Pacemaker-induced ventricular fibrillation during radiofrequency catheter ablation for ventricular tachycardia

We present the case of an 80-year-old male with ischemic cardiomyopathy and cardiac resynchronisation therapy and defibrillator presented with recurrent episodes of ventricular tachycardia (VT) requiring frequent defibrillator shocks. Monitored ventricular tachycardia episodes showed monomorph VT with an electrocardiogram appearance suggestive of inferior left ventricular origin. The patient was already on guideline recommended pharmacotherapy for chronic heart failure. In keeping with current international guidelines, physician and patient decided to undergo VT ablation.

The case was performed using 3D anatomical mapping under general anaesthesia. The cardiac implantable electronic device (CIED) was temporarily programmed to backup pacing mode (RV VVI 30) with tachycardia therapies suspended. The patient's intrinsic rhythm was sinus rhythm at 43 beats per minute. Voltage mapping of the left ventricle demonstrated low amplitude in the inferior wall in keeping with previous inferior myocardial infarction. Programmed ventricular stimulation delivered around the region of scar and at the right ventricular apex failed to induce ventricular tachycardia. The ablation strategy was therefore to perform substrate modification and pace-mapping. However during radiofrequency energy delivery, the patient developed ventricular fibrillation requiring emergent external DC cardioversion. Electrogram interrogation showed that the CIED switched to noise reversion mode during ablation. The consequent asynchronous pacing resulted in a paced ventricular beat landing on an intrinsic T wave, otherwise known as 'R-on-T' phenomenon, inducing ventricular fibrillation (figure 1). All pacing therapies were temporarily disabled for the remainder of the case.

Many electrophysiology procedures are performed in patients with CIED's. This case serves as an important reminder that this phenomenon could potentially occur in any procedure that could cause CIED undersensing and preparation for this should be undertaken without exception.

Figure 1. 12 lead ECG recording during radiofrequency ablation energy delivery. Note asynchronous right ventricular pacing resulting in 'R on T' on the third paced beat and subsequent ventricular fibrillation.