Contemporary management of atrial fibrillation

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SYNOPSIS

Atrial fibrillation is responsible for considerable morbidity in our population. Management of persistent atrial fibrillation of acute onset involves electrical or pharmacological cardioversion to restore sinus rhythm and the use of antiarrhythmic drugs to maintain sinus rhythm. The duration of atrial fibrillation is an important determinant of the timing and success of cardioversion and the risk of embolic complications. When sinus rhythm cannot be maintained, control of ventricular rate and the prevention of stroke become the goals. This is also the case in patients in whom conversion to sinus rhythm is impractical or likely to be unsuccessful. The choice of aspirin or warfarin depends on each patient's individual risk of stroke.

Index words: arrhythmia, cardioversion, antiarrhythmic drugs, anticoagulants.

Introduction

Atrial fibrillation is the most common arrhythmia presenting to cardiologists and general practitioners. Its prevalence is 0.4% in the general population, increasing to 9% of people over the age of 80. As our population ages, the prevalence of atrial fibrillation in Australia will continue to rise.

Despite being considered a benign arrhythmia, atrial fibrillation is a major cause of morbidity. Patients suffer a wide variety of symptoms including palpitations, dizziness, dyspnoea, angina and worsening heart failure. The most feared complication is systemic embolism, particularly embolic stroke. Optimal management of atrial fibrillation can improve patients' symptoms and reduce their risk of stroke substantially.

There are two approaches to therapy. One involves restoring and maintaining sinus rhythm. When this is not practical, the focus turns to the control of ventricular rate and anticoagulation to prevent embolism.

Assessment

In patients discovered to have atrial fibrillation treatable conditions contributing to the arrhythmia should be identified (Table 1). Comorbidities which may influence the decision to use warfarin and the choice of antiarrhythmic drug should be considered. The assessment should include a thorough history and examination, a 12 lead ECG, echocardiography and thyroid function tests.

One of the most important factors influencing treatment is the duration of atrial fibrillation. Most patients with atrial fibrillation of less than 24 hours duration will spontaneously revert to sinus rhythm. The longer the patient has been in atrial fibrillation, the lower the success rate for both pharmacological and electrical cardioversion. The risk of atrial thrombus and embolic stroke also increases with time.

Establishing the exact duration of atrial fibrillation can be difficult. While some patients are highly symptomatic with the onset of the arrhythmia, others can be completely asymptomatic. If the onset of atrial fibrillation is unclear from the history, it must be assumed that the atrial fibrillation has been present for longer than 48 hours.

Restoration of sinus rhythm

DC electrical cardioversion

Consensus of cardiological opinion is that patients who present within 48 hours of the onset of atrial fibrillation can be cardioverted without the need for warfarin (Fig. 1). When the atrial fibrillation has been present for longer than 48 hours, the risk of atrial thrombus is too high and cardioversion should be delayed until the patient has been anticoagulated for at least three weeks. Anticoagulation is continued for four weeks following successful cardioversion as normal atrial function is not immediately restored (atrial stunning).

Electrical cardioversion is very successful in restoring sinus rhythm, but the recurrence rate without medication is high, particularly in the presence of underlying heart disease. Drugs may be used to improve the success of cardioversion and the long-term maintenance of sinus rhythm.

Pharmacological cardioversion

An attempt can be made to restore sinus rhythm pharmacologically, avoiding the need for hospital admission and general anaesthetic. Flecainide, sotalol and amiodarone improve the rate of conversion to sinus rhythm when compared to placebo, but each drug has its limitations. The role of digoxin in acute cardioversion remains controversial.
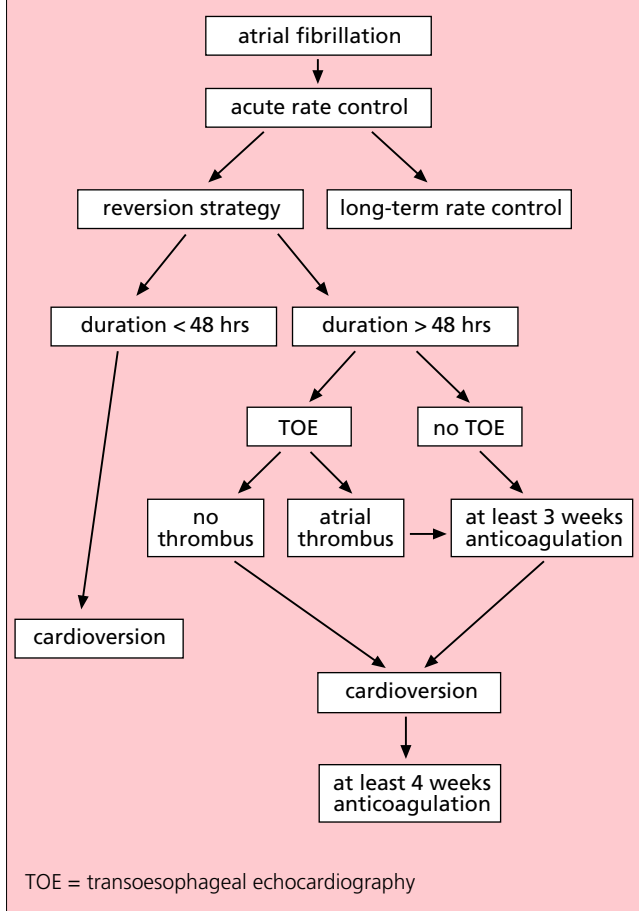
The new class III agent, ibutilide, is effective in terminating atrial fibrillation and flutter of up to 90 days duration.[1] It has

Table 1

Common conditions contributing to atrial fibrillation

hypertension	coronary disease	valvular heart disease
heart failure	alcohol excess	pericarditis
infection	thyrotoxicosis	chronic lung disease

Fig. 1

Management of newly diagnosed atrial fibrillation

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              atrial fibrillation
                      │
              acute rate control
              ↙             ↘
    reversion strategy    long-term rate control
      ↙          ↘
duration < 48 hrs   duration > 48 hrs
    │              ↙          ↘
    │            TOE         no TOE
    │         ↙      ↘          ↘
    │   no        atrial    at least 3 weeks
    │ thrombus  thrombus →  anticoagulation
    ↓       ↘        │           ↙
cardioversion    ↘   │       ↙
                  cardioversion
                      │
              at least 4 weeks
               anticoagulation
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TOE = transoesophageal echocardiography

a half-life of only six hours and is given intravenously over 10 minutes. A second dose is given 10 minutes later if necessary. Success rates of up to 63% have been reported. This must be weighed against the increased risk of polymorphic ventricular tachycardia (4%) so ECG monitoring is required. Ibutilide has also been used to improve the success rate of electrical cardioversion.

If pharmacological cardioversion is unsuccessful, electrical cardioversion should be considered.

Anticoagulation and cardioversion

In hospitals where transoesophageal echocardiography (TOE) facilities are available, 'accelerated cardioversion' may be performed. Patients without atrial thrombus on TOE can be cardioverted with relative safety, without the need for pretreatment with warfarin. Anticoagulation is still necessary following the procedure. Unfortunately, a negative TOE does not entirely rule out the possibility of stroke.

Maintenance of sinus rhythm

Class Ia (e.g. quinidine), class Ic (e.g. flecainide) and class III antiarrhythmic drugs (e.g. amiodarone, sotalol) reduce the recurrence of atrial fibrillation. Digoxin does not prevent recurrent atrial fibrillation and may be withdrawn once sinus rhythm is restored unless indicated for concomitant heart failure.

Class I drugs

The class Ia drugs (e.g. quinidine) have fallen out of favour because of the suggestion of an increased mortality with long-term use. This is probably due to proarrhythmic adverse effects.

The Cardiac Arrhythmia Suppression Trial also raised doubts about the safety of flecainide. The risk appears to be greatest for patients with underlying heart disease. With very few exceptions, flecainide should only be considered for the prevention of recurrent atrial fibrillation if left ventricular function is normal.

Class III drugs

The class III drugs have gained popularity because of their efficacy and relative safety.

Sotalol is as effective as the class I drugs but has a better safety profile. The main concern is QT prolongation and the risk of torsades de pointes which is increased by hypokalaemia. QT intervals and electrolytes should therefore be checked regularly.

Amiodarone is at least as effective as sotalol but its non-cardiac adverse effects can limit its long-term use. Initially reserved for patients with resistant arrhythmias, it is now being used more widely. Lung function, liver enzymes and thyroid function should be checked regularly to monitor for toxicity. Amiodarone is the drug of choice for patients with concomitant left ventricular dysfunction.

New class III drugs

In contrast to sotalol and amiodarone, dofetilide is a pure class III drug. It is effective at stopping atrial fibrillation and maintaining sinus rhythm. Dofetilide has no overall negative inotropic effect and few non-cardiac adverse effects, but it does cause QT prolongation and torsades de pointes.

The safety of dofetilide in heart failure was studied in the DIAMOND-CHF trial.[2] Dofetilide reduced the incidence of atrial fibrillation but had no effect on mortality. When starting treatment at least 72 hours of inpatient ECG monitoring is advised. Careful dose adjustment for renal impairment (as used in the trial) is also recommended.

Rate control

If acute atrial fibrillation precipitates severe hypotension, ischaemia or heart failure, immediate electrical cardioversion is usually needed. If the patient is stable, drugs can be used to slow the ventricular response.

Digoxin is most frequently used for this purpose but may be insufficient when used alone, particularly if there is sympathetic activation (e.g. exercise or after surgery). Combining digoxin with either verapamil or diltiazem, or a beta blocker (e.g. atenolol) can overcome this problem. These additional drugs are also very effective as monotherapy for controlling the rate of atrial fibrillation. They are particularly useful for patients with coexisting hypertension or angina. Digoxin is the treatment of choice if the patient has heart failure.

In the occasional patient in whom rate control cannot be achieved pharmacologically, atrioventricular node ablation,

with rate responsive ventricular pacing, may be considered. Anticoagulation is still required.

Rate control versus rhythm control

It is unclear whether chronic atrial fibrillation is best managed with rhythm control (repeated cardioversion and antiarrhythmic drugs to restore and maintain sinus rhythm) or rate control (controlling ventricular rate and anticoagulation). This is the subject of ongoing, randomised controlled studies. While we await these results, both approaches are reasonable and patient preference may be the deciding factor.

In general, the approach adopted should reflect the likelihood of maintaining sinus rhythm following cardioversion. The two important factors predicting the recurrence of atrial fibrillation are the duration of atrial fibrillation and the presence of structural heart disease. It is therefore more reasonable to attempt rhythm control in patients with normal hearts and atrial fibrillation of recent onset than in patients with heart failure or valve disease who have had atrial fibrillation for many years. If sinus rhythm cannot be maintained despite repeated cardioversions and a variety of antiarrhythmic drugs, the goal of treatment becomes rate control.

Anticoagulation

Pooled data from five large studies suggest that warfarin reduces the risk of stroke by 68% (target INR 2.0–3.0).[3] This reduction of embolic stroke occurs at the expense of bleeding complications. Warfarin is more effective than aspirin, but carries a higher bleeding risk. The decision to choose warfarin or aspirin must be based on an assessment of the risks and benefits of treatment for each individual.

In general terms, warfarin is recommended for patients at high risk of embolic stroke (>10% per year) (Table 2). Warfarin could be considered for patients at moderate risk of stroke (5% per year). The benefit of warfarin is less clear in this group and aspirin is a reasonable alternative in the presence of relative contraindications to warfarin. Patients with atrial fibrillation under the age of 65 without risk factors (so-called 'lone atrial fibrillation') have a low incidence of stroke (1%). The risks of warfarin probably outweigh the benefits for these patients so aspirin is recommended.

Non-pharmacological measures for refractory cases

Ablation and surgery

One approach involves the physical interruption of the electrical circuits that sustain atrial fibrillation. The 'maze' surgical procedure and non-surgical catheter ablation based on the same principle are only available in highly specialised units. Both carry considerable procedural risks.

An interesting recent development is the ablation of cardiac tissue around the pulmonary veins to treat patients with paroxysmal atrial fibrillation. These areas may be the origin of the ectopic beats that precipitate some attacks of atrial fibrillation.[4]

Table 2

Clinical stratification of the risk of stroke in patients with atrial fibrillation

High risk >10% per year	valvular heart disease
	previous transient ischaemic attack or stroke
	heart failure or left ventricular dysfunction
	age >75 with hypertension or diabetes
Moderate risk approximately 5% per year	age >65 not high risk
	age <65 with hypertension, diabetes or vascular disease
Low risk <1% per year	age <65 no risk factors

Atrial defibrillator

Following the success of the implantable defibrillator for ventricular arrhythmias, initial experience with atrial defibrillators has brought mixed results. While they appear to be effective, the shocks are uncomfortable and may be quite frequent with paroxysmal atrial fibrillation. Patients are less likely to accept the discomfort, given the relatively benign nature of the arrhythmia. There is also a risk that the defibrillator shock may trigger ventricular arrhythmias. Dual chamber defibrillators make this less of a problem. The cost implications of wider use of these expensive devices would also be considerable.

Conclusion

The management of atrial fibrillation needs to be tailored to each patient. The risks and benefits of cardioversion, antiarrhythmic drugs and anticoagulation must be weighed up and discussed with the patient to ensure the best outcomes.

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Self-test questions

The following statements are either true or false (answers on page 111)

5. Warfarin reduces mortality in patients with atrial fibrillation and heart failure.

6. Digoxin does not prevent recurrent atrial fibrillation.