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Case Report

New left ventricular active fixation lead: The experience of lead extraction

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ABSTRACT

Left ventricular active fixation lead is fundamental for targeted pacing site. The challenge is the extraction but in our experience Attain® Stability™ was removed without any problem. As usual the lead can cause a thrombosis of the coronary vein but we performed a venoplasty in order to place again a lead in the target site and maintain the CRT response.

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1. Introduction

Targeted pacing site is fundamental in cardiac resynchronization therapy to achieve reverse left ventricular (LV) remodeling.[1,2] The recently released active fixation LV lead Attain® Stability™ (Model 20066, Medtronic Inc, Maastricht, the Netherlands) enables a targeted pacing site at no compromise with the risk of lead dislodgement[3,4] or phrenic nerve stimulation, and with an acceptable LV pacing threshold[3] regardless of vein length and size.[4] The challenge for the active fixation lead is the feasibility of extraction, given the former experience with the deployable-lobes Starfix lead (Medtronic Inc., Minneapolis, MN). The Attain® Stability™ features a side helix as fixation mechanism, which has proven easy to be extracted in the experimental model. We report a case where LV extraction occurred about 7 months after implantation because of pocket infection.

2. Case report

An 83-year-old woman had recurrent hospital admissions along 3 years with severe congestive heart failure (NYHA III to IV) due to idiopathic dilated cardiomyopathy, permanent atrial fibrillation, wide QRS (160 ms) with complete left bundle branch block morphology, and severe left ventricular dysfunction (LV ejection fraction = 27%). The patient was successfully implanted with CRT-P (Consulta, Medtronic, Minneapolis, MN) with a 5076 CapSureFix Novus Lead in right ventricle and an active fixation left ventricular lead in a mid-part of a postero-lateral vein of the coronary sinus (Attain® Stability™ Model 20066 LV lead; Medtronic, Inc, Tilburg, the Netherlands) that matched with the target pacing site as observed by pre-operative strain analysis at echocardiography. This target pacing site was concordant with the intraoperative Q-LV measurement, LV depolarization

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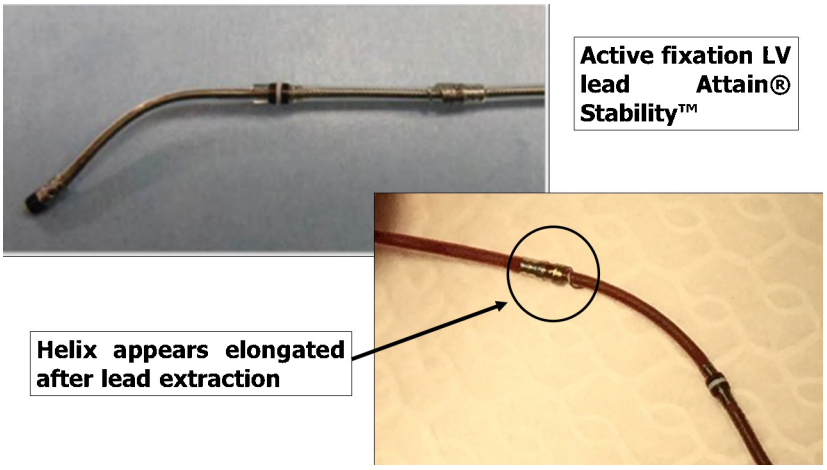

Fig. 1 – Attain® Stability™ lead before the implant and after the extraction.

occurring after the termination of the QRS complex. Atrioventricular node ablation was performed concomitantly during the procedure because of a very difficult rate control with drugs (resting heart rate > 70 bpm on metoprolol + diltiazem with symptomatic hypotension); only metoprolol 50 mg daily was given at follow-up.

The patient had clinical improvement and diuretics were gradually decreased. Seven months after CRT-P implantation, the patient showed fever (37.8 °C) and an inflammatory skin reaction at the pacemaker pocket. Laboratory: white blood cells 4400/mmc, red blood cells 3,960,000/mmc, platelet 147,000/μL, C-reactive protein mildly increased at 1.45 mg/dl,

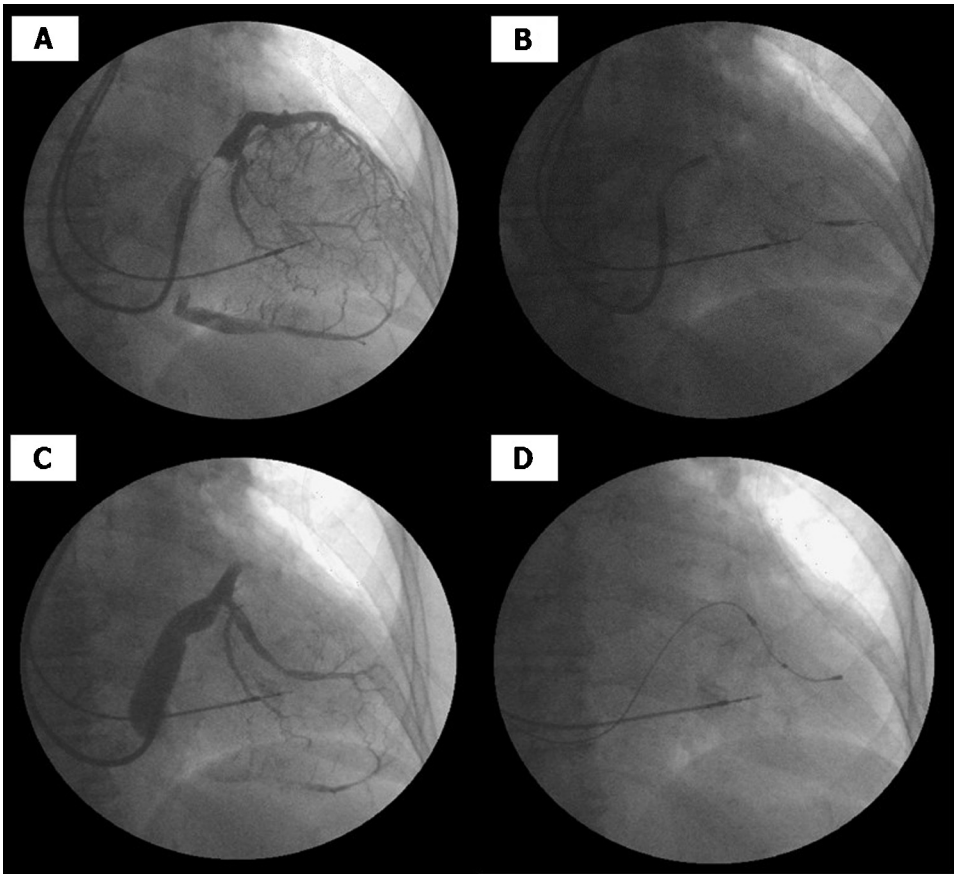

Fig. 2 – Re-implantation of a new Attain® Stability™ lead. *Legends*: coronary sinus angiogram after lead extraction (A), venoplasty with multiple balloon inflations starting from the distal portion of the coronary vein up to its take-off from the coronary sinus (B), coronary sinus angiogram after the venoplasty (C), Attain® Stability™ lead final placement (D).

blood cultures negative. At echocardiography, no vegetations were detected on the leads; the patient was a CRT super-responder based on normalization of left ventricular volume (50% reduction of end systolic volume) and of LV ejection fraction (increased to 60%). Positron emission tomography (PET) scan was highly suggestive of pocket inflammation/infection (SUV max = 8.9), and showed no abnormal findings endovascular and at other sites. Skin thinning and reddening progressed over one week.

Empirical antibiotic therapy against staphylococci was started with i.v. vancomycin and rifampicin and the fever subsided. After 3 days, the CRT-P system was explanted from the left side. The active fixation lead was removed as per the manufacturer's recommended technique without any problem: after insertion of a regular stylet, the lead was turned counter-clockwise (around 8–10 turns) and then traction was applied with a mild force (same force needed as with others left ventricular passive leads, close to the 0.5–1 kg as mentioned in the training). On visual examination, the fixation helix appeared elongated (Fig. 1). The patient was nearly pacemaker-dependent with an escape rhythm at 30 bpm, so a new CRT-P system was implanted right-sided. Owing to a nearly complete thrombosis of the coronary vein previously hosting the LV lead, venoplasty with repeated inflations of a 4 mm × 8 mm balloon was performed, in order to place again the LV lead at the same target site and maintain the CRT super-response (Fig. 2A–D). A new Attain® Stability™ was implanted with good electrical parameters. The culture of the explanted device revealed *Staphylococcus aureus* infection; hence, the patient was treated with i.v. vancomycin and oral rifampicin for 4 weeks. Neither fever nor pocket infection was observed during 6 months follow-up.

All electrical parameters of pacemaker were regular (right ventricular and LV sensing respectively 11.5 mV and 6.8 mV, with capture threshold respectively 0.3 V and 1.5 V and impedance was respectively 471 Ω and 839 Ω).

3. Discussion

The possibility to target an LV stimulation site regardless of vein length and size is a great opportunity to increase the chances of response to CRT, and to prevent lead dislodgement and phrenic stimulation. The design of the Attain® Stability™ allows an easy disengagement at the ''distal'' level (the target vein), owing to the different conception compared to the Starfix lead. Stabilization with lead stenting has also proved effective and amenable to uncomplicated lead extraction.[3,5] Though more data on long-implanted leads are awaited, the grade of lead engagement along the thoracic veins course cannot be anticipated as different from any other 4F LV lead. Thus, we believe that this technological improvement should enhance the adoption of active fixation LV leads, the perception of limited extractability being its major opponent in the clinicians' opinion. In this patient, a targeted lead placement was coupled to AV node ablation owing to a difficult rate control during AF, as recommended in literature,[6,7] resulting in a super-responder. The timing of re-implantation after pocket infection was dictated by the risk of complete coronary vein thrombosis at short term, that might have precluded a successful lead re-implantation and CRT delivery, as previously reported by Burke et al.[8] in patients with indwelling leads for longer than 3 months. Moreover, the absence of endovascular infection (blood culture, PET, echocardiography) supported an early re-implantation strategy.[9]

Conflict of interest

M.Z. received speaker's fees from Medtronic; G.B. received speaker's fees from Boston Scientific, Medtronic, St. Jude and Boehringer Ingelheim; and M.B. received speaker's fees from Medtronic and Biotronik.

REFERENCES

1. Khan FZ, Virdee MS, Palmer CR, et al. Targeted left ventricular lead placement to guide cardiac resynchronization therapy: the TARGET study: a randomized, controlled trial. *J Am Coll Cardiol.* 2012;59:1509–1518.
2. Ypenburg C, van Bommel RJ, Borleffs CJ, Bleeker GB, Boersma E, Schalij M, Bax JJ. Long-term prognosis after cardiac resynchronization therapy is related to the extent of left ventricular reverse remodeling at midterm follow-up. *J Am Coll Cardiol.* 2009;53:483–490.
3. Biffi M, Bertini M, Ziacchi M, Diemberger I, Martignani C, Boriani G. Left ventricular lead stabilization to retain cardiac resynchronization therapy at long term: when is it advisable? *Europace.* 2014;16:533–540.
4. Yee R, Gadler F, Hussin A, et al. Novel active fixation mechanism permits precise placement of a left ventricular lead: early results from a multicenter clinical study. *Heart Rhythm.* 2014;11:1150–1155.
5. Szilagyi S, Merkely B, Roka A, et al. Stabilization of the coronary sinus electrode position with coronary stent implantation to prevent and treat dislocation. *J Cardiovasc Electrophysiol.* 2007;18:303–307.
6. Ganesan AN, Brooks AG, Roberts-Thomson KC, Lau DH, Kalman JM, Sanders P. Role of AV nodal ablation in cardiac resynchronization therapy in patients with coexistent atrial fibrillation and heart failure: a systematic review. *J Am Coll Cardiol.* 2012;59:719–726.
7. Gasparini M, Galimberti P. AV junction ablation in heart failure patients with atrial fibrillation treated with cardiac resynchronization therapy. The picture is now clear!. *J Am Coll Cardiol.* 2012;59:727–729.
8. Burke MC, Morton J, Lin AC, et al. Implications and outcome of permanent coronary sinus lead extraction and reimplantation. *J Cardiovasc Electrophysiol.* 2005;16:830–837.
9. Tarakji KJ, Wazni OM, Harb S, Hsu A, Saliba W, Wilkoff BL. Risk factors for 1-year mortality among patients with cardiac implantable electronic device infection undergoing transvenous lead extraction: the impact of the infection type and the presence of vegetation on survival. *Europace.* 2014;16:1490–1495.