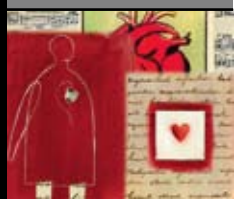

Management of atrial fibrillation

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BACKGROUND
Atrial fibrillation affects a significant proportion of the Australian population, affecting approximately 5% of people over 65 years of age.

OBJECTIVE
This article provides an approach to the management of this common arrhythmia.

DISCUSSION
During initial assessment, it is important to identify and treat any comorbid conditions that may contribute to atrial fibrillation. The clinician must then determine an appropriate anticoagulation regimen and choice of either a rate or rhythm control approach. Anticoagulation can be with either warfarin or aspirin, with the decision based on an assessment of the patient's thromboembolic risk. Rate and/or rhythm control can be achieved pharmacologically, with device based therapy or with newer catheter ablation techniques. A combination of these differing approaches may be required in patients in whom it is difficult to achieve and maintain therapeutic goals.

Atrial fibrillation (AF) has been described as an emerging epidemic. It is estimated to affect approximately 5% of the population aged over 65 years in Australia. It is responsible for a significant burden of illness and is associated with an increase in the long term risk of stroke, heart failure and mortality.[1] Therefore, it is important that all clinicians develop a reliable approach to the diagnosis and management of this common illness. Atrial fibrillation may be asymptomatic. Diagnosis is made by detecting an irregular pulse and typical electrocardiogram (ECG) changes (*Figure 1*).

Atrial fibrillation is frequently seen as a sequela of hypertension, coronary artery disease, valvular heart disease and congestive cardiac failure. The development of AF in these circumstances can lead to a significant reduction in cardiac function and exacerbate the underlying cardiac disease. This deterioration influences the treatment approach employed in these cases.

Atrial fibrillation is also commonly associated with a wide range of other diseases including:

- infections
- pulmonary disease including pulmonary emboli
- endocrine disorders (most commonly thyrotoxicosis)
- electrolyte disturbances
- renal failure, and
- during convalescence postoperatively.

Diagnosis and treatment of the underlying condition in this situation should be the primary goal. A detailed discussion of investigation and treatment of these conditions is beyond the scope of this article.

Management

The appropriate management of AF is dependent upon the clinical context in which it is encountered. The majority of cases can be dealt with appropriately on an outpatient basis. The approach to the treatment of AF involves two important principles:

- assessment of thromboembolic risk, and
- rate control

Rhythm control as such may not be necessary.

Assessment of thromboembolic risk

It is important to appreciate that much of the morbidity and mortality associated with AF results from thromboembolism. Discoordinate atrial contraction can lead to thrombus formation in the left atrial appendage. This may embolise and enter the systemic circulation to cause infarction, and may manifest in the brain, kidney, gastrointestinal tract, or limbs (*Figure 2*).

An evaluation of thromboembolic risk should be performed in all patients who present with AF. This includes patients with paroxysmal and chronic AF. Following reversion to sinus rhythm, atrial stunning increases the risk of emboli for 4

weeks. For this reason, anticoagulation should be continued in sinus rhythm for at least 1 month, and may be continued if there is suspicion of further paroxysmal events. Symptoms are unreliable as episodes of AF are frequently silent.

The benefits of anticoagulation in AF are well established.[2] Warfarin reduces stroke risk by approximately 70% with a target INR of 2.0–3.0. Aspirin, although less effective, has also been shown to reduce stroke risk by approximately 20% at a dose of 325 mg. Anticoagulation with warfarin does carry a risk of bleeding complications, generally considered to be 0.5–1.5% per year.[3] Therefore, in some patient groups the benefit of warfarin does not outweigh the potential risks (*Table 1*).

When considering the issue of anticoagulation, it is reasonable to stratify patients into low, medium and high risk of embolic complications (*Table 2*). This enables a rational decision to be made regarding anticoagulation.

Patients with a history of suspected embolic stroke and mitral valve disease, especially mitral stenosis, are at high risk of embolic events (estimated at 10–15% per annum). These patients clearly benefit from warfarin and this approach should be instituted in all cases unless there is a major contraindication to warfarin therapy such as recent intracranial haemorrhage or recurrent falls.

Patients with a history of: hypertension (even if normotensive on treatment), left ventricular dysfunction or a history of heart failure, diabetes mellitus, or age over 65 years are at intermediate risk (*Table 2*). These patients have an annual embolus risk of approximately 3.5–5.0%. These risk factors are generally considered to be additive. Anticoagulation with warfarin is appropriate in the majority of these patients although the risks and benefits should be carefully considered in each case.

Patients less than 65 years of age, and with none of the above mentioned risk factors, are at low risk for embolic complications, estimated at 0.5–1.0% per year. In these patients, the benefit of warfarin is outweighed by the potential risks and aspirin is the most appropriate agent.

If it is necessary to interrupt warfarin therapy for surgical or dental procedures, it is the consensus of expert opinion that, given the low daily risk of embolic complications, it is reasonable to cease anticoagulation for up to 1 week without substituting unfractionated or low molecular weight heparin.[4] These guidelines do not apply to patients with prosthetic valves.

In patients who have reverted to sinus rhythm it is reasonable to consider ceasing anticoagulation. The caveat to this approach is that unless there has been a clear precipitating event, such as infection or surgery, fibrillation is likely to recur in the future. Patients in whom a rhythm control strategy has been employed and who have anticoagulation ceased have an increased risk of emboli.[5] This decision therefore needs to be made with careful consideration of the ongoing risk of recurrent AF.

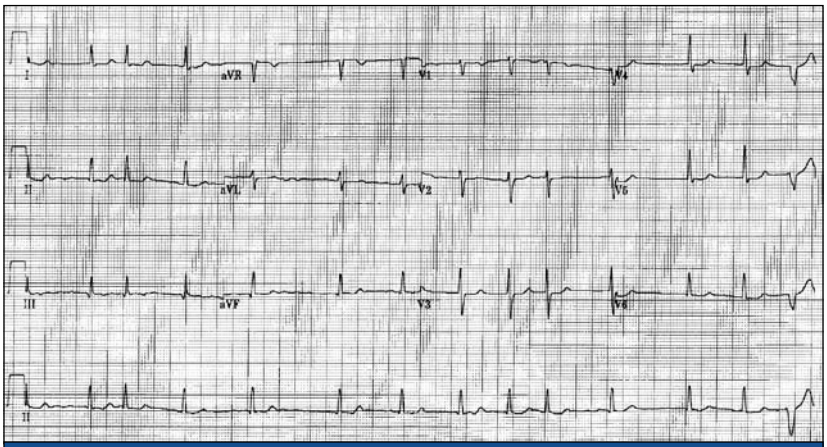

Figure 1. An ECG demonstrating a patient in AF. Note the irregular time interval and the loss of P waves preceding each QRS complex

Rate control

The loss of coordinated atrial contraction in AF can result in an accelerated ventricular rate. This can contribute to the symptoms of shortness of breath or palpitations, and can also cause hypotension, congestive cardiac failure or myocardial ischaemia. Preventing symptoms and complications is the goal of rate control. This can be achieved with drugs or AV nodal ablation and pacing.

Pharmacologic

The efficacy of pharmacological rate control is about 80%.[6] These agents act to slow atrioventricular nodal conduction and thus slow the ventricular rate. If monotherapy is unsuccessful, then a second or third agent can be introduced. This must be done cautiously as the incidence of symptomatic bradycardia or heart block increases with escalation.

Beta blockers

Beta blockers, metoprolol or atenolol, are suggested as first line therapy for rate control. Sotalol is excluded from this group as it has broader antiarrhythmic properties and is discussed later. The target rate for treatment is a resting heart rate of 60–80 bpm, and the dose may be increased if this is not achieved. These agents depress myocardial contractility and must be used with caution if there are signs of decompensated heart failure or hypotension. They must also be avoided in patients with asthma.

Calcium channel antagonists

Nondihydropyridine calcium channel antagonists, diltiazem and verapamil, are commonly used to obtain rate control.

These agents should be used second line for patients in whom beta blockers are contraindicated or not tolerated. They also act to depress ventricular function and should be used with caution if there is a history of left ventricular failure.

Digoxin

Digoxin is as effective as a rate control agent at rest, but alone it fails to adequately control exercise induced tachycardia. Therefore it is best used in combination with another agent, although in predominantly sedentary elderly patients it is suitable as monotherapy. It is also indicated for use in patients with hypotension or left ventricular failure as it does not lower blood pressure and may offer slight inotropy. Digoxin is renally excreted, and so care should be taken to adjust the dose for patients with impaired renal function. Drug levels can be used to monitor this in the medium to long term.

AV nodal ablation and pacing

Ablation of the AV node and insertion of a permanent pacemaker provides highly effective heart rate control. This procedure is best used for patients who have failed treatment with pharmacologic agents or cannot tolerate them due to hypotension. It is also useful in patients with tachycardia induced cardiomyopathy. The limitations of this procedure are the persistent need for anticoagulation (due to persistent AF), loss of AV synchrony and lifelong pacemaker dependence. There is some concern over the long term effects of right ventricular pacing, and this procedure is best avoided in young patients.

Table 1. Contraindications to warfarin therapy

Relative contraindications
PHx peptic ulcer disease
Concomitant NSAID therapy
Advanced age (>85 years)
Absolute contraindications
Recent intracranial haemorrhage (within past 12 months)
Cirrhotic liver disease
Advanced malignancy
Recurrent falls

Table 2. Antithrombotic therapy for patients with AF

Low risk*	0 risk factors	Aspirin 300 mg/day
Intermediate risk*	1 risk factor	Aspirin 300 mg/day or warfarin (target INR 2.0–3.0)
High risk*	2 risk factors or PHx CVA/TIA or mitral valve disease	Warfarin (target INR 2.0–3.0)

* Recognised risk factors: hypertension, left ventricular failure, diabetes mellitus, age >65 years

Rhythm control

Cardioversion of AF is not essential. Many patients will tolerate AF with only minimal or no symptoms. In these cases, management should consist of only rate control and anticoagulation as required. However in some cases, AF can cause significant symptoms and reversion to sinus rhythm is required. This can be achieved by either drug therapy or direct current reversion (DCR).

Amiodarone

Amiodarone is the most effective antiarrhythmic agent currently available. Its broad spectrum of activity is due to the prolongation of the action potential and refractory period of cardiac conducting tissue. Trials examining the efficacy of amiodarone are somewhat confusing due to the heterogeneous patient group and range of dosing regimens. Amiodarone can be used either in the acute setting with recent onset of AF or for patients in chronic fibrillation.

In the acute setting, either intravenous regimens with a loading bolus and infusion or oral treatment are reasonable options. Trials have shown reversion rates of up to 95%, particularly with intravenous regimens,[7] but data is limited for patient specific groups. Patients with a shorter duration of AF, smaller left atrial size and who receive higher doses of amiodarone are more likely to revert. In chronic AF, the chance of successful reversion is lower.

Administration of oral amiodarone is appropriate in these circumstances and at 28 days, it can be expected that 15–40% of patients will be in sinus rhythm. Although an effective antiarrhythmic, amiodarone usage is associated with significant adverse effects.[8] Bradycardia, hypotension, nausea and constipation have all been reported. Thyroid abnormalities, either hypo- or hyperthyroidism, are also a frequent complication. Amiodarone is also widely distributed in body tissues and has an extraordinarily long half life of 60–90 days. These serious potential complications must be taken into account before commencing a patient on amiodarone.

Flecainide

Flecainide has been proven as an effective agent in AF, acting to revert and maintain sinus rhythm.[9] Flecainide however has a significant side effect profile limiting its usefulness clinically. Flecainide causes significant reduction in cardiac conduction and contractility and is also proarrhythmic. It is contraindicated in patients with coronary artery disease or left ventricular dysfunction, and should only be used if these conditions have been excluded. It may also act to increase

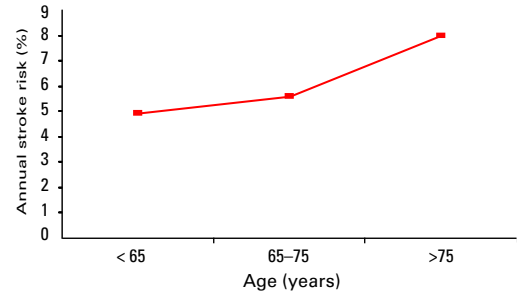

Figure 2. Annual stroke rates in relation to age in untreated patients with AF

AV nodal conduction, actually accelerating the ventricular rate. Therefore, it is often used in conjunction with an AV nodal blocking agent such as beta blockers or verapamil.

Sotalol

Sotalol is a third agent available in Australia. It is a beta blocker with extended antiarrhythmic properties. There is conflicting evidence regarding its ability to revert patients to sinus rhythm but it has been proven to assist in maintaining sinus rhythm.[10] It is therefore not currently recommended for pharmacologic cardioversion, but can be useful following DCR for maintenance of sinus rhythm. Sotalol is a popular agent because it does not have the broad adverse effect profile of the agents described above. The only serious adverse event apart from those associated with other beta blockers is QT prolongation.

Electrical cardioversion

Immediate DCR is indicated acutely for AF or flutter associated with a rapid ventricular rate associated with haemodynamic compromise or symptoms of myocardial ischaemia. Direct current reversion is also indicated for patients with AF of less than 48 hours. In stable, symptomatic patients it can be attempted after at least 4 weeks of therapeutic anticoagulation. If the patient has significant symptoms or haemodynamic compromise with an unknown duration of AF, a transoesophageal echocardiogram (TOE) may be performed immediately before DCR. The immediate success rate of DCR is 70–99%. Maintenance of sinus rhythm is more likely to be achieved on antiarrhythmic medication.[11]

Direct current reversion should not be attempted for patients with relatively short periods of sinus rhythm between cardioversions. This group of patients is designated as having permanent AF. Rate control and anticoagulation is the most appropriate strategy in this setting.

Catheter ablation

Early catheter based techniques attempted to scar the atrium in order to terminate fibrillation. Enthusiasm for these techniques was tempered by prohibitive complication rates. Recent advances in the pathophysiology of AF have enabled modified procedures concentrating on the pulmonary veins with higher success rates and lower complications. This procedure is best reserved for younger patients with paroxysmal AF that have failed treatment with at least one antiarrhythmic drug. In patients without significant structural heart disease, success rates of up to 90% are achieved,[12] although multiple procedures may be required.

Conclusion

Successful treatment of AF is dependent on careful assessment of the risks and benefits of potential treatment options for each patient. These have been outlined above, and will hopefully be of use when determining treatment for patients in the future.

Conflict of interest: none declared.

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