

An Extraction Complication: Extreme Twisting and Its Management

Bir Ekstraksiyon Komplikasyonu: Aşırı Burulma ve Yönetimi

A 62-year-old male patient with a cardiac resynchronization therapy-defibrillator device implanted in 2012 was referred for extraction of the device due to pocket infection after a generator replacement procedure. The extraction procedure was performed under deep sedation using midazolam, propofol, and fentanyl. Continuous oxygen supply, oxygen saturation level monitoring using pulse oximetry, arterial pressure monitoring using an arterial line, a venous line for drugs

CASE IMAGE OLGU GÖRÜNTÜSÜ

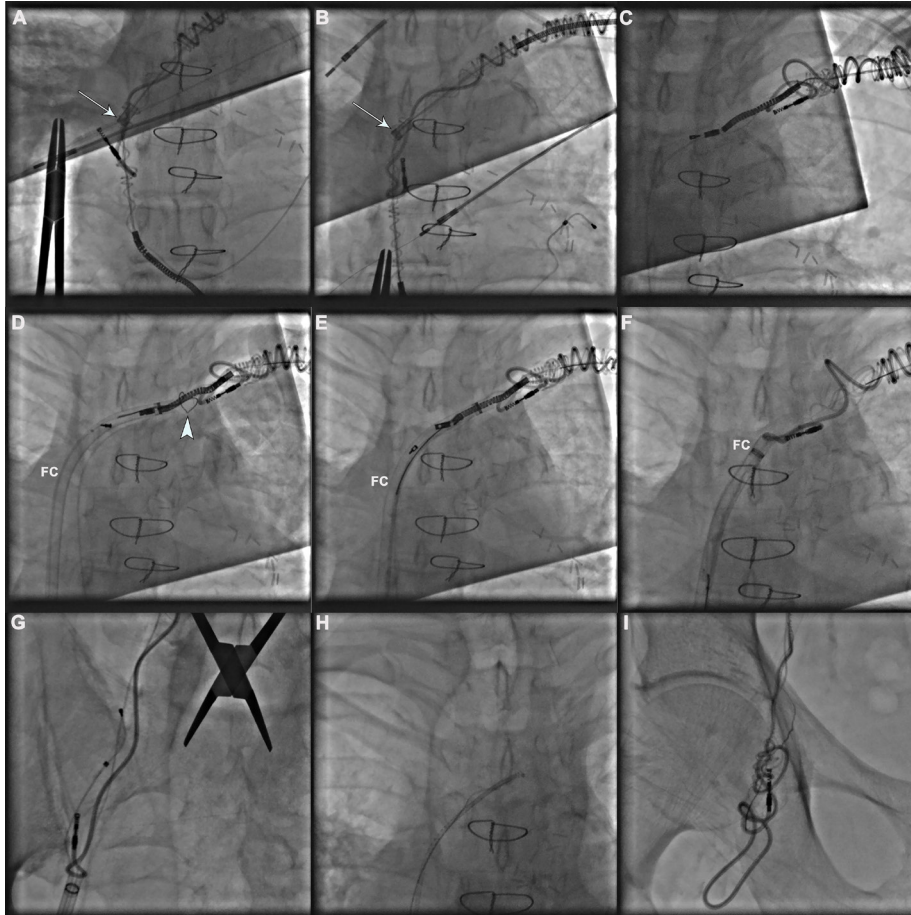


Figure 1. Extraction procedure. Twisting of the atrial and coronary sinus leads around the defibrillator lead and the dilator sheath (arrow) (Panel A). Advanced twisting of the leads and entrapment of the dilator sheath (arrow) (Panel B). Dislocated atrial and ventricular leads in the innominate vein (Panel C). Snaring (arrowhead) (Panel D) and extraction (Panel E) of the defibrillator lead. Snaring (Panel F) and pulling down (Panel G) of the remaining two leads with the relief of proximal segments (Panel H). Stacked atrial and coronary sinus lead fragments in the femoral vein (Panel I). FC: FlexCath steerable catheter.

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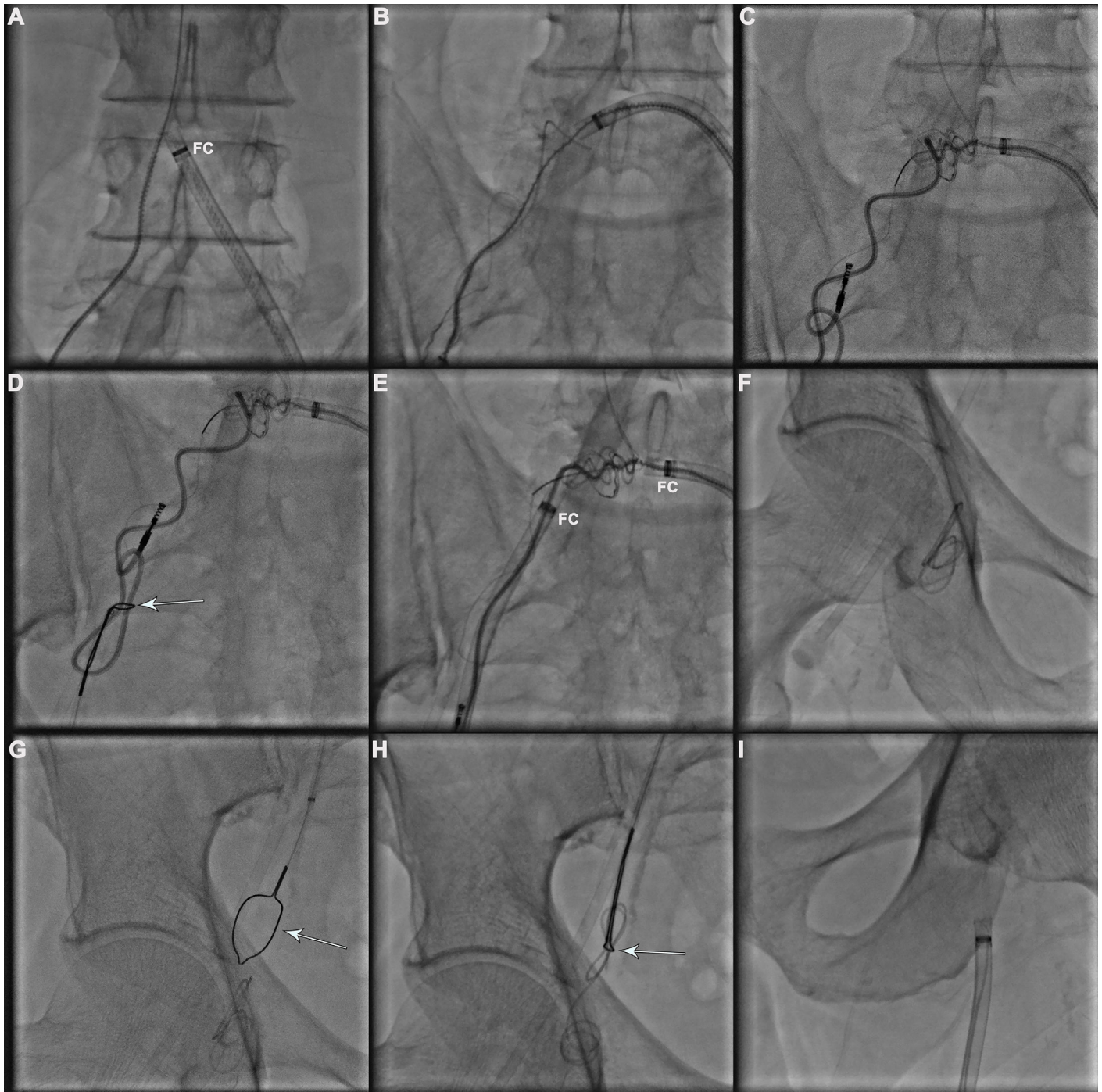


Figure 2. Extraction procedure (continued). Snaring of the free segment of the atrial lead in the inferior vena cava (Panel A) and advancement of the steerable sheath toward the contralateral common iliac vein (Panel B). Stacked leads at the iliac bifurcation (Panel C). Snaring (arrow) of the atrial lead from the right side (Panel D). Near-kissing steerable sheaths with stacked lead fragments between them (Panel E). Remaining coronary sinus lead fragment in the right femoral vein (Panel F). Retrograde advancement of the snare (arrow) from the left side (Panel G) with grasping (arrow) of the lead fragment (Panel H). The procedure was completed with the removal of the steerable sheath (Panel I). FC: FlexCath steerable catheter.

and liquids, and an on-site transthoracic echo machine for frequent monitoring of cardiac function and structures were obtained. Surgical backup was always available and ready for an emergent operation. After failed attempts using simple and locking stylets, a 13F first-generation rotating mechanical dilator sheath (Evolution[®], Cook Medical) was advanced

over the right ventricular dual-coil, passive-fixation defibrillator lead. However, incremental twisting of two electrodes (right atrial active fixation and left ventricular passive fixation) around the defibrillator lead and the dilator sheath occurred with each triggering of the device due to only rightward and spiral movement of the body and tip of the dilator

sheath (Figure 1, Panel A). Finally, extreme twisting of leads with entrapment of the dilator sheath was seen in the venous system (Figure 1, Panel B). After perpendicular cutting of the outer sheath using scissors like cutting a coronary sinus guiding sheath, manual leftward movement of the dilator sheath from the handle, opposite to the extraction direction, was the first attempt to relieve the entrapped sheath. During hard movements of the entire system, all three electrodes were dislocated from their implanted sites in the heart. The right atrial and right ventricular leads are stuck in the innominate vein, whereas the left ventricular lead is in the proximal body of the coronary sinus (Figure 1, Panel C). Since extraction from the implanting vein is now impossible, proximal portions of the three leads with their inner styles were cut from the body. As a bailout procedure, a 15F steerable sheath (FlexCath Advance™, Medtronic) and a 15 mm snare catheter (AndraSnare, Andramed) were advanced through the right femoral vein. First, the right ventricular defibrillator lead was snared from the distal defibrillator coil and pulled down with the advancement of the steerable sheath and extracted (Figure 1, Panels D and E). Next, using the same steerable sheath and snare, the right atrial and left ventricular leads were snared from their body. Both leads were pulled down with the opening of twisted segments in the innominate vein (Figure 1, Panels F, G, and H). However, only the distal portion of the left ventricular lead could be extracted from the femoral vein. The distal part of the right atrial lead and the remaining portion of the left ventricular lead are stuck in the femoral vein with the distal part of the right atrial lead in the inferior vena cava (Figure 1, Panel I). The free-floating distal part of the right atrial lead was snared using another steerable sheath (FlexCath Advance™) and a snare (15 mm AndraSnare) from the left femoral vein and pulled inside of the steerable sheath with the advancement of the steerable sheath from the left common iliac vein to the right common iliac vein (Figure 2, Panels A and B). Nevertheless, both leads are stacked at the bifurcation level (Figure 2, Panel C). Previously used steerable sheath and the snare were re-advanced from the right femoral vein to grasp the distal part of the right atrial lead and straighten the stacked segment with the aim of extraction (Figure 2, Panel D). Both steerable sheaths were positioned end to end with the stacked segment between them (Figure 2, Panel E). Forced last pulling of the snared lead from the right femoral site resulted in the extraction of the right atrial lead with the remaining portion of the left ventricular lead in the right femoral vein (Figure 2, Panel

F). Further advancement of the steerable sheath from the left femoral site to the right common iliac vein allowed the snare to grasp the lead segment (Figure 2, Panels G and H). Thus, final extraction could be performed with the removal of the steerable sheath (Figure 2, Panel I).

See also the full-length video of the extraction procedure (Video*).

When handling cases with two or more electrodes, outer sheath use may help the operator to dissect fibrous tissue without rotational movement, which usually prevents twisting of the leads and entrapment of the mechanical rotator. Moreover, if possible, a new generation of rotational sheaths with bidirectional rotational movements should be used to prevent unidirectional rotations, which could result in twisting of the leads over both the other leads and the rotational sheath. When using an old-generation rotational sheath with unidirectional movement as in the current case, do not pull the trigger of the sheath repeatedly; instead, watch for lead movements during triggering, and stop triggering if any twisting of the lead is observed.

Although the way of extracting the leads is the transvenous route, the operator may require surgical support when the leads cannot be extracted from the implanted vein due to the extensive fibrosis (especially for the coronary sinus leads) and lack of suitable tools such as large-bore catheters, snares, deflectable catheters, etc. in a femoral bailout procedure. Furthermore, the operator may not be familiar with these tools. Hemodynamic instability and/or major complication during the procedure should draw the attention of the operator to stop the procedure and consult the surgery.

*Video le associated with this article can be found in the online version of the journal.

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