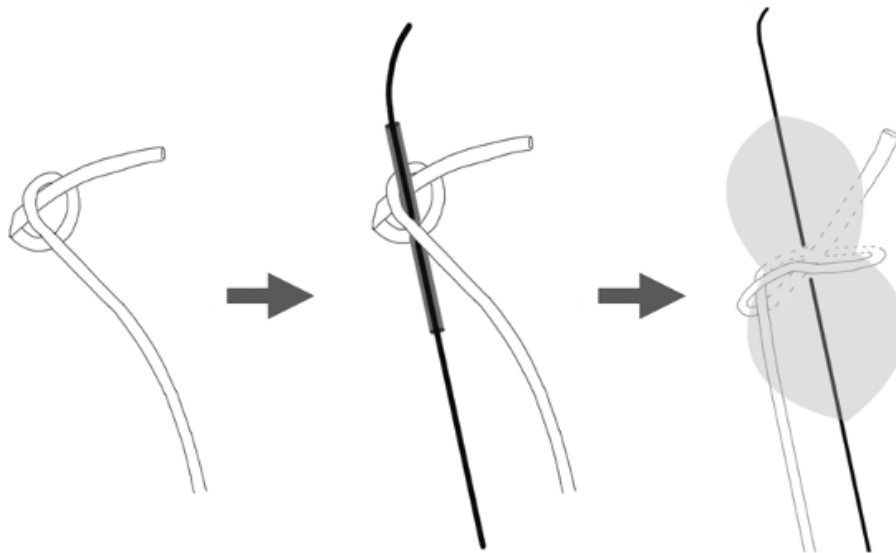
**Conflict of Interest:** None

**Author Contribution:** MT performed literature review and wrote and edited the manuscript. HT, JT, and KY performed the procedure detailed in this case. HT, HY, JT, HK, AO, HK, YK, KK, and KY assisted with the literature review, editing, and revision of the manuscript. The authors have read and approved the final manuscript.

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**Figure 2.** Images captured during the procedure: (a) the knotted catheter (black arrow); (b) a 0.035” guidewire is inserted from the left femoral artery into the knotted loop (black arrowhead); (c) a noncompliant balloon catheter (Gekira®) is delivered by the over-the-wire technique and is inflated from the inside of the knotted loop (white arrow). Thereby, the knotted loop has loosened. A 0.035” guidewire becomes passable through the knotted part of the catheter (white arrowhead). Eventually, the knotted catheter was untangled.



**Figure 3.** Schema showing the procedure. After a guidewire is inserted into the knotted loop, a balloon catheter is delivered using the over-the-wire technique (middle image). Then, after the balloon catheter is inflated, the knot is loosened (right image).

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