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CASE REPORT / OLGU SUNUMU

Removal of a catheter kinked in the radial artery by anchoring the distal part of the catheter with a needle via transcutaneous approach

Radiyal arter içinde kıvrılmış kateterin brakiyal arter içinde transkütan yolla bir iğneyle delinip "gerdirilerek düzeltilip" çıkarılması

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Summary– Presently described is a case in which a catheter became twisted in the radial artery during coronary angiography and was removed after stretching it with an external needle tip inserted into the brachial artery. A 77-year-old male patient had undergone coronary artery bypass surgery 10 years earlier and implantation of a permanent pacemaker 2 years prior. He had presented with typical angina and a regional wall motion defect had been observed on echocardiography. Coronary angiography was scheduled. A 5-F sheath (Terumo Corp., Tokyo, Japan) was inserted, and angiography via the right radial artery was initiated. Soon after, the 5-F diagnostic catheter became twisted due to subclavian artery tortuosity. The fold in the catheter could not be flattened with 0.038-mm or 0.035-mm guidewires or rotation movements. With scopy assistance, a 21-gauge, 40-mm, green needle was inserted percutaneously into the catheter through the brachial artery. So, the catheter was stretched and the kink could then be corrected and the catheter was removed from the sheath. Subsequent Images revealed no trauma or deformity to the brachial or radial arteries. It was not possible to straighten the fold until the distal portion of the catheter was fixed in place and stretched. A catheter can be transdermally anchored with a needle if it becomes kinked in the upper extremity vessels. This is a simple and reliable method that is a traumatic.

Özet– Bu yazıda koroner anjiyografi sırasında radiyal arter içinde kıvrılıp düğümlenmiş bir kateterin brakiyal arter içinde dıştan bir iğne ucu ile yakalanıp gerdirilerek düzeltilip çıkarılmasına ilişkin bir olgu sunuldu. Yetmiş yedi yaşında erkek hasta 10 yıl önce koroner arter baypas greft (CABG) ameliyatı, iki yıl önce kalıcı kalp pili implantasyonu geçirmiş. Tipik göğüs ağrısı, ekokardiyografide bölgesel hareket kusuru olduğu için koroner anjiyografiye alındı. 5Fr radiyal kılıf sağ radiyal artere yerleştirildikten sonra işleme başlandı. 5Fr anjiyografik kateter subklavyen arterinin tortiyozitesi nedeniyle işleme başladıktan hemen sonra kıvrılıp düğümlendi. 0.038 ve 0.035 inç çeşitli kılavuz teller kullanılarak, ters ve düz rotasyon hareketleriyle kıvrılma düzeltilemedi. Kateterin düğümünü distal kısımdan sabitleyip gerdirmeyince düzeltmek mümkün olmadı. Bu amaçla brakiyal bölge sterilize edildi ve lokal anestezi yapıldı. Skopi altında bir adet yeşil enjektör iğne ucunu brakiyal arteri de delerek transkütan yolla kateterden geçirdik. Böylece kateteri gerdirebildik. Kıvrımı düzeltip kateteri kılıftan çıkardık. Daha sonra aldığımız görüntülerde brakiyal ve radiyal arterde travmaya ve deformasyona rastlamadık. Kateter distal ucundan sabitlenip gerdirilmedikçe kateterdeki bükümü düzeltmek mümkün değildi. Kateter üst ekstremite damarlarında bükümlendiğinde bir iğneyle tespit edilebilir. Bu basit ve güvenilir travmatik olmayan bir yöntemdir.

Catheter fractures or kinks, which are frequently encountered in catheterization laboratories and make it impossible to perform the procedure, are iatrogenic, and frustrating complications which the physicians should promptly find a solution. Rigid guide wires and rotational movements are frequently used in this type of complications. If these manipulations fail, then a sheath is inserted into another artery, and with the help of a snare the kink can be straightened, and then the catheter can be removed.[1–8]

In this article, we present a case where the distal end of the kinked, and knotted catheter in the brachial artery observed during coronary angiography was hooked up, straightened, and then removed with the

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aid of a green needle tip. Thus In this way, it was possible to remove the crimped catheters by stretching from both ends.

CASE REPORT

A 77-year-old male patient underwent coronary artery bypass graft (CBAG) surgery 10 years ago and a permanent pacemaker was inserted two years previously. In echocardiography, left ventricular systolic function was slightly decreased, ejection fraction was 50%, besides mild left ventricular enlargement, inferior and lateral wall contraction deficits, and mild mitral regurgitation were detected. Because of typical chest pain, the patient was taken to coronary angiography unit after informed consent was signed. In the coronary angiography of the previous year, the left internal mammary artery (LIMA) graft was found to be patent, and interventions were applied targeting the critical lesions in the circumflex artery (CX) and right coronary artery (RCA).In addition, the presence of contractile defects on the inferior wall of the heart and the absence of ischemia in the anterior wall suggested the presence of non-LIMA grafts and / or CX, RCA lesions. Therefore, the right radial and femoral artery approach instead of left radial, and femoral routes were chosen as the access paths.

After insertion of the Terumo® 5F Glidesheath™ radial sheath, and cannula into the radial artery, angiography was started using a PendraCare® 5F JL 4.0 angiography catheter. Shortly after initiation of the procedure, the catheter crimped in the radial artery due to the limitation of the procedure possibly caused by subclavian artery tortuosity. The kink could not be corrected by performing clockwise and reverse rotation movements with the moderately, and very rigid guide wires. Then the distal part in the brachial artery was tried to be straightened by compressing it with the cuff of the sphygmomanometer, but this manipulation also failed.

Abbreviations:

CX	*Circumflex artery*
LIMA	*Left internal mammary artery*
RCA	*Right coronary artery*

We tried to pull up the catheter by inserting the needle through the skin, and hooking its distal part in the brachial artery. Then we anchored distal part of the catheter to the skin of the brachial region, and tried to straighten the catheter to no avail. First we used the insulin injector tip (Genject® Brown 26 gauge 18mm needle). We managed to picked-up the catheter by perforating its part in the brachial artery through percutaneous puncture, but the needle could not resist the pulling force, and kinked. Then, we caught and stretched the distal part of the catheter in the brachial artery using a thicker green tip injector needle (Genject® 21 38 mm green needle) used for normal IM, and IV injections. We managed to remove the curled part from the sheath. We pulled up, and extracted the radial sheath immediately, wrapped the forearm and the arm with an elastic bandage (Figs. 1, 2).

Three hours later, we repeated coronary angiography through the left radial artery, and we did not detect any critical stenosis in the coronary artery and graft vessels, and any complications such as dissection, arteriovenous fistula, hematoma, which disrupted the integrity of the radial and brachial arteries. On the following day, a slight ecchymosis was seen on the brachial region. Any hematoma, pain, or significant complaints were not observed in the patient (Fig. 1). Doppler ultrasonography performed one month later did not reveal any complication, such as dissection, rupture, arteriovenous fistula and, furthermore, radial artery was patent.

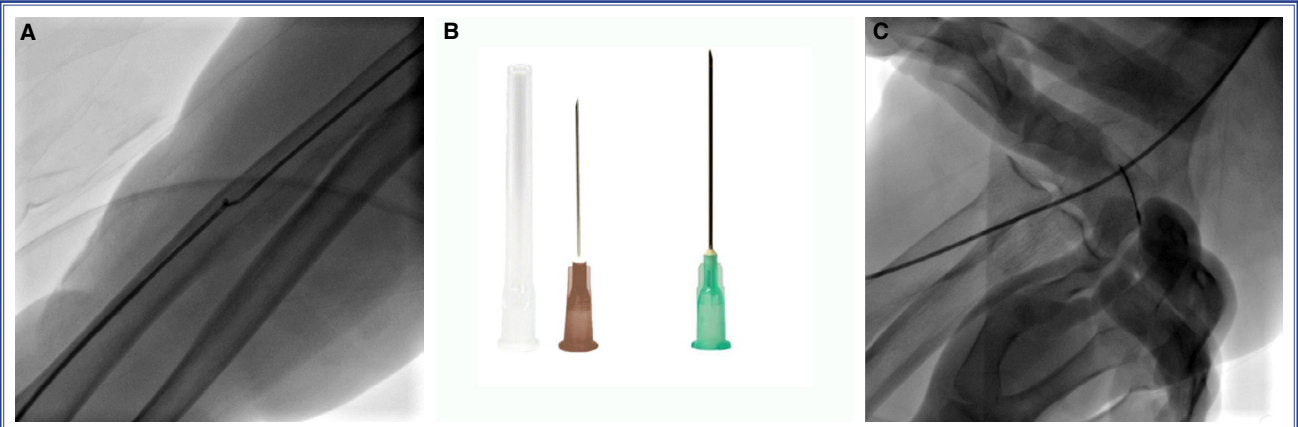

Figure 1. (A) The image of the folded catheter in the radial artery **(B)** Left. A 26G 18 mm needle, Right: 21 G 38 mm needle **(C)** Picking up the catheter in the brachial artery with a needle inserted through the skin.

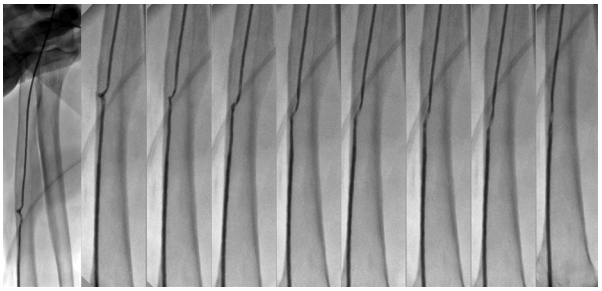

Figure 2. The steps of the removal process of the folded catheter entrapped in the brachial artery. The distal part of the catheter is caught with a needle, stretched from its both ends to straighten the fold.

DISCUSSION

In our web-based search, we found case reports related to removal of kinked, knotted catheters and guidewires by pulling them out with a snare delivered into the femoral artery, by sending another catheter through the sheath and forming a balloon in the curled catheter or through its external compression by hand. However, we did not find any publication or case report concerning a method for removing the kinked catheter by anchoring the distal part of the catheter to the skin using a needle.[1–8]

When catheter bends, and knots are seen in the aorta, correcting this problem by using 0.038 guidewire is often possible due to the large diameter of the aorta. In our laboratory, we have encountered similar conditions hundreds of times, and we have been able to correct this complication without applying any additional invasive and / or surgical methods.

In contrast to the twisting of the catheter happened in the aorta, in this case, the kinking in the proximal part of the catheter within the radial artery, inability to enter into the aorta- i.e. a larger space- prevented the removal of the catheter. Retraction of the catheter, and correction of the fold using a radial sheath was desired, but the sheath could not resist the force of extraction. Since the withdrawal of the catheter with the sheath may create a large defect in the radial artery, this option was not used.

In addition, the cuff of the sphygmomanometer was used in order to compress, and straighten the catheter in the brachial artery by grasping it from its

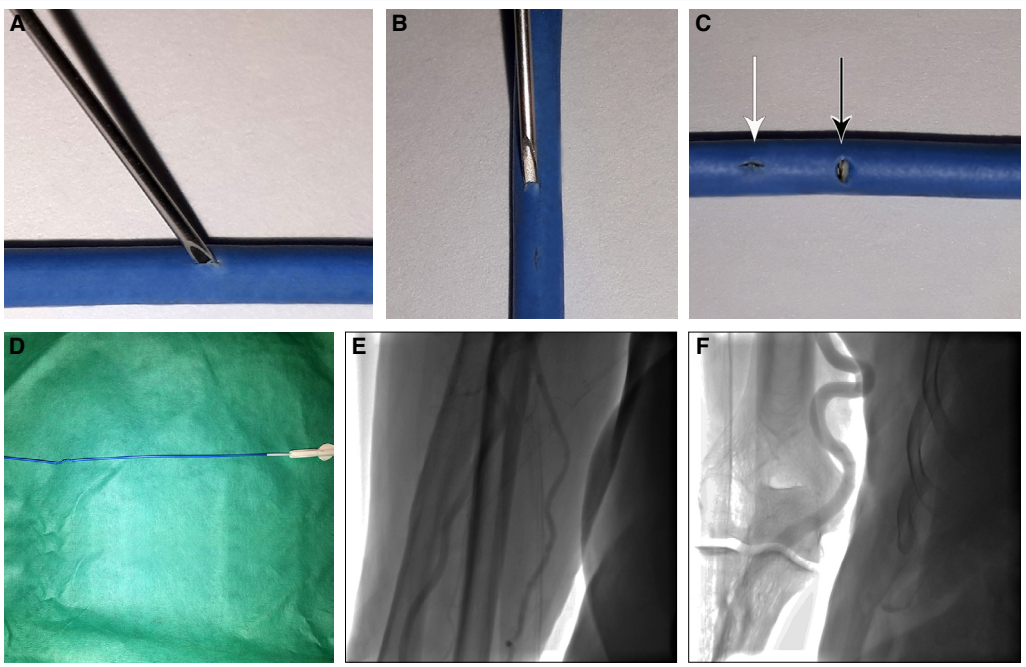

Figure 3. This illustration shows holes on diagnostic catheter formed along the direction of the needle tip **(A)** Puncturing the catheter so that the sharp end of the needle tip lies parallel to the catheter axis. **(B)** Hole punching with a needle perpendicular to the catheter axis. **(C)** When a hole is opened parallel to the catheter axis (white arrow), as we did, the resistance of the catheter is not impaired. Appearance of the hole opened by the needle inserted perpendicular to the axis of the catheter (black arrow) **(D)** Image of the extracted broken catheter. **(E)** Image of radial artery after catheter removal, **(F)** Image of brachial artery after catheter removal. No sign of trauma, perforation or rupture which disrupts the integrity is observed in both arteries.

distal end. The cuff wrapped around the brachial region was inflated up to 280 mm Hg to stabilize the distal part of the catheter with no avail.

In some of our cases 6Fr sheath was used in brachial artery for coronary or peripheral interventions, and the sheath was removed five hours later, Even in these cases, any complication has not been observed in the brachial artery. This finding encouraged, and assured us that temporary puncture of the brachial artery with a much thinner needle than the 6Fr sheath would not cause a permanent injury to the brachial artery.

Finally, we percutaneously punctured distal part of the catheter in the brachial artery with a needle, and then pulled out, and straightened its proximal part before its successful removal. We pricked the catheter by holding the curved tip of the needle parallel to the axis of the catheter, so as not to cut the catheter. Thus, it was thought that we could prevent the needle tip from rupturing the catheter as if it was a scalpel Fig. 3).

Three hours after the procedure, since the patient could not lie down in supine position for long periods of time, intervention through femoral artery was not appropriate, so the angiography was repeated through the left radial artery and the right brachial and radial arteries were visualized.

If we had not succeeded in holding and straightening the catheter in the brachial artery with a needle, we would deeply sedate the patient who could not lie on his back, and if necessary we would try to remove the catheter through femoral route by holding its distal end, and straightening the catheter with a snare under mechanical ventilator support in case of need. If we failed with this procedure, we would cut down the brachial artery to pick up and remove the catheter.

Limitations

During the catheter extraction procedure, we did not injure any nerve or vein with a needle. However we could puncture nerve and veins adjacent to the brachial artery with our needle which could not be seen under the fluoroscope. We have been very hesitant about this, but the experience we gathered with the punctures of the brachial artery sheath has encouraged us to perform this procedure.

Conclusion

If catheter bends are encountered in the upper extremity vessels, then the distal part of the kinked catheter can be percutaneously punctured, picked up from its brachial segment, straightened, and removed using tip of a needle. We believe that this method can be applied safely in other cases.

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