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CASE REPORT

A broken, O-shaped catheter during coronary angiography: Percutaneous retrieval via femoral approach using a wire-balloon technique

Koroner anjiyografi esnasında kırılarak "O" şeklini almış kateter: "Tel-balon" tekniği ile femoral yaklaşımın kullanıldığı perkütan yolla dışarı alınması

Kerim Esenboğa, M.D., Demet Menekşe Gerede Uludağ, M.D., Mustafa Kılıçkap, M.D., Ali Timuçin Altın, M.D.

Department of Cardiology, Ankara University Faculty of Medicine, Ankara, Turkey

Summary– Entrapment of equipment during coronary angiography is an uncommon but serious complication of invasive coronary procedures. Percutaneous extraction of trapped material is the accepted method of treatment. This case report is a description of the extraction of a diagnostic catheter retained as a result of collapsing into an O-shape in the right common iliac artery while trying to engage the tip of the catheter with the right coronary ostium. This rationale and unique wire-balloon method, requiring no specifically designed device, can be simply and safely performed in similar cases.

Özet– Koroner anjiyografi esnasında kullanılan malzemelerin hapsolması invaziv koroner işlemlerin nadir görülen fakat ciddi komplikasyonlarından biridir. Perkütan yolla sıkışmış malzemelerin çıkarılması kabul görmüş tedavi yöntemidir. Biz de burada koroner anjiyografi esnasında sağ koroner artere selektif olarak oturmaya çalışırken sağ arteria iliaca comminis'te "O" şeklinde kıvrılarak hapsolan diyagnostik kateterin çıkarılması işlemini sunuyoruz. Rasyonel ve özgün olan ve spesifik her hangi bir malzeme gerektirmeyen bu tel-balon metodu benzer olgularda basit ve güvenilir şekilde uygulanabilir.

As a result of the increasing number of coronary angiography procedures, the frequency of related complications has also increased. Entrapment of equipment during coronary angiography is an uncommon but serious complication of invasive coronary procedures that may lead to adverse events.[1] One potential complication is the entrapment of equipment in the vessel. In such a situation, percutaneous extraction of the trapped material is the accepted method of treatment and can be an alternative to surgery. Presently described is the extraction of a diagnostic catheter retained as a result of folding over into an O-shape in the right common iliac artery while trying to engage the tip of the catheter with the right coronary ostium. A wire-balloon technique was used to extract the broken catheter.

CASE REPORT

A 71-year-old female patient with hypertension and type 2 diabetes mellitus was admitted due to non-ST segment myocardial infarction. Coronary angiography was performed. An 11-cm, 6-F sheath (Avanti Sheath Introducer; Cordis Corp., Santa Clara, CA, USA) was inserted into the right femoral artery. While trying to engage the tip of the catheter at the right coronary ostium, the catheter collapsed into an O-shape in the right common iliac artery (Fig. 1). Although there was no fragmentation of any part of the catheter, severe twisting was observed at some points.

First, an 8-F sheath was placed in the left femoral artery. Following an intravenous injection of 7000 units of heparin to prevent a thrombotic compli-

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Correspondence: Dr. Kerim Esenboğa. Anakara Üniversitesi Tıp Fakültesi, Kardiyoloji Anabilim Dalı, Cebeci Hastanesi Kalp Merkezi, Cebeci, 06590 Ankara, Turkey.
Tel: +90 312 - 312 52 51 e-mail: kerimesenboga@yahoo.com

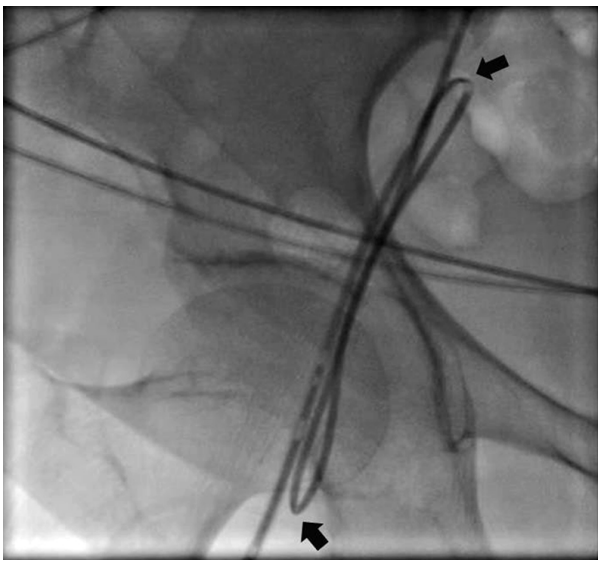

Figure 1. The broken, O-shaped, folded catheter is seen in the right common iliac artery.

Figure 2. The black arrow indicates the balloon catheter used to retrieve the broken catheter.

cation, such as a thrombus formation inside the catheter, retrieval was attempted several times with a snare wire (FSF-21-300; Cook Medical, Inc., Bloomington, IN, USA). The plan was to unfold the catheter by pulling the free tip down to the left common iliac artery. While we caught the catheter, we were unable to bring the free tip of the catheter into the sheath in the left groin.

It was then decided to trap the free tip by introducing a 0.014-in Choice guidewire (Boston Scientific Corp., Marlborough, MA, USA) and a balloon catheter (Maverick 1.5x20 mm; Boston Scientific Corp., Marlborough, MA, USA). An 8-F Judkins right 4 (JR4) guide catheter (Boston Scientific Corp., Marlborough, MA, USA) was placed near the doubled-over catheter. After achieving a coaxial position for the proximal tip of the guiding catheter and the free tip of the collapsed catheter, the 0.014-in intermediate guidewire was advanced through the JR4 guiding catheter 10 cm into the folded-over catheter. The balloon catheter was passed 5 cm through the broken catheter to the free tip and was inflated to 8 atm (Fig. 2) and we were able to trap the free tip.

We then pulled the guiding catheter and the balloon catheter down until the loop of the catheter unfolded in the right common iliac artery. After deflating the balloon, the guiding catheter, the balloon catheter, and the guidewire were pulled out through the sheath in the left femoral artery. Finally, the now-unfolded catheter was removed through the sheath located in the right femoral artery. The patient provided written, informed consent and this report was approved by the local ethics committee and was performed in accordance with the Declaration of Helsinki.

DISCUSSION

Foreign bodies in the vascular system are dangerous because of the possibility of infectious or thromboembolic complications. There are some important issues to consider in order to prevent the entrapment of catheters during a coronary angiography procedure. In the presence of severe tortuosity, a long sheath is useful to prevent the kinking or malformation of materials, particularly a guiding catheter, due to its soft structure. Additional precautions include continuous monitoring of blood pressure during catheter maneuvers with the awareness that a loss of pressure may indicate kinking, avoiding aggressive manipulation of the catheter, careful manipulation of 0.038-in guidewires inside catheters, and using radial access as an alternative. In spite of all these measures, if entrapment of materials inside the vasculature occurs, extraction from the vessel can be achieved percutaneously via specifically designed devices. Several methods have been used successfully to extract fragments from a vessel, including tip-deflecting wires, snare loops, helical baskets, grasping forceps, and balloon catheters.[2,3]

The wire snare loop, first introduced in 1969, is the most commonly used method.[4] This method is thought to be the safest, but the technique is difficult and requires a lot of time. Furthermore, the success rate is low if the catheter fragment is located in the cardiac chambers.[5,6] It should be emphasized that if there is no free end to loop over, all of the classic techniques can fail in the retrieval of foreign bodies.

A snare loop is usually the first choice, but if a specific tool designed for the retrieval procedure is not available, it becomes necessary to decide whether to pursue a surgical approach or to perform something else percutaneously with the existing equipment. If an emergency percutaneous coronary intervention is required in a patient with acute coronary syndrome, the procedure can be continued through either a radial or a contralateral femoral approach, and if the entrapped catheter is very close to the femoral region, it can be removed via a minor surgical intervention. A catheter may occasionally fragment during a retrieval procedure and it can be risky for it to remain in the aorta, so it is useful for less-experienced operators to remember that surgery is always an option for material to be retrieved, especially if a minor surgical procedure will be sufficient.

A trapping technique has been used to retrieve a ruptured and entrapped coronary balloon catheter in left main coronary artery.[7] There are case reports of successfully using a similar method in areas other than the coronary tree after a snare loop approach had failed.[8,9] To our knowledge, the current case represents the first experience reported in the literature of extraction of a broken catheter using this wire-balloon technique.

Percutaneous procedures for the retrieval of catheter fragments in the vascular system are safe and simple compared with a surgical approach. We think that this rationale and unique wire-balloon method, requiring no specifically designed device, can be simply and safely performed in similar cases.

**Supplementary video files associated with this article can be found in the online version of the journal.*

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REFERENCES

1. Minami Y, Meguro K, Shimohama T, Yanagisawa T, Kakizaki R, Tojo T, et al. Successful retrieval of entrapped balloon with optical coherence tomography guidance. JACC Cardiovasc Interv 2016;9:2070–1.[CrossRef]
2. Woodhouse JB, Uberoi R. Techniques for Intravascular Foreign Body Retrieval. Cardiovasc Intervent Radiol 2013; 36:888–97. [CrossRef]
3. Schechter MA, O'Brien PJ, Cox MW. Retrieval of iatrogenic intravascular foreign bodies. J Vasc Surg 2013;57:276–81.
4. Curry JL. Recovery of detached intravascular catheter or guide wire fragments. A proposed method. Am J Roentgenol Radium Ther Nucl Med 1969;105:894–6. [CrossRef]
5. Steinberg D, Satler LF, Pichard AD. Snare Extraction of a Fractured Coronary Stent in a Saphenous Vein Graft. Catheter Cardiovasc Interv 2007;70:241–3. [CrossRef]
6. Koseoglu K, Parildar M, Oran I, Memis A. Retrieval of intravascular foreign bodies with goose neck snare. Eur J Radiol 2004;49:281–5. [CrossRef]
7. León Jiménez J, Roa Garrido J, Camacho Freire SJ, Díaz Fernández JF. Trapping as retrieval technique to resolve a ruptured and entrapped coronary balloon catheter. Catheter Cardiovasc Interv 2017;90:773–6. [CrossRef]
8. Kim JY, Yoon J, Jung HS, Kim WJ, Yoo BS, Lee SH, et al. Broken guidewire fragment in the radio-brachial artery during transradial sheath placement: percutaneous retrieval via femoral approach. Yonsei Med J 2005;46:166–8. [CrossRef]
9. Candemir B, Polat K, Canbay A. Percutaneous extraction of a short, 0.038-inch guide wire retained in the right common iliac artery. Turk Kardiyol Dern Ars 2008;36:479–81.

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