VIA MEDICA

CASE REPORT

Cardiology Journal
2008, Vol. 15, No. 4, pp. 371–375

ISSN 1897–5593

Percutaneous extraction of a coiled, 20-year-old lead in a patient with cardiac resynchronization therapy

Barbara Małecka[1], Andrzej Kutarski[2], Jacek Bednarek[1], Andrzej Ząbek[1] and Jacek Lelakowski[1]

[1]Departament of Electrocardiology, Cardiology Institute CMUJ, John Paul II Hospital, Kraków, Poland
[2]Chair and Department of Cardiology, Medical Academy, Lublin, Poland

Abstract

A 61-year-old patient with a 20-year history of permanent pacemaker implantation and half-a-year cardiac resynchronization therapy using a left ventricular lead placed via surgical approach was admitted for extraction of an old coiled right ventricular lead, which triggered ventricular arrhythmia and created a risk of pulmonary embolism. The lead was extracted via the left femoral vein in two stages: untying a loop on the lead using a pig-tail catheter and Dotter basket followed by traction and dissection of adhesions using a Byrd dilator sheath. Dissection of the old lead from the active right ventricular one posed special technical problems.
(Cardiol J 2008; 15: 371–375)

Key words: percutaneous lead extraction, permanent pacing

Case report

A 61-year-old female patient presenting with sick sinus syndrome received a permanent cardiac pacemaker 20 years ago. Because of myopotential inhibition of the unipolar passive fixation ventricular lead (Siemens Elema 411/60), the patient received a new bipolar ventricular lead (Biotronik SX 60) 9 years ago. The old electrode was deactivated and sewn to the fibrous wall of the pacemaker pocket. One year later dual chamber pacing was abandoned because of chronic atrial fibrillation development. The atrial lead (Medtronic 4504M) was deactivated during pacemaker replacement.

The pacing system was changed to a biventricular cardiac resynchronization therapy one, due to NYHA class III heart failure, left ventricular ejection fraction (LVEF) of 30% and symptoms of contraction dyssynchrony. As chest X-ray revealed a coiled old lead, the venous approach was abandoned and a left ventricular lead (Medtronic Sutur Less MYO) was advanced via left-sided microthoracotomy. The dislodgement and coiling of the lead probably occurred a year before — an approximate date was provided by analysis of chest X-rays and echocardiograms (Fig. 1A, B). Cardiac resynchronization therapy installation resulted in a significant hemodynamic improvement (NYHA class II and LVEF 44%) and the patient was referred for extraction of the inactive, coiled old lead. Indications for the procedure included ventricular arrhythmia necessitating administration of amiodarone with beta-blocker, and additionally increased risk of pulmonary embolism.

The lead extraction was carried out under local anesthesia with 1% Xylocaine. Its proximal end remained in the vein whereas the distal end had grown firmly into the right ventricular wall in the vicinity of the active right ventricular lead tip.

A Byrd Workstation Femoral 16 F was introduced subsequently via the left femoral vein. Then

Address for correspondence: Barbara Małecka, Departament of Electrocardiology, Cardiology Institute CMUJ, John Paul II Hospital, Prądnicka 80, 31–202 Kraków, Poland, e-mail: barbara_malecka@go2.pl

Received: 17.11.2007 Accepted: 22.04.2008

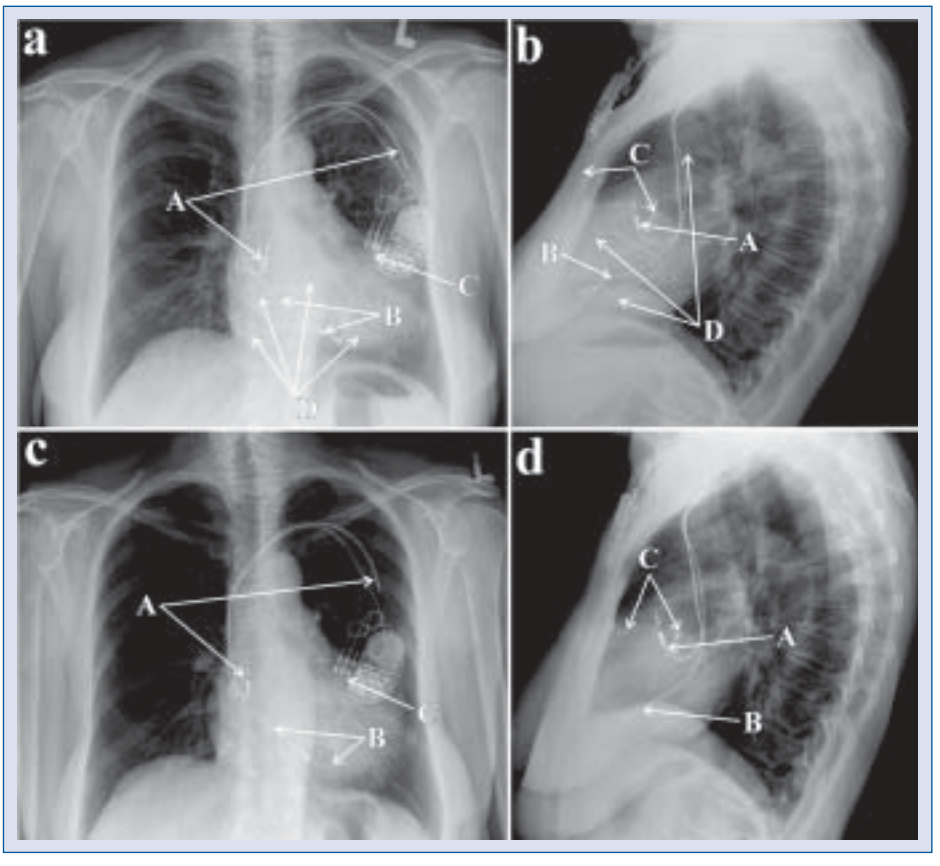

Figure 1. PA and lateral fluoroscopic image before the removal, showing three endocardial leads: deactivated atrial lead, active ventricular lead, and the old broken ventricular lead, pulled and coiled within the right ventricle (**A**, **B**). PA and lateral fluoroscopic image after removal. The only endocardial leads are: Deactivated atrial lead and the active ventricular lead. The epicardial lead screwed on the left ventricle shown clearly on the lateral images (**C**, **D**). Arrows: A — inactive atrial lead; B — active right ventricular lead; C — active left ventricular lead; D — looped ventricular lead "without free end".

a successive pig-tail Launcher Guiding Catheter (Medtronic LAA8JR40) was introduced. The proximal end of the lead was snared at the right atrial level and pulled down to untie the loop (Fig. 2A–E). Subsequently, the Dotter Helical Loop Basket (Cook Medical 12 F) was used to grasp the proximal lead end which was previously liberated and detached from the venous inner wall (Fig. 2F). Finally it was exteriorized with direct traction. The distal tip of the old lead was dissected from the myocardial tissue by manual application of force as a result of the traction, but it remained attached to the active right ventricular lead by the mobilized piece of fibrous tissue (Fig. 3A–D). A Byrd Dilator Sheath Polypropylene Yellow Extra Long was chosen as the tool to separate the leads that were sealed with the mass of fibrous tissue (Fig. 3B–E). Available, published scientific descriptions did not provide any data concerning such usage of this device, which had been widely used to separate leads from intravascular adhesions to the venous wall and intracardiac adhesions to endocardial surfaces. Both described applications were obtained with access through the subclavian or jugular veins, and regarded the leads with free ends, accessible within the pacemaker pockets.

Although it was reasonable, and in some way elegant, to introduce the recommended locking stylet through the lead internal lumen, the disintegration of the coil by hitherto manoeuvres like stretching and pressing by pig-tail as well as basket catheters, occluded the lumen. It disabled introduction and usage of the locking stylet. Its functional equivalent became the lead itself, and the long threads attached to the proximal end which was exteriorized through Byrd Workstation. The threads were tied to the lead end using the original knots. The polypropylene sheath was then introduced intravenously over the threads with the lead, being pulled out simultaneously. The last one played the role of

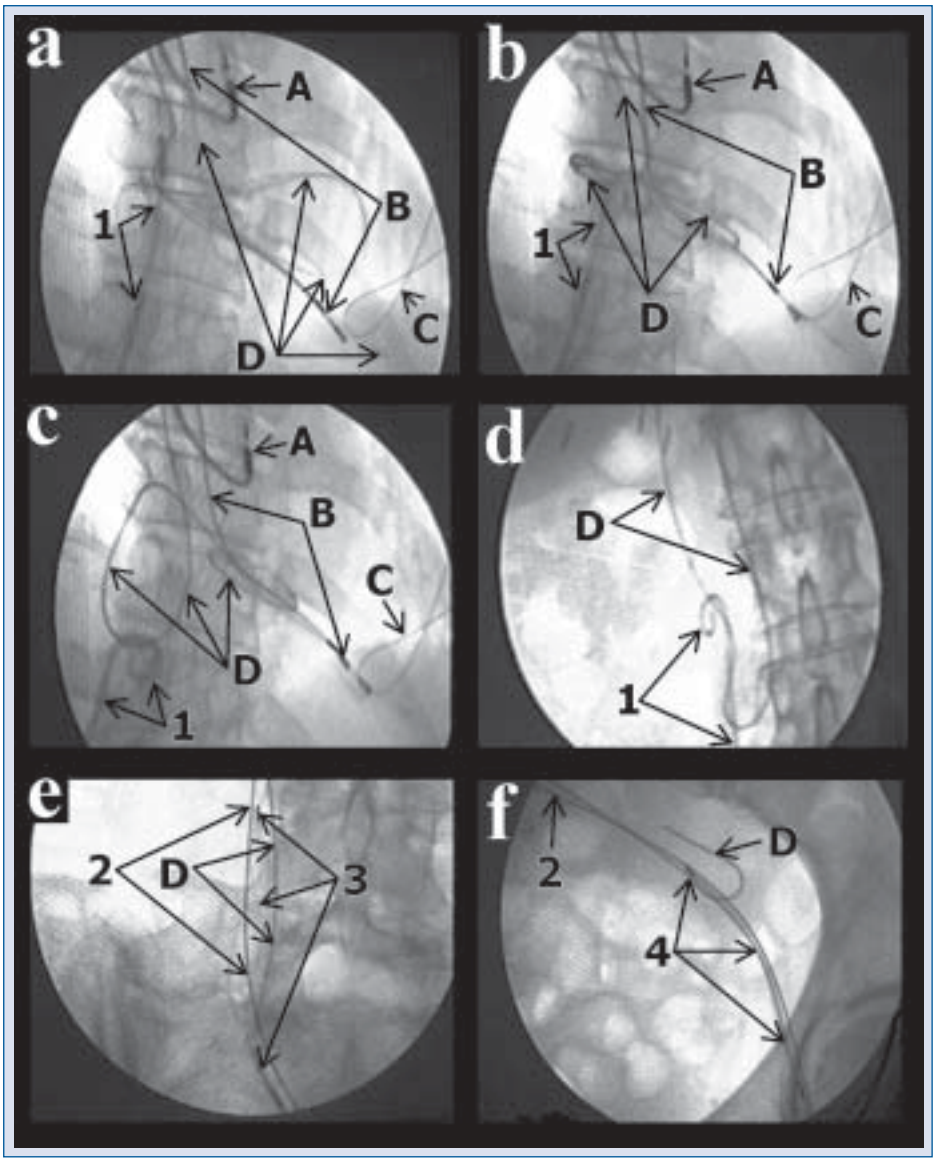

Figure 2. PA, fluoroscopic image. **A.** The proximal end of the extracted lead entrapped in the vena cava superior; meanwhile, the distal one to the right ventricular endocardium. The pig-tail Launcher guiding catheter (Medtronic LAA8JR40) introduced by femoral approach, in the early phase of wrapping over the looped lead in the right atrium; **B.** The pig-tail catheter untying the loop in the right ventricle; **C.** The pig-tail catheter pulling down the loop towards the inferior vena cava; **D.** The pig-tail catheter stretching the loop at the sub-phrenic level of the vena cava inferior; **E.** The proximal end of the lead detached from the vena cava superior wall, directed towards its bifurcation. The attempt to catch the lead end with the Dotter basket. The lead shade overlaps the shade of the additional intravascular stylet; **F.** The proximal end snared and pulled by the Dotter basket towards the Byrd Workstation in the left femoral vein. Arrows: A — atrial lead; B — active right ventricular lead; C — intrapericardial loop of left ventricular lead; D —– extracted lead "without free end"; 1 — pigtail; 2 — additional intravascular stylet; 3 — opened Dotter basket; 4 — locked Dotter basket.

specific guide-wire (Fig. 3B–E). The construction consisting of the Byrd Dilator and the lead with extended threads inside created the intravascular countertraction with the lead system. The extraction force was initially applied to the threads and to the proximal lead end thereafter, with the simultaneous countertraction pushing with the sheath. On X-ray the old lead was hung on the active one bend within the right atrium (Fig. 3C). The extracted lead was dissected parallel to the active one by repeated manipulation with the sheath, without causing any damage to the latter. Rotational movements of the sheath to free the adhesion could result in pulling out the active right ventricular lead while floating

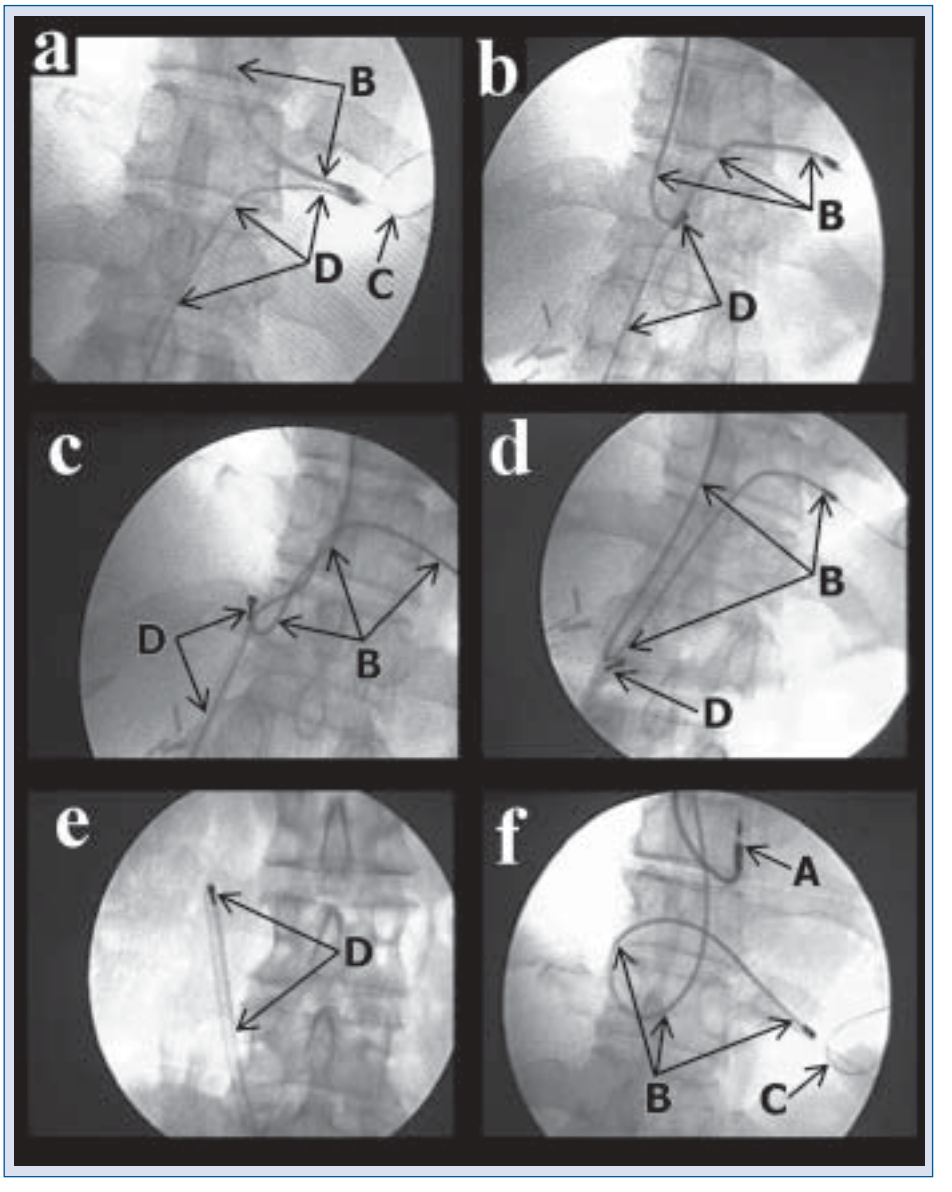

Figure 3. PA, fluoroscopic image. The dissection of the distal tip of the old lead from the myocardial tissue during traction applied via the Dotter basket (**A**, **B**). The separation of the two endocardial ventricular leads, sealed by the mobilized mass of fibrous tissue, using the Byrd dilator (**C**, **D**, **E**, **F**). Arrows: A — inactive atrial lead; B — active right ventricular lead; C — looped left ventricular "screw-on" lead; D — distal fragment of inactive right ventricular lead.

free in the right atrium and causing no resistance (Fig. 3D). But finally we managed to exteriorize the inactive lead completely without any complications (Fig. 1E, D). However, we finally managed to exteriorize the inactive lead completely without any complications. The femoral Byrd Workstation was subsequently removed entirely.

Discussion

The lead in the present case was removed via the femoral vein approach, which is recommended for extraction of leads older than one year and dislodged into cardiac cavities [1–3]. The extracted lead had remained in the heart for 20 years and coiled for over a year. The patient required antiarrhythmic treatment due to multiple ventricular premature beats, probably provoked by the abandoned lead irritating the tricuspid area and right ventricular outflow tract. Echocardiograms did not reveal any thrombus formation on the lead, but pulmonary microembolization could not be excluded [4]. An additional interesting aspect of the procedure was the postponement of lead removal until clinical

improvement outcome, after cardiac resynchronization therapy introduction via a surgical approach. The problems encountered during the procedure related to the vicinity of the active right ventricular lead over which the extracted lead was hanging with a piece of fibrous tissue torn off the endocardium. The leads were dissected using a Byrd dilator sheath. To our knowledge, it is probably the first usage of the Byrd Dilator Sheath introduced through the inferior femoral vein. The access previously used was obtained only through subclavian and jugular veins [2, 5–8].

Transvenous removal was safely and successfully performed using a Cook Medical device (Byrd Workstation Femoral 16 F, Dotter basket 12 F and Byrd Dilator Sheaths Polypropylene Yellow, 13.9 F) with pig-tail Medtronic catheter.

Conclusions

1. Extraction of a coiled old lead via a transvenous femoral approach can be a feasible and safe method.
2. Separation of coexistent endocardial leads, sealed by fibrous tissue, can also be performed using the femoral vein approach.

Acknowledgements

The authors do not report any conflict of interest regarding this work.

References

1. Byrd CL, Belott PH, Brinker JA et al. Recommendations for extraction of chronically implanted transvenous pacing and defibrillator leads: Indications, facilities, training. PACE 2000; 23 (Part I): 544–551.
2. Klug D, Jarwe M, Messaoudene SA et al. Pacemaker lead extraction with the Needle's eye snare for countertraction via a femoral approach. PACE, 2002; 25: 1023–1028.
3. Tyers GFO. Similar indications but different methods: Should there be a consensus on optimal lead extraction techniques? PACE, 2002; 25:1019–1022.
4. Bohm A, Pinter A, Duray G et al. Complications due to abandoned noninfected pacemaker leads. PACE, 2001; 24: 1721–1724.
5. Bracke F, Meijer A, van Gelder B. Extraction of pacemaker and implantable cardioverter defibrillator leads: Patient and lead characteristics in relation to the requirement of extraction tools. PACE, 2002; 25: 1037–1040.
6. Byrd CL, Wilkoff BL, Love CJ et al. Intravascular extraction of problematic or infected permanent pacemaker leads: 1994–1996. PACE, 1999; 22: 1348–1357.
7. Manolis AS, Maounis TN, Vassilikos V, Chiladakis J, Melita--Manolis H, Cokkinos DV. Ancillary tools in pacemaker and defibrillator lead extraction using a novel lead removal system. PACE, 2001; 24: 282–287.
8. Rosenheck S, Weiss A, Leibowitz D, Sharon Z. Noninstrumental pacemaker and defibrillator lead removal. The importance of the rotation forces. PACE, 2002; 25: 1029–1036.