Sudden cardiac death and ventricular arrhythmias

Janet M McComb

What's new ?

- The National Institute for Health and Clinical Excellence has updated its guidance on the use of implantable defibrillators. In addition to secondary prevention indications and to the MADIT primary prevention indication, they recommend that prophylactic defibrillators be implanted in patients with low left ventricular ejection fractions post myocardial infarction, with wide QRS complexes
- Risk stratification in some of the familial conditions associated with sudden cardiac death (e.g. long QT syndrome, Brugada syndrome) has been clarified

Ventricular arrhythmias range from asymptomatic ventricular ectopy to sustained ventricular tachycardia and cardiac arrest. They are common and are usually benign, at least in those with a structurally normal heart. In patients with structural heart disease (often coronary artery disease), ventricular arrhythmia is an adverse prognostic factor associated with cardiac arrest and death.

Cardiac arrest

Cardiac arrest is usually due to either ventricular fibrillation (VF) or ventricular tachycardia (VT). About 10% of patients who have a cardiac arrest outside hospital are successfully resuscitated and survive to leave hospital, and as these are at high risk of recurrent cardiac arrest and sudden death, they should be investigated and offered appropriate prophylactic treatment. Conditions associated with cardiac arrest are listed in Figure 1.

The commonest underlying reason for cardiac arrest is pre-existing coronary artery disease, although this will not have been recognized prior to the event in 50% of patients. After resuscitation and recovery, initial investigation should focus on whether or not the patient has coronary artery disease. Assessment of ventricular function, which is an important predictor of recurrence, by echocardiography or ventriculography is essential. A schema for the investigation and management of patients resuscitated from either VF or VT is shown in Figures 2 and 3, stratified by ventricular function.

Conditions associated with cardiac arrest

- Coronary artery disease, either acute ischaemia and/or infarction, remote or acute
- Dilated (non-ischaemic) cardiomyopathy (DCM)
- Hypertrophic cardiomyopathy (HCM)
- Long QT syndrome (LQTS) (congenital or acquired)
- Brugada syndrome
- Corrected congenital heart disease
- Arrhythmogenic right ventricular dysplasia/cardiomyopathy (ARVD/C)
- Atrial fibrillation with Wolff–Parkinson–White syndrome

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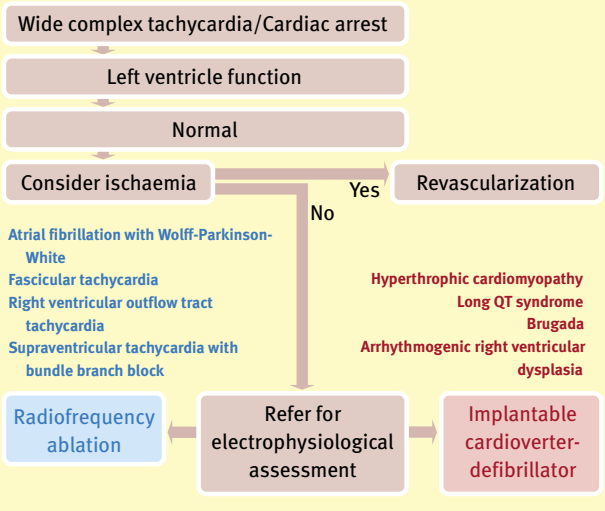
As recurrence is likely, the patient resuscitated from sudden cardiac death (or VT) should be considered for treatment with an implantable cardioverter defibrillator (ICD), unless the cause is thought to be transient, and/or correctable, e.g. acute ischaemia in the presence of normal LV function, electrolyte imbalance, anti-arrhythmic drug therapy, atrial fibrillation (AF) with Wolff–Parkinson–White (WPW) syndrome, or there are co morbidities significantly reducing life expectancy. Implantation of an ICD in these circumstances is termed secondary prevention.

Other less common causes of cardiac arrest

Hypertrophic cardiomyopathy (HCM)

HCM is the most common cause of sudden cardiac death in the young. Cardiac arrest may be the presenting symptom. Those who survive have a risk of recurrence of 11% per year, and should be offered an ICD. As the condition is often familial, and a family

Schema for investigation and management of patients resuscitated from VT or VF with normal left ventricle function



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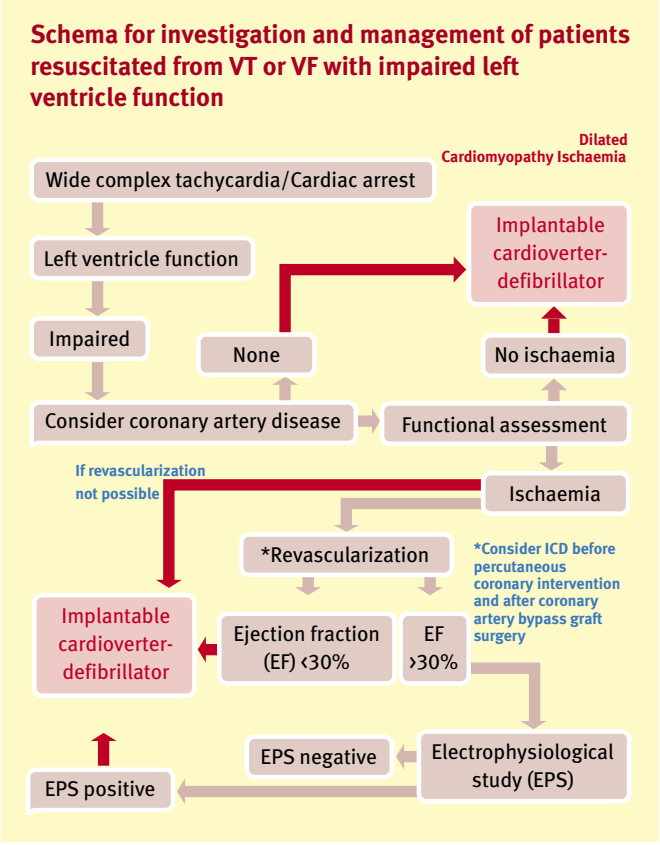

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history of sudden death is a risk factor, family screening and genetic counselling should be offered.

Brugada syndrome

Brugada syndrome is a recently recognized familial abnormality of the cardiac sodium channel, which is characterized by distinct ST-segment elevation in the right precordial leads (Figure 4) and a high risk of sudden cardiac death in young and otherwise healthy adults, often male. Patients with the syndrome surviving a cardiac arrest, or syncopal attacks without other cause, should be offered an ICD and family screening.

Long QT syndrome (LQTS)

LQTS may be either congenital or acquired, and is associated with sudden cardiac death. It sometimes occurs in patients with bradycardia. There is increasing evidence that those with the 'acquired' form actually have a *forme fruste*, which is exposed by various provocative factors (listed in Figure 5). Patients who survive a cardiac arrest, often due to a specific type of polymorphic ventricular tachycardia known as torsade de pointes (Figure 6), should be offered an ICD, unless the arrest was clearly associated with a provocative factor, which can be avoided in future, e.g. by permanent pacing in the patient with heart block as an underlying cause. Drugs known to prolong the QT interval should be avoided (lists available at www.torsades.org).

Arrhythmogenic right ventricular dysplasia/cardiomyopathy (ARVD/C)

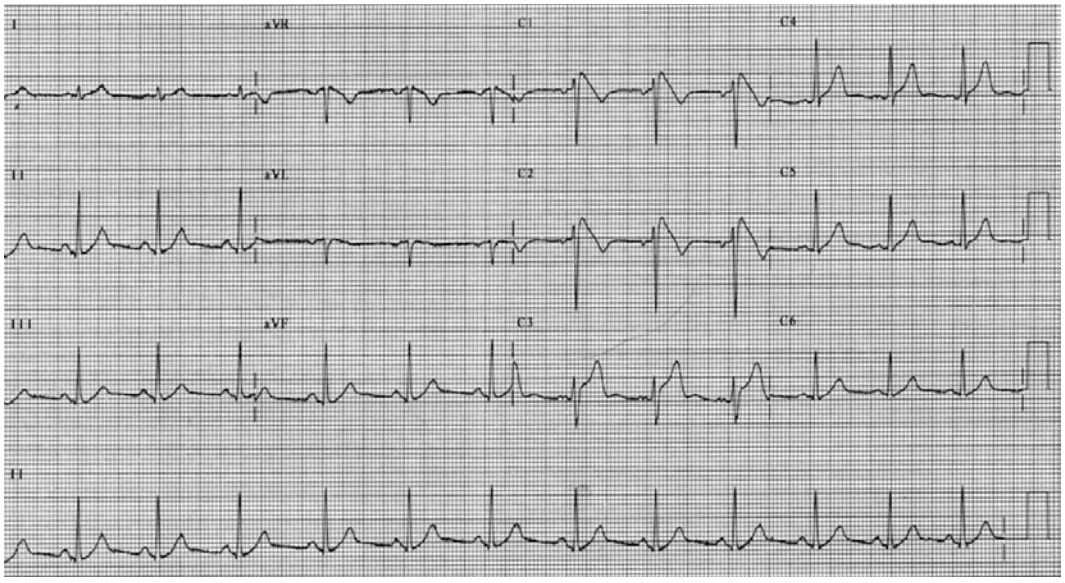
This is also a genetically determined abnormality, which presents either with heart failure, or with ventricular arrhythmias or cardiac arrest, often exercise related, and more often in males. Typical ECG abnormalities are often present, with T wave inversion from V1–V3 in sinus rhythm, and a left bundle block morphology in VT (Figure 7). The patient with ARVD/C who survives a cardiac arrest should be offered an ICD.

Sustained ventricular tachycardia

Diagnosis

The differential diagnosis of regular wide-complex tachycardia includes:

- ventricular tachycardia
- supraventricular tachycardia (SVT) with bundle branch block
- SVT with accessory pathway conduction.



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