

# Ventricular Arrhythmias



This factfile should be read in conjunction with factfile 04/2004 'Palpitations: their significance and investigation.'

## Summary

- Ventricular arrhythmias can only be diagnosed with the aid of an ECG
- Ventricular ectopics, in the absence of structural heart disease or a family history of sudden cardiac death, are benign and do not require specialist intervention or specific drug therapy
- Ventricular arrhythmias in the context of structural heart disease may be life threatening and require specialist attention
- Implantable defibrillators and catheter ablation offer the best therapies to treat life-threatening ventricular arrhythmias
- Some non-cardiac drugs may cause the long QT syndrome and increase the risk of sudden death
- Mutations in genes for cardiac ion channels are responsible for many familial sudden cardiac death syndromes

## Background

Ventricular arrhythmias are so called because they originate from the ventricular chambers of the heart. They can only be diagnosed with the aid of an ECG on which ventricular beats are identified by their unusual broad complexes. They range from isolated, premature beats through sustained ventricular tachycardia (VT) to ventricular fibrillation (VF). Their clinical importance also ranges from irrelevant asymptomatic events through symptomatic nuisances to sudden cardiac death (SCD). Their prognostic importance is increased by the presence of structural heart disease. Therefore, cardiac structure and function should be assessed, at least by echocardiography, before determining a management strategy for patients with ventricular arrhythmias.

### Ventricular Ectopics

Ectopic beats (or extrasystoles), often arising from specific sites such as the right ventricular outflow tract, are common and can affect people of all ages. They may be completely asymptomatic and discovered incidentally on a routine ECG or they are experienced as 'missed beats'. In structurally normal hearts, they are not dangerous and can be difficult to suppress with medication which is thus best avoided. However, in the presence of significant structural heart disease, frequent ectopy marks an increased risk of SCD and specialist advice should be sought.

### Non-sustained VT

VT is diagnosed when there are at least 3 consecutive, ventricular beats. If it lasts less than 30 seconds, it is

categorised as non-sustained. Non sustained VT may be completely asymptomatic. If the patient's heart is normal then symptomatic episodes can be safely and effectively treated with either beta-blockade or a class 1c antiarrhythmic drug, such as flecainide or propafenone. However, these drugs may be hazardous if structural heart disease is present, in which case specialist advice should be sought.

### Sustained VT

#### *After myocardial infarction*

During a myocardial infarction (MI) the heart is particularly vulnerable to ventricular arrhythmias. These are the commonest cause of death at the time of MI and the reason why MI patients die before reaching medical help. Ventricular arrhythmias occurring in the context of an acute MI, though life-threatening, do not confer an adverse prognosis if dealt with promptly. However, after recovering, the remnant scar may act as a source of episodes of life-threatening VT long after the acute event. The risk of late VT is difficult to predict, but the likelihood increases with worsening left ventricular function. For patients with significantly reduced left ventricular function (left ventricular ejection fraction  $\leq 35\%$ ) and episodes of sustained VT, insertion of an implantable cardioverter defibrillator (ICD, see BHF Factfile 5/99 'Non-drug treatment of arrhythmias - implantable cardioverter defibrillators') improves survival over and above any protection offered by antiarrhythmic drugs. ICDs can identify and terminate sustained ventricular arrhythmias, either by rapid pacing or by delivering an internal DC shock.

In some patients with recurrent episodes of VT, the area of the heart responsible can be selectively destroyed by catheter ablation (see BHF Factfile 1/2001: Ablation Therapy for Arrhythmias). Ablation is usually offered in conjunction with an ICD to reduce the frequency of device discharges. VT in patients with impaired left ventricular function due to other causes, e.g. cardiomyopathy, is treated by the same approach.

#### **In normal hearts**

VT in a structurally normal heart, in the absence of a family history of sudden cardiac death, usually originates from the left posterior branch of the left bundle (fascicular tachycardia) or from the right ventricular outflow under the pulmonary valve. Less commonly it originates from the left ventricular outflow tract below the aortic valve. This type of VT is not life threatening. Medical treatment may suffice although the source of the VT may also be amenable to ablation therapy which is preferable to life long antiarrhythmic therapy, particularly in young patients.

#### **Arrhythmogenic right ventricular dysplasia (ARVD)**

ARVD is a cardiomyopathy which causes VT as well as structural and functional deterioration of the right ventricle. It can be life threatening but can often be ablated by a percutaneous approach. However, if there are multiple, different tachycardias then an ICD may be implanted.

#### **Other heart disease**

VT may also occur in the context of other cardiac abnormalities such as valvular defects, hypertrophic cardiomyopathy and after cardiac surgery in which case treatment of the arrhythmia is tailored to treatment of the underlying cause.

#### **Ventricular Fibrillation**

Ventricular fibrillation (VF) is an extremely fast and chaotic electrical abnormality. The only effective treatment for VF is

rapid DC cardioversion (defibrillation). Because there is no cardiac output at all during VF, death will result in the absence of expertly administered cardiopulmonary resuscitation. Patients who experience VF outside the context of an MI should be treated with an ICD.

#### **Genetic predisposition**

It is increasingly apparent that some people have an inherited (genetic) risk of developing life-threatening VT or VF, even when their hearts are structurally normal. This should be suspected when there is a family history of SCD. One such example is the long QT syndrome, where mutations in cardiac-specific ion channels lead to a prolonged QT interval on the surface ECG which is associated with a predisposition ventricular arrhythmias and sudden death. The characteristic ECG appearance of the rare form of VT that occurs in the long QT syndrome is called 'torsade de pointes' (a turning around points). The long QT syndrome can also be acquired as a side effect of a variety of (often non-cardiac) drugs that affect ion channels, particularly in patients who are genetically predisposed. A similar, more recently described syndrome, the Brugada syndrome, causes an incomplete right bundle branch block and ST segment elevation in ECG leads V<sub>1</sub> and V<sub>2</sub> and is associated with a risk of life-threatening VT. Fortunately, many of the mutations responsible for these syndromes are now being identified, raising the possibility of future genetic screening to confirm or exclude the diagnosis in family members of patients affected by these syndromes.

All arrhythmias regardless of their underlying cause occur more commonly in the context of abnormal levels of serum electrolytes, particularly potassium. Therefore electrolytes should be checked in all patients presenting with ventricular arrhythmias.

#### **References:**

Morgan JM. Patients with ventricular arrhythmias: Who should be referred to an electrophysiologist? *Heart*, 2002; **88**: 544 - 550.

Huikuri HV, Castellanos A, Myerburg RJ. Medical Progress: Sudden Death Due to Cardiac Arrhythmias. *N Engl J Med* 2001; **345**: 1473-1482.

**Do you have any comments on BHF publications? Why not have your say at [bhf.org.uk/youresay](http://bhf.org.uk/youresay)**

14 Fitzhardinge Street, London W1H 6DH  
Telephone 020 7935 0185  
[bhf.org.uk/factfiles](http://bhf.org.uk/factfiles)

*Factfile* is produced by the British Heart Foundation in association with the British Cardiac Society and is compiled with the advice of a wide spectrum of doctors, including general practitioners. It reflects a consensus of opinion.