Underdrive pacing to terminate ventricular tachycardia

An 81-year-old man was admitted in haemodynamically stable monomorphic ventricular tachycardia (VT). He had previously suffered a myocardial infarct and later developed remote monomorphic VT (rate 180 bpm, cycle length 550 ms) requiring an implantable defibrillator (St Jude Current DR) and treatment with amiodarone.

The admission rhythm was of similar morphology to the original VT, but slower (120 bpm, cycle length 500 ms) due to amiodarone treatment (Figure 1). Manual and programmed atrial/ventricular overdrive pacing delivered through the device were unsuccessful at terminating the VT. However, fixed 'underdrive' pacing at 100 bpm (cycle length 600 ms) terminated the VT restoring sinus rhythm (Figure 2).

Underdrive pacing is a largely forgotten mode of anti-tachycardia pacing and can terminate supraventricular re-entrant tachycardias as well as VT. One study using temporary transvenous pacemakers demonstrated termination of VT in 39% of cases using underdrive pacing and 41% using overdrive techniques. Another study using transthoracic pacing to terminate VT demonstrated that underdrive pacing was successful in 29% of cases compared with 67% with overdrive pacing.

The presumptive mechanism is that random stimulation eventually results in a paced beat being delivered during the relative refractory period of the re-entrant circuit. The window for termination using this method is narrow and prolonged underdrive pacing may be required to achieve termination, with a small risk of a paced beat falling on the T wave producing ventricular fibrillation (VF) or degenerating supraventricular tachycardia (SVT) to atrial fibrillation (AF).

This case suggests that underdrive pacing could be tried where overdrive pacing has failed before cardioversion of VT.

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REFERENCES
Figure 1  Twelve lead ECG showing monomorphic ventricular tachycardia at 120 bpm (cycle length 500 ms).

Figure 2  Close up view of underdrive pacing at 100 bpm. Disruption of the ventricular tachycardia is noted, with eventual capture of the ventricle and pacing at 100 bpm.