

Contemporary management of tachyarrhythmias

Antiarrhythmic drugs remain important for treating cardiac arrhythmias, but research over the last decade has shown previously unrecognised risks for many of these agents.

Recent findings and technological advances have led to a shift in management towards radiofrequency ablation and implantable devices.



STUART P. THOMAS

BMed, PhD, FRACP

Dr Thomas is Staff Specialist Cardiologist, Department of Cardiology, Westmead Hospital, Sydney, NSW.

Cardiac arrhythmias are responsible for a range of clinical syndromes, from the trivial to the life threatening, and the physician's response ranges from reassurance (in the case of frequent ectopy) to resuscitation for haemodynamically unstable ventricular arrhythmias. This review will consider the presentation and investigation of arrhythmias, as well as recent advances in management. The GP's role in ongoing management is also discussed.

Presentations in sinus rhythm

The symptoms of arrhythmias will often suggest the underlying problem. However, confirming the diagnosis and establishing its mechanism may be challenging.

Features

Palpitations

Features of palpitations that suggest arrhythmia include sudden onset and offset, as well as the absence of precipitants. Syncope associated with palpitations is very suggestive of arrhythmia.

Syncope or presyncope

Features of syncope that suggest a cardiac origin include dizziness prior to collapse and rapid recovery. A period of approximately 10 seconds is usually required for loss of consciousness after initiation of ventricular fibrillation or haemodynamically unstable ventricular tachycardia – this is often long enough for patients to stop a motor vehicle on the side of the road or to alert

IN SUMMARY

- If palpitations or syncope are the major feature of the presentation, documentation of the arrhythmia is critical. Every effort should be made to document the heart rhythm during symptoms.
- It is important to be alert to the possibility of ventricular tachycardia. Supraventricular tachycardias with aberrant conduction in the ventricles may present as broad complex tachycardias, but all broad complex tachycardias should be treated as ventricular tachycardia until proven otherwise.
- Electrical cardioversion should be used as soon as practicable for patients with ventricular fibrillation, haemodynamically unstable patients with ventricular tachycardia, and unconscious patients with undetermined rhythms. Cardiopulmonary resuscitation should be performed as required.
- Most of the complications of antiarrhythmic therapy are dose related. Patients should be maintained on the lowest effective dose of any drug.
- A subgroup of patients with asymptomatic atrial fibrillation may be treated safely by rate control rather than repeated attempts to restore sinus rhythm.

their companions. There is usually no injury, abnormal movements, aura or postsyncope alteration in the level of consciousness (unlike syncope due to epilepsy).

The presence of syncope does not usually help in distinguishing bradyarrhythmias and supra-ventricular tachycardia from ventricular tachycardia, and absence of syncope does not exclude ventricular tachycardia. However, syncope is an important symptom that has implications for patients working in dangerous environments and may affect their ability to drive a motor vehicle.

Other symptoms

Chest pain, fatigue and cardiac failure may be due to arrhythmia. Atrial fibrillation often presents with cardiac failure or fatigue rather than palpitations.

Investigation

If palpitations or syncope are the major feature of the presentation, documentation of the arrhythmia is critical. Every effort should be made to document the heart rhythm during symptoms.

A 12-lead ECG is desirable in all cases of stable arrhythmia. If the arrhythmia is intermittent the frequency of symptoms dictates the approach to documentation. Symptoms occurring daily may be documented by a 24-hour Holter monitor. Less frequent symptoms may better be investigated by a portable event recorder, which can be carried for several days or weeks until symptoms occur.

In rare cases of infrequent but profound syncope, an implantable loop recorder may be useful. This recently developed device, which is like a small pacemaker without leads, is implanted subcutaneously over the left pectoral region. The recording function is triggered by either a high or low rate, or telemetrically by the patient via a small handheld unit. The use of these devices is limited by cost.

Presentations requiring urgent action

Electrical cardioversion should be applied as soon as practicable for patients with ventricular fibrillation, haemodynamically unstable patients with ventricular tachycardia, and unconscious patients with undetermined rhythms. Cardio-pulmonary resuscitation should be performed as required.

Managing tachyarrhythmias

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Tachyarrhythmias are common in Australians, and GPs play a role in identifying patients and in ongoing management. The major trend in treatment is a shift from pharmacological therapy towards radiofrequency ablation and device therapy.

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The conscious patient with left ventricular failure or with cardiogenic shock secondary to arrhythmia is difficult to manage in the out-patient setting. The physician should be prepared to perform cardiopulmonary resuscitation or electrical cardioversion (if available) if the patient loses consciousness. These patients should be transferred to an emergency unit where they can receive antiarrhythmic therapy, cardioversion or overdrive pacing as appropriate.

When the patient is haemodynamically stable a 12-lead ECG should be obtained; if this is not possible, a rhythm strip is better than nothing.

Ventricular tachycardia

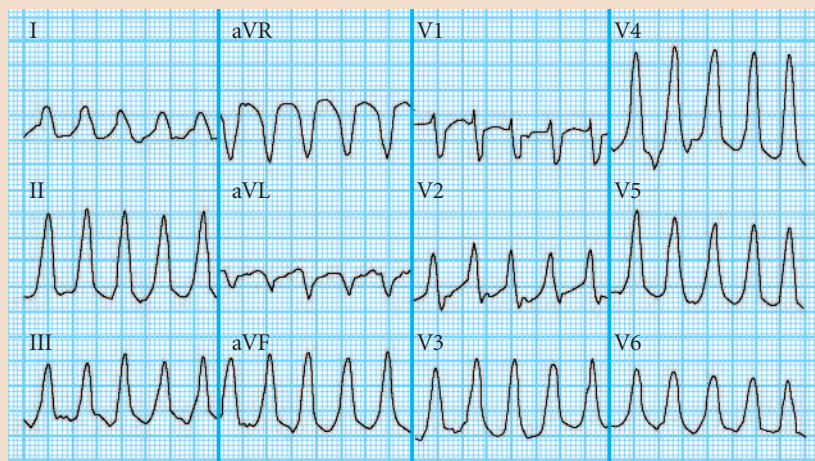


Figure 1. Ventricular tachycardia in a 79-year-old man. The complexes are broad and the ventricular rate is 190 beats per minute.

Supraventricular tachycardia

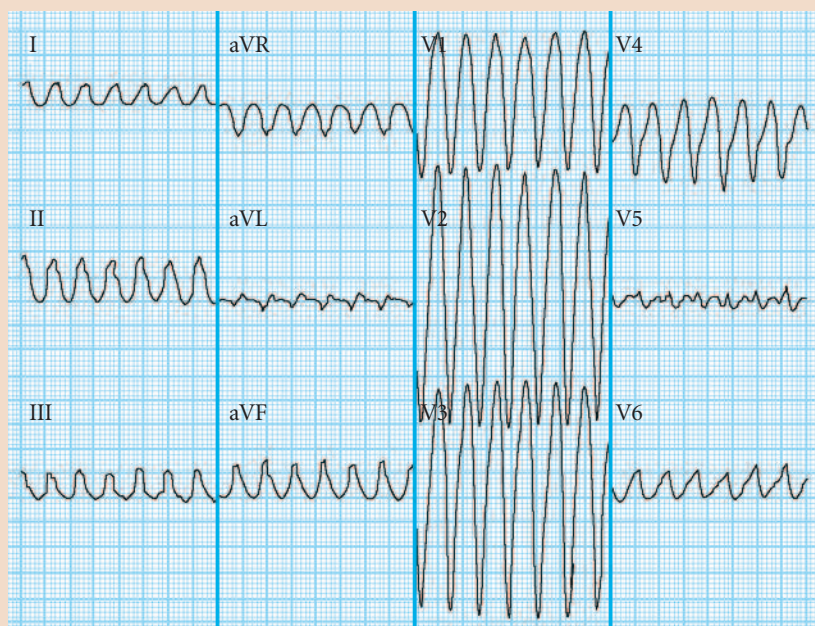


Figure 2. Supraventricular tachycardia presenting as a broad complex tachycardia conducting to the ventricles with a left bundle branch block in a 50-year-old woman. The ventricular rate is 250 beats per minute. This type of rhythm should be considered and treated as ventricular tachycardia until the diagnosis is confirmed.

Correct identification of the arrhythmia is critical for management, and documentation at this stage may avoid the need for many later investigations, particularly if the arrhythmia is episodic and infrequent.

Broad complex tachycardia: can it be ventricular tachycardia?

Although GPs will encounter ventricular tachycardia infrequently, it is important to be alert to the possibility (Figure 1). Patients with ischaemic heart disease and a regular broad complex arrhythmia almost always have ventricular tachycardia. Supraventricular tachycardias with aberrant conduction in the ventricles may present as broad complex tachycardias (Figure 2), but all broad complex tachycardias should be treated as ventricular tachycardia until proven otherwise.

Ventricular tachycardia may be stable and well tolerated. It is normally treated with intravenous lignocaine ([Lignocaine Hydrochloride Injection, Xylocard], 100 mg) or sotalol (1 to 1.5 mg/kg). These drugs should be administered only if the resources to deal with cardiopulmonary collapse are available.

Torsades de pointes

Torsades de pointes is an uncommon adverse effect of many common drugs and may also result from congenital long QT syndrome. Recognition is important because the key to management is removal of the precipitant, rather than addition of antiarrhythmic drugs.

Narrow complex tachycardia

A regular narrow complex tachycardia usually indicates atrioventricular junctional tachycardia (Figure 3), an accessory pathway tachycardia, or atrial flutter with fixed atrioventricular block. Acute management should be identical to that of broad complex arrhythmias if haemodynamic collapse occurs. Cardiopulmonary resuscitation and electrical cardioversions should be used if required.

In those cases where the arrhythmia is haemodynamically stable, carotid sinus massage or pharmacological therapy with adenosine (Adenocor) or intravenous verapamil (Isoptin Injection) will usually restore sinus rhythm. Documenting the arrhythmia and its response to interventions is important for directing further management.

Atrial fibrillation of recent onset usually requires urgent action to control ventricular rate and restore sinus rhythm – the early restoration of sinus rhythm reduces the risk of thromboembolic complications and may reduce the risk of early recurrence. For symptomatic patients without cardiac failure, my current approach is to use intravenous amiodarone, sotalol, flecainide (Flecatab, Tambocor) or digoxin (Lanoxin, Sigmaxin). In patients with cardiac failure, bradycardia or a long QT interval, amiodarone, flecainide and sotalol should be used with caution. Sotalol may precipitate bronchospasm, and amiodarone should not be used in patients with interstitial lung disease or thyroid dysfunction. All three drugs – particularly flecainide – may cause proarrhythmia, especially in patients with poor left ventricular function.

Ongoing management and the GP

GPs play a role in identifying patients who have arrhythmia or are at risk of arrhythmia, and in detecting adverse reactions and recurrences of arrhythmia; they also

Atrioventricular junctional tachycardia

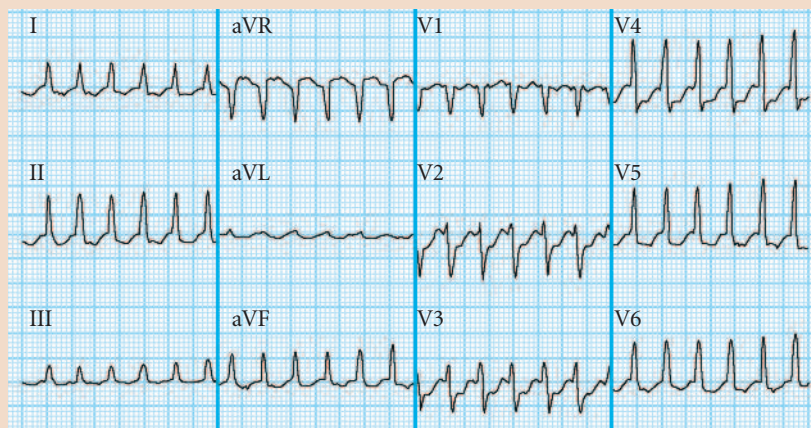


Figure 3. Atrioventricular junctional (nodal) re-entrant tachycardia in a 49-year-old woman with a ventricular rate of 228 beats per minute. This is a common type of narrow complex tachycardia.

need to adjust dosages of antiarrhythmic agents and supervise anticoagulation regimens. In addition, GPs need to be alert to potential problems of pacemakers and defibrillators and aware of early treatment measures for atrial fibrillation.

Dosages of antiarrhythmic agents

Antiarrhythmic drugs may be used to terminate arrhythmias or reduce the risk of arrhythmia recurrence; they are also used for primary prevention. Paradoxically, antiarrhythmic drugs may precipitate ventricular tachycardia or *torsades de*

pointes – this phenomenon is called proarrhythmia (Figure 4). The risk of proarrhythmia with commonly used antiarrhythmic drugs is small (1 to 2% for sotalol, amiodarone and flecainide).

Some proarrhythmic events are likely to be fatal and most occur in the first few days of therapy – this is the basis for the argument that these agents should be started in hospital. In practice, many patients start antiarrhythmic therapy as outpatients, and GPs need to be alert to the possibility of proarrhythmia in patients experiencing palpitations or

Proarrhythmia



Figure 4. Runs of polymorphic ventricular tachycardia in a patient with a prolonged QT interval in sinus rhythm. This episode of proarrhythmia occurred after administration of sotalol.

Atrial flutter

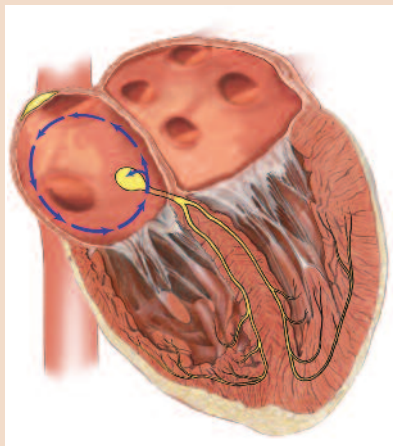


FIGURE 5A © CHRIS WIKOFF, 2003

Figure 5a. Type 1 atrial flutter, which is the most common type, is caused by electrical re-entry in the right atrium. It can be cured in over 90% of cases by radiofrequency ablation.

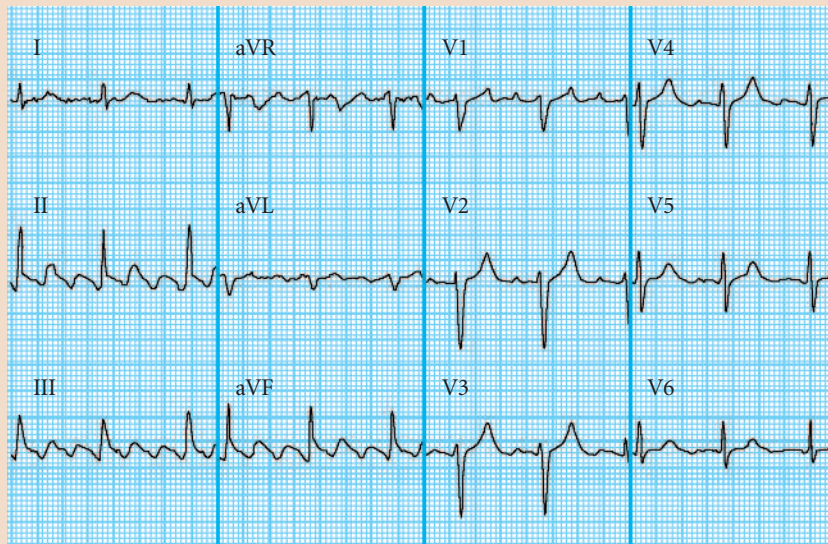


Figure 5b. Atrial flutter with 3:1 atrioventricular block and the characteristic sawtooth pattern visible in the inferior leads.

syncope on antiarrhythmic therapy. Risk factors for proarrhythmia include:

- a long QTc interval (particularly if greater than 450 milliseconds)
- concurrent administration of digoxin
- low potassium levels
- left ventricular dysfunction
- bradycardia
- female sex.

Most of the complications of antiarrhythmic therapy are dose related, including proarrhythmia and the toxic effects of amiodarone. Symptomatic hypotension or bradycardia should lead to cessation or dose reduction. Sotalol may cause general fatigue or precipitate airways disease. Patients on amiodarone need regular monitoring to detect skin discolouration as well as thyroid, lung and liver disease. Lung function studies, performed at baseline and six-monthly intervals, may be used to reduce the risk of irreversible lung toxicity. Patients should be maintained on the lowest effective dose of any drug.

Anticoagulation

If practicable, warfarin (Coumadin, Marevan) should be administered to all patients with atrial fibrillation who are over 65 years of age and to those under 65 with structural heart disease or hypertension. The risk of stroke in these patients is approximately 5% per year (substantially higher for those with mitral valve disease and atrial fibrillation). Warfarin reduces this risk to 1 to 2%, but the risk of serious haemorrhage is approximately 1% per year. An INR of 2 to 3 is desirable in the majority of cases.

Care of pacemakers and defibrillators

In most cases, pacemakers and defibrillators will be monitored at a specialist centre. However, GPs need to be alert to the risk of device or lead failure. Lead failures may manifest as failure to capture – atrial leads are particularly prone to this problem. Defibrillator lead failures may present as inappropriate shocks.

Early treatment of atrial fibrillation

Early return to sinus rhythm not only reduces the risk of stroke but also limits damage to the atria known as remodelling – this remodelling is thought to increase the risk of atrial fibrillation recurrence. Sinus rhythm may be restored spontaneously or by either pharmacological intervention or electrical cardioversion. This is usually best managed in the emergency room.

If a patient is noted to be in atrial fibrillation, the physician should always consider the duration of the arrhythmia. An attempt to convert the rhythm to sinus is indicated unless there is previous evidence of failed cardioversion or a clear history of longstanding asymptomatic atrial fibrillation. Atrial fibrillation cannot be considered permanent unless cardioversion has been attempted.

The recent AFFIRM study showed that for a subgroup of asymptomatic patients rate control (rather than repeated

attempts to restore sinus rhythm) did not result in excess morbidity or mortality.¹ Digoxin, beta blockers, verapamil and diltiazem are the most appropriate agents. For symptomatic patients, early treatment is desirable.

When to refer

Atrial fibrillation, ventricular fibrillation, ventricular tachycardia and some atrial arrhythmias are chronic problems that require ongoing attention from the GP, but many aspects of arrhythmia management require specialist or hospital care. The correct time to refer a patient will depend on the GP's confidence to manage the problem and the availability of specialist assistance. In general, referral should be considered for:

- patients with suspected arrhythmia in

whom the diagnosis remains unclear

- most patients with ventricular arrhythmias (referral required at the time of diagnosis)
- patients with recurrent regular narrow complex arrhythmias or pre-excitation on their ECG
- patients with difficult to manage atrial fibrillation.

Advances in treatment of arrhythmias

Prevention of sudden death

The role of implantable defibrillators in the secondary prevention of ventricular arrhythmias is well established, and several recent trials have broadened the indications for these devices. Defibrillators increase survival by preventing sudden death in patients with poor left ventricular function and inducible ventricular tachycardia or documented nonsustained ventricular tachycardia.

Cure of ventricular tachycardia

Several rare types of ventricular tachycardia may be cured by percutaneous transvascular radiofrequency ablation, including right ventricular outflow tract tachycardia, idiopathic left ventricular tachycardia, and bundle branch re-entry. These arrhythmias are usually suspected on the basis of the clinical picture and ECG, and confirmed by an electrophysiological study.

Supraventricular arrhythmias

In cases of recurrent supraventricular arrhythmia, radiofrequency ablation has become the first line of treatment for most patients. Radiofrequency ablation results in a permanent cure for narrow complex arrhythmias in over 90% of cases, with safety comparable to that of antiarrhythmic therapy. With few exceptions, patients with regular narrow complex tachycardias, including atrial flutter (Figures 5a and b), should be provided with the option of radiofrequency ablation for managing their arrhythmia.

Curative therapy for atrial fibrillation

In occasional patients who have severely symptomatic or problematic atrial fibrillation, a recently developed curative radiofrequency ablation procedure may be appropriate. Radiofrequency energy is used to electrically isolate the pulmonary veins (Figure 6). The procedure is successful in 50 to 70% of cases but is associated with a 1% risk of serious complications. This procedure is still in an investigational stage and is most suitable for patients who previously would have been considered for His bundle ablation and insertion of a permanent pacemaker.

Conclusion

The major trend in the management of arrhythmias is a shift from pharmacological therapy towards radiofrequency ablation and device therapy. Radiofrequency ablation is often the treatment of choice for supraventricular tachycardias, including isthmus dependent atrial flutter. Implantable defibrillators are the main therapeutic option for ventricular arrhythmias and are used for primary prevention in an expanding group of patients. Atrial fibrillation remains a major problem, but early success with curative procedures and a better understanding of the risk of stroke provide hope for the future. **MT**

Reference

1. Wyse DG, Waldo AL, DiMarco JP, et al; The Atrial Fibrillation Follow-up Investigation of Rhythm Management (AFFIRM) Investigators. A comparison of rate control and rhythm control in patients with atrial fibrillation. *N Engl J Med* 2002; 347: 1825-1833.

Pulmonary vein isolation for atrial fibrillation

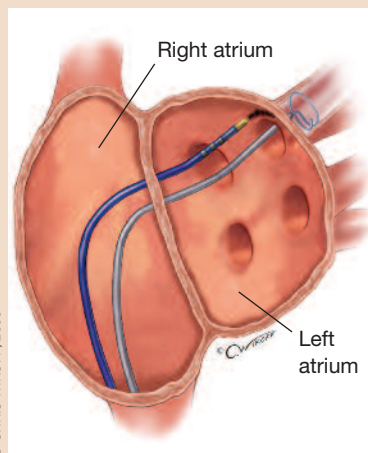


Figure 6. Isolation of the pulmonary veins is performed using electrode catheters advanced from the femoral veins across the atrial septum into the left atrium. A circular mapping catheter (silver) is used to identify the electrical connections between the atrial body and the vein, and a second ablation catheter (blue) is used to deliver radiofrequency energy.