and a maximum power output of 70 W were delivered using an 8 mm tip ablation catheter (Blazer II XP™ 4500THN4, EP Technologies, Boston Scientific Corporation/San Jose, CA, USA) via a pre-shaped long sheath (SR2™, St Jude Medical, AF Division, Minnetonka, MN, USA) placed at a ventricular site between those electrode pairs where the local ventricular activation preceded the QRS onset by 21 ms and successful ablation was achieved. No complications occurred.

The majority of the idiopathic ventricular arrhythmias (VAs) have a right or left ventricular outflow tract origin.1–3 Some uncommon sites of idiopathic VA origins have been revealed.1,4 Some of these uncommon sites of VA origins have been revealed.1,4 Some of these uncommon sites of VA origins have been revealed.1,4 However, the mapping and catheter ablation of TA VAs may not be fully understood. To the best of our knowledge, this is the first report describing the efficacy of a Halo-type catheter for mapping and catheter ablation of VAs originating from the TA. Because precise positioning of a Halo-type catheter relative to the TA may vary depending on the anatomical features of the TA,5,6 reliance on activation mapping of VAs in the right ventricle may be misleading. During TA VAs, the activation vector along the TA would diverge in opposite directions from the VA origin. Consequently, the bipolar electrograms recorded on either side of the VA origin by a Halo-type catheter positioned along the TA would reflect an opposite polarity to the VA origin site as a boundary. Therefore, the observation of a bipolar electrogram polarity reversal may allow for more precision in the localization of the origin of VAs than identification of the earliest ventricular activation alone.

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References

A case of diaphragmatic pacing with cardiac resynchronization therapy
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Cardiac resynchronization therapy (CRT) is now an accepted treatment for heart failure [McAlister et al. in Cardiac resynchronization therapy for patients with left ventricular systolic dysfunction: a systematic review. JAMA 2007;297:2502-14.]. In addition to the complications associated with standard pacemaker implants, CRT procedures have their own additional complications such as coronary sinus dissection, diaphragmatic stimulation, and longer implant times. We present a case of CRT implantation which illustrates these problems because of an unusual complication.

Case report
A 69-year-old female with hypertension and type II diabetes mellitus was initially diagnosed with high-grade atrio-ventricular block in 2003 and had a dual-chamber pacemaker implanted. At that time, her transthoracic echocardiogram demonstrated a mildly dilated left ventricle (LV end-diastolic 5.8 cm) and an overall preserved systolic function (estimated ejection fraction 50–55%).

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During follow-up in the pacing clinic, she was noticed to have increasing episodes of atrial fibrillation. In 2006, she was reviewed as a cardiology outpatient and reported breathlessness upon minimal exertion and abdominal fullness. Clinical examination demonstrated mitral and tricuspid regurgitation, a small left pleural effusion, ascites, and peripheral oedema. Her electrocardiogram demonstrated a ventricular-paced rhythm, and a pacing check confirmed permanent atrial fibrillation and 100% right ventricular pacing. Transthoracic echocardiography demonstrated the enlargement of her left atrium (5.5 cm), moderate mitral regurgitation, and deterioration in her LV systolic function (LV end-diastolic 6.6 cm, LV end-systolic 4.7 cm) with marked dyssynchrony of the ventricular function. With optimization of her medical therapy, she remained symptomatic, going from New York Heart Association class IV to class III. She was therefore admitted in July 2007 to upgrade her dual-chamber pacemaker to a cardiac resynchronization therapy (CRT) device.

The left subclavian vein (LSCV) was cannulated using the Seldinger technique. Cannulation was with a first-pass puncture using a needle with a curve placed on it to reduce the risk of pneumothorax. Using a 9 Fr sheath, a Medtronic Attain (Minneapolis, MN, USA) fixed shape guide with an Amplatz Left 2.0 5 Fr catheter was initially used to try and cannulate the coronary sinus (CS). This was unsuccessful, hence a St Jude (St Paul, MN, USA) steerable cannulator was used to intubate the CS before passing the guide catheter. A Medtronic Attain venogram balloon, model 6215-80 CM, was then advanced to the tip of the guide catheter and a CS venogram was performed. A Medtronic Attain Bipolar OTW Lead (Model 4194) was placed in two posterolateral veins, but diaphragmatic stimulation occurred in both the branches. A Medtronic Attain Unipolar OTW Lead (Model 4193) was placed into a smaller, high lateral branch without diaphragmatic stimulation and satisfactory pacing parameters. The leads were connected to a Medtronic InSync III CRT-P device.

That evening, the patient experienced left pleuritic pain and was hypotensive with a systolic pressure of 90 mmHg. Transthoracic echocardiography did not show evidence of pericardial effusion, and the chest X-ray demonstrated a left pleural effusion with no change in the lead position (Figure 1). The electrocardiogram demonstrated biventricular pacing. Next day, the pacing check demonstrated a loss of LV capture with the patient experiencing diaphragmatic twitching. Her repeat chest X-ray demonstrated opacification at the left base as seen previously, but with the displacement of the CS lead (Figure 2). Subsequent computed tomography (CT) of the thorax confirmed a left haemothorax with a collapsed left lower lobe. The CS lead was seen in the left pleural space with the tip on the diaphragm. A contrast-enhanced CT image of the LSCV demonstrated the lead exiting the vein into the pleural cavity (Figure 3).

A left inter-costal drain was inserted and 1 week after the upgrade, the LV lead was explanted with gentle traction in the cardiac catheter laboratory, under fluoroscopic guidance, with the presence of on-site cardiothoracic backup. Eleven days after the original implant, the LV lead was replaced, again via the LSCV. A venogram was performed to confirm the patency of the vein and an Attain Unipolar OTW Lead (4193) was positioned in a lateral branch. A venogram at the end of the procedure did not demonstrate dye extravasation and a post-procedural chest X-ray excluded pneumo/haemothorax.

She underwent echocardiographic optimization and her 6-week pacing check was satisfactory, with the patient reporting a marked improvement in symptoms.

Figure 1  Chest X-ray post-cardiac resynchronization therapy implant demonstrating coronary sinus lead in the high lateral branch (arrows) and left pleural effusion.
Discussion

One of the complications of CRT includes diaphragmatic pacing via stimulation of the phrenic nerve, which can necessitate repositioning of the CS lead peri- or post-implant. In addition, acute CS lead displacement occurs in 2.1% within 24 h.² The displacement of the CS lead is normally into the right heart but unusually in this case, the lead prolapsed back into the LSCV and then exited the vessel into the thoracic cavity, with the lead tip directly stimulating the diaphragm. It is thought that the LSCV must have been originally double-cannulated like a ‘buttonhole’ with the curved needle entering the vein, exiting, then re-entering, this allowing the initial placement of the CS lead. This unusual cause of diaphragmatic pacing from the CRT therapy has not been previously described in the literature.

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References