Case report
A woman, with dilated cardiomyopathy and severe heart failure, was admitted to our institution for resynchronization therapy. Following the coronary venography, an attempt to implant the lead (Attain OTW 4193) into the lateral vein was made. Although the electrode could be introduced into the lateral vein easily, the threshold was >8.0 V. We performed the same procedure in other appropriate veins, but no satisfactory thresholds were got. However, it was found that extending the guidewire (BMW, Guidant) from the end of the pacing catheter was associated with a decrease in threshold from >8.0 to 1.5 V. The guidewire could be advanced ~4 cm from the tip of the pacing lead (as shown in Figure 1) to a point just in front of where the wire wedged, which gave us the best threshold and good stability. However, pectoral muscle stimulation was induced by the pacemaker implantation. We changed the left ventricular (LV) lead pacing pattern to LV_tip/RV_ring, so the pectoral muscle stimulation stopped. The remaining procedure proceeded without any difficulties. The final electrophysiological properties of the LV leads were as follows: threshold 1.5 V, R-wave 8.5 mV, and impedance 320 Ω. It is over 1 year since the implantation, and the patient goes very well with improvement in heart symptomatic function. The threshold of LV lead was stable in 12-month follow-up.

Discussion
It is not exactly certain how the guidewire works to improve the pacing threshold. The most likely explanation is that by extending the guidewire beyond the tip of the pacing electrode, we are simply changing the position that we are pacing from and accessing an area of myocardium that has more favourable characteristics for pacing. When the patient gets the satisfactory threshold by using the retained guidewire technique, impedance of LV lead would be lower. It can induce the pectoral muscle stimulation when generator had been put in pocket. Changing the LV pacing pattern to LV_tip/RV_ring can decrease the pectoral muscle stimulation.

The technique of using a retained guidewire in LV leads had already been used by De Cock et al. in order to improve lead stability. However, guidewires are prone to flexural fatigue and fracture, and there was dispute on the long-term safety of this method. Hence, the retained guidewire technique is acceptable as a sort of last resort of therapy. In some problematic cases, this alternative may be a great help for the physicians during the implantation, in particular, when the epicardial operative approach is contraindicated or impossible.

Conflict of interest: none declared.

Reference
Clinical case

An 88-year-old patient presented to the emergency department in poor haemodynamic condition with a ventricular tachycardia (VT) at 160 bpm with a right bundle branch block morphology and superior axis. His medical history included a postero-inferior myocardial infarction 16 years earlier. A contrast-enhanced cardiac MRI was performed showing a non-dilated left ventricle with an infero-posterior dense scar and an ejection fraction of 34%. The MRI protocol included the peripheral injection of 0.1 mmol/kg body weight of Gadolinium-DTPA (diethylene triamine penta-acetic acid (DTPA) and the posterior collection of late-enhanced scans in long-axis and short-axis orientations by using a breath-hold ECG-triggered 2D inversion-recovery turbo FLASH sequence as described elsewhere. An ablation procedure of VT was performed. An open irrigated cool-tip catheter (Navi-Star™ Thermo-Cool™, Biosense Webster®, Diamond Bar, CaliforniaCA, USA) was advanced to the left ventricle through a transseptal approach for mapping and ablation. Programmed stimulation reproducibly induced the clinical sustained VT at a cycle length of 350 ms (Figure 1A) requiring burst pacing for termination. The VT was poorly tolerated and a decision was made to perform a substrate ablation. Electro-anatomical voltage mapping using the CARTO® XP navigation system (Biosense Webster®, Diamond Bar, CaliforniaCA, USA) showed an area of scar (scar: voltage ≤0.5 mV, border zone: voltage >0.5 mV and <1 mV) in the infero-posterior wall (Figure 1D). The late-enhanced MRI images (scar and left ventricular cavity) were segmented (Figure 1B) by using the CARTO® XP software and integrated with the electro-anatomical map using fiducial points placed at the apex and the septal and lateral mitral annulus (Figure 1C). The integration showed a good spatial correlation in terms of the anatomic location of the scar (Figure 1D). A linear ablation along the border zone of the scar where the pace-map resembled the clinical VT was successfully performed. After the ablation, no VT could be induced. Procedure and fluoroscopy time were 245 m and 62 minutes, respectively. No peri-procedure complications occurred. After an 8 months follow-up the patient is free from VT recurrence.

Figure 1  (A.) Twelve-lead ECG of the ventricular tachycardia induced during the electrophysiology study. The cycle-length of the tachycardia is 350 ms and shows a right bundle branch block pattern and superior axis. (B.) Short-axis view at the mid-ventricular level of a cardiac MRI inversion-recovery sequence showing transmural myocardial delayed contrast enhancement at the inferior and infero-lateral segments of the left ventricle (arrow). (C) Postero-inferior view of the CARTO® XP integration of the segmented late-enhanced MRI image (scar in grey, left ventricular cavity in pink) with the electro-anatomical map (map not represented). The dark-red dots correspond to the ablation points. The blue tags correspond to the sites where the best pace-maps were obtained. (D) Postero-inferior view of the CARTO® XP integration of the segmented late-enhanced MRI image of the scar (grey) with the electro-anatomical bipolar voltage map of the left ventricle. The purple colour represents areas of voltage >1 mV. The red colour represents areas of voltage <0.5 mV. The dark-red dots correspond to the ablation points. The blue tags correspond to the sites where the best pace-maps were obtained. Note the good anatomical correlation between the MRI scar image (grey) and the electro-anatomic representation of the scar (red).
Discussion
MRI is widely used for guiding ablations, mainly atrial fibrillation, given its accuracy to delineate the anatomy. The ability of late contrast-enhanced MRI to define the location and extent of myocardial necrosis may be of interest in guiding VT ablation procedures. This case shows the feasibility of integrating late-enhanced images and how they match the areas of low voltage depicted by the electro-anatomic mapping system. Characterization of the myocardial tissue by MRI and its integration with the electro-anatomic maps can help in delineating the extent of the scar, making substrate ablation of unmappable VT more accurate. Further research in this field is warranted.

Conflicts of interest: none declared.

References

CASE REPORT
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Pacemaker syndrome and pseudo-ventricular high threshold after dual-chamber pacemaker replacement
Antoine Kossaify and Nicolas Moussallem
USEK-NDS University Hospital, Department of Cardiology, St Charbel Street, Byblos, Jbeil, Lebanon
Tel: +96 132 32 046, Email: antoinekossaify@yahoo.com

We report a 60-year-old male patient who presented with pacemaker syndrome. The patient had recent dual-chamber pacemaker replacement. Surface ECG and endocavitary electrograms were compatible with leads connection inversion. Device interrogation showed pseudo-ventricular high threshold. Dual-chamber pacemaker leads inversion in a pacer-dependent patient can lead to life-threatening complications. Industry technicians should not perform device technical assistance when unsupervised by physicians with expertise.

Case report
A 60-year-old patient presented with pacemaker syndrome (PMS). He was pacemaker (PM)-dependent and had device replacement 6 months ago. After that, only the company representative performed device follow-up and had nothing to mention.

Device interrogation showed high ‘ventricular output’ in this automatic ventricular capture device. The markers showed Ap-Vs (atrium paced, ventricle sensed) which could have been interpreted as ventricular intrinsic activity restoration (Figure 1). Surface ECG showed retrograde P waves in D3 concomitant with Vs. Leads inversion diagnosis was retained and surgical correction was performed.

Figure 1 Surface ECG shows retrograde P waves. Intracardiac markers show Ap-Vs.