Case Report

Percutaneous Retrieval of a Misinserted Pigtail Catheter Straightener during Infra-Renal Abdominal Aortic Stenting: A Case Report

1) *Department of Radiology, Aichi Medical University, Japan*
2) *Department of Vascular Surgery, Aichi Medical University, Japan*

Yuichiro Izumi[1)], Shuji Ikeda[1)], Akira Kitagawa[1)], Yusuke Imaeda[2)], Tetsuya Yamada[2)], Makiyo Hagihara[1)], Toyohiro Ota[1)], Tsuneo Ishiguchi[1)], Kojiro Suzuki[1)]

Abstract

Percutaneous retrieval of an intravascular foreign body is a minimally invasive technique. Using cone-beam computed tomography and the lateral grasp technique, we successfully retrieved a pigtail catheter straightener that had been misinserted into the right common iliac artery. Some examples of catheter straightener retrieval have been reported; however, it is important to take care not to accidentally insert a catheter straightener into a vessel via an angiographic sheath.

Key words: Intravascular foreign body, Percutaneous retrieval, Catheter straightener

(Interventional Radiology 2020; 5: 145-149)

Introduction

Percutaneous retrieval of an intravascular foreign body (IFB) is less invasive compared to surgical retrieval. Since the first case report by Thomas et al. in 1964 [1], forceps, baskets, and snare devices have been used for this purpose [2-5]. Most IFBs are iatrogenic, e.g., wire fragments, catheter fragments, inferior vena cava filters, coils, and stents [2-10]. We report a rare case of misinsertion of a pigtail catheter straightener into the common iliac artery during angioplasty for infrarenal aortic stenosis. The catheter straightener was successfully retrieved using cone-beam computed tomography (CBCT) and the lateral grasp technique.

Case

An 80-year-old man presented with the chief complaint of intermittent claudication. Initial contrast-enhanced computed tomography (CECT) revealed a stenosis due to short-segment dissection of the infrarenal abdominal aorta as the cause of claudication. We decided to treat the stenotic lesion by deploying a stent.

Aortic stenting was performed using an angiographic unit (Artis zee; Siemens, Erlangen, Germany). We inserted a 7-F sheath into the right common iliac artery via the right femoral artery under local anesthesia and performed aortography using a 4-F pigtail catheter (Performa; Merit Medical, UT, USA). A 14 × 60-mm self-expandable stent (SMART stent; Cordis, OH, USA) was then deployed at the infrarenal aortic stenosis. After the stenting procedure, we realized the loss of the pigtail catheter straightener, which appeared to have been misinserted into the aorta (**Fig. 1**). Flat-panel detector images demonstrated the location of the catheter straightener between the aortic stent and the right common iliac artery. Percutaneous retrieval of the catheter straightener was attempted by inserting a 4-F sheath into the left common iliac artery via the left common femoral artery. Subsequent right iliac angiography revealed the catheter straightener as a thin filling defect. A 25-mm snare (Amplatz goose-neck snare; Medtronic, MN, USA) was introduced via a 7-F sheath of the right common iliac artery. However, we could not catch

Received: June 12, 2020. Accepted: August 12, 2020.
doi: 10.22575/interventionalradiology.2020-0018
Correspondence Author: Yuichiro Izumi. E-mail: yizumi@aichi-med-u.ac.jp

either end of the catheter straightener. Subsequently, we performed CBCT to verify the position of the catheter straightener against the vascular wall. It revealed that the ends of the catheter straightener were in close contact with the stent and right common iliac artery but away from the arterial wall at the level of the aortic bifurcation (**Fig. 2A-C**). Accordingly, we abandoned the snare and attempted the lateral grasp technique [11, 12]. We exchanged the 4-F sheath in the left femoral artery for a 7-F sheath. A 4-F cobra catheter (EN catheter; Hanaco, Saitama, Japan), 1.9-F microcatheter (Progreat Σ microcatheter; Terumo, Tokyo, Japan), and 0.016-inch microwire (GT wire; Terumo) were introduced via the 7-F sheath. We advanced the microwire into the right external iliac artery past the lateral side of the catheter straightener at the level of the aortic bifurcation. The distal part of the microwire could be grasped using a 4-mm microsnare (Amplatz goose-neck microsnare; Medtronic) via a 3-F catheter advanced through the same left femoral sheath (**Fig. 3A, B**). The catheter straightener was then snared by the looped microwire at the level of the aortic bifurcation. The whole system, including the catheter straightener, microsnare, and sheath, was then removed from the left femoral artery (**Fig. 3C, D**). Final angiography of the abdominal aorta to the common iliac arteries showed no vessel injuries. Clinically, no findings of distal embolization were observed.

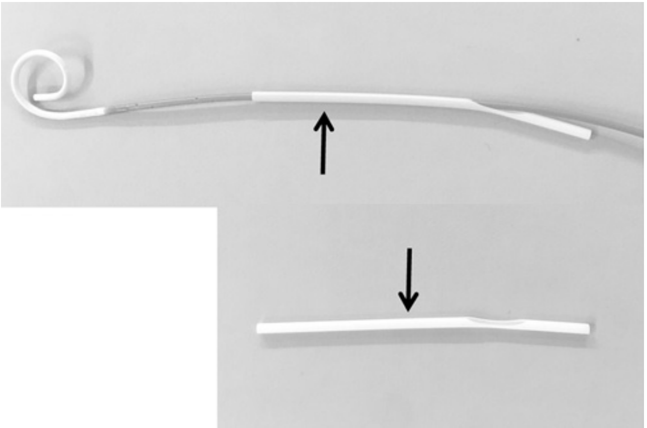

Fig. 1. Digital photos of a pigtail catheter and its straightener.
(A) Pigtail catheter shown along with its straightener and (B) the catheter straightener alone (arrows). The purpose of the catheter straightener is to straighten the tip of the catheter.

Discussion

During stent placement for infrarenal abdominal stenosis caused by segmental aortic dissection, we accidentally inserted the pigtail catheter straightener into the artery. The catheter straightener was located between the aortic stent

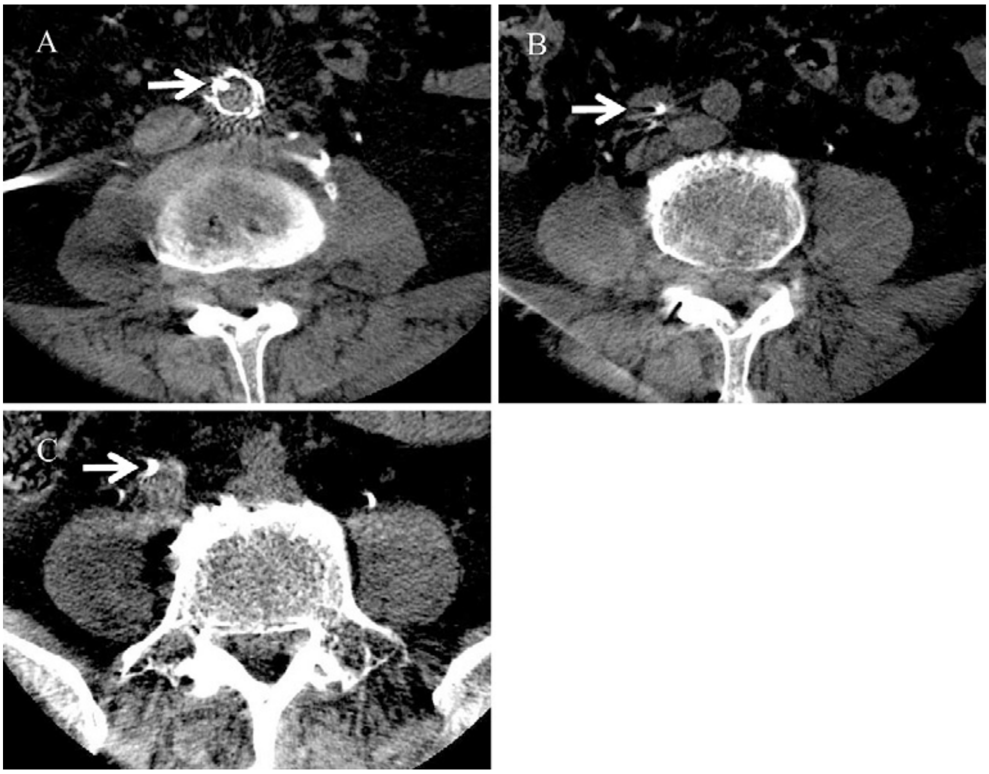

Fig. 2. Cone-beam computed tomography.
A) The catheter straightener (arrow) is tight against the wall of the stent at a level above the aortic bifurcation. B) The straightener (arrow) is positioned away from the lateral side of the wall of the right common iliac artery, at a level just below the aortic bifurcation. C) The straightener (arrow) is positioned tight against the wall of the distal right common iliac artery.

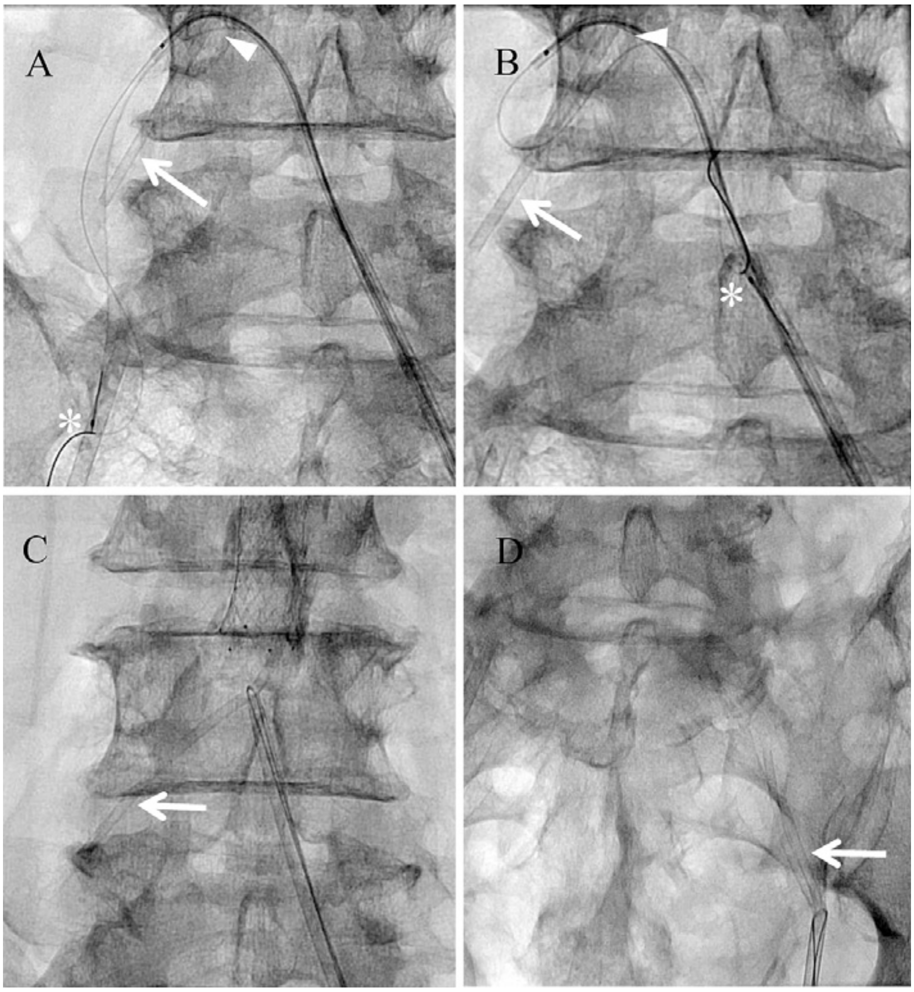

Fig. 3. Abdominal radiographs obtained during retrieval of the catheter straightener.
A, B) A 4-F catheter and a 3-F catheter were passed either side of the catheter straightener (arrows) at the origin of the common iliac artery (arrowheads). A microsnare advanced via the 3-F catheter was used to grasp the tip of a microwire advanced via the 4-F catheter (asterisks). The catheter straightener was then snared with the microsnare and microwire.
C, D) The microsnare and microwire together with the catheter straightener (arrows) were pulled back to the tip of the sheath in the left common iliac artery. The whole system was then removed by way of the left femoral approach with manual compression.

and the common iliac artery and subsequently retrieved.

Goose-neck snares have been used in retrieval of various types of IFBs and have often been successful without the use of any other device [4, 6, 9]. If IFB does not have a free end, a pigtail catheter can be used to reposition the IFB so a free end can then be retrieved by a goose-neck snare [2, 9, 13]. However, we did not try this technique, because displacement of the IFB might lead to migration to the lower extremities or vessel injuries. The lateral grasp technique is an effective alternative for IFB retrieval in which a wire and snare are passed on either side of the IFB, and the wire is then advanced through the snare loop [11, 12]. Schematic drawings of the lateral grasp technique of our case are shown in **Fig. 4**. We avoided the lateral grasp technique through the right femoral approach because the right common iliac artery was tortuous and had severe calcification. If we tried to retrieve from the right side, i.e., had the IFB been pulled toward to the ipsilateral femoral artery, it might have caused arterial wall injuries.

In our case, CBCT was useful for evaluating whether or not the catheter straightener was in close proximity to the vascular wall and gauging the gap required for passage of the microwire between the catheter straightener and the vascular wall. In addition, CBCT did not require the patient to be transferred from the angiographic room to the CT room, which would have increased the risk of migration of the catheter straightener to the lower extremities and increased the procedure time. In the report by Barbiero et al., a misinserted catheter straightener of a 5-F pigtail catheter could not be detected in fluoroscopic images but was detected on CECT 5 days after endovascular stent-graft deployment for an abdominal aortic aneurysm. They used digital subtraction angiography and ultrasound to locate the catheter straightener, which was retrieved 39 days after deployment of the

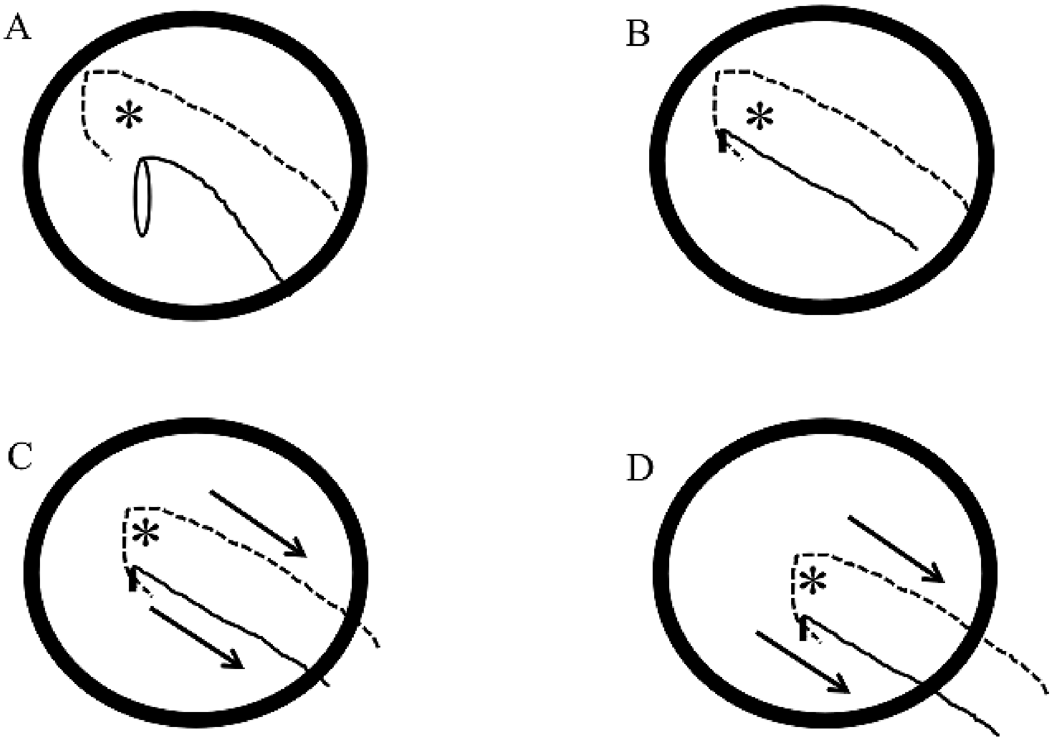

Fig. 4. Schematic drawings of the lateral grasp technique.
A broad ring indicates the cross-section image of the common iliac artery. A, B) A microwire (dotted line) was passed through the lateral side of the catheter straightener (asterisk). A snare and a catheter (solid line) grasped the tip of the microwire from the other side. C, D) The whole system was pulled toward the left femoral artery (arrows), thereafter the system was removed.

stent graft [14]. In our case, the use of CBCT made the retrieval quick and safe.

Large-diameter sheathes are used to deploy stents or stent grafts for stenoses or aneurysms of the aorta, and the pigtail catheter straightener might be misinserted into the aorta. Care should be exercised when inserting a pigtail catheter with a catheter straightener through a large diameter sheath.

As reports of retrieval of this type of IFB are few, more cases should be accumulated. In conclusion, we successfully conducted percutaneous retrieval of a pigtail catheter straightener using the lateral grasp technique.

Conflict of interest: The authors declare that they have no conflicts of interest to report.

References

1. Thomas J, Sinclair-Smith B, Bloomfield D, et al. Non-surgical retrieval of a broken segment of steel spring guide from the right atrium and inferior vena cava. Circulation 1964; 30: 106-108.
2. Uflacker R, Lima S, Melichar AC. Intravascular foreign bodies: Percutaneous retrieval. Radiology 1986; 160: 731-735
3. Grabenwoeger F, Dock W, Pinterits F, et al. Fixed intravascular foreign bodies: A new method for removal. Radiology 1988; 167: 555-556.
4. Cekirge S, Weiss JP, Foster RG, et al. Percutaneous retrieval of foreign bodies: Experience with the nitinol goose neck snare. JVIR 1993; 4: 805-810.
5. Sheth R, Someshwar V, Warawdekar G. Percutaneous retrieval of misplaced intravascular foreign objects with the dormia basket: An effective solution. Cardiovasc Intervent Radiol 2007; 30: 48-53.
6. Egglin TKP, Dickey KW, Rosenblatt M, et al. Retrieval of intravascular foreign bodies: Experience in 32 cases. AJR 1995; 164: 1259-1264.
7. Gabelmann A, Kramer S, Gorich J. Percutaneous retrieval of lost or misplaced intravascular objects. AJR 2001; 176: 1509-1513.
8. Carroll MI, Ahanchi SS, Kim JH, et al. Endovascular foreign body retrieval. J Vasc Surg 2013; 57: 459-463.
9. Ayx I, Goessmann H, Hubauer H, et al. Interventional removal of intravascular medical devices: Methods and technical success. Fortschr Röntgenstr 2016; 188: 566-573.
10. Goland J, Yasuda E, Monteverde M, et al. Catheter fragment retrieved from an arterial branch of the right middle cerebral artery. Surg Neurol Int 2019; 10: 129.
11. Sochman J, Peregrin JH. Potential use of a combined extractor in intravascular procedures. Cardiovasc Intervent Radiol 2007; 30: 750-753.
12. Woodhouse JB, Uberoi R. Techniques for intravascular foreign body retrieval. Cardiovasc Intervent Radiol. 2013; 36: 888-897.
13. Auge JM, Oriol A, Serra C, et al. The use of pigtail catheters for retrieval of foreign bodies from the cardiovascular system. Catheterization and Cardiovascular Diagnosis 1984; 10: 625-628.
14. Barbiero G, Cognolato D, Polverosi R, et al. Percutaneous retrieval of a radiolucent foreign body from an EVAR device by combining different image modalities. Cardiovasc Intervent Radiol 2009; 32: 785-788.