

# MANAGEMENT OF ATRIAL FIBRILLATION

*Atrial fibrillation is an increasingly common cardiac arrhythmia.*

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Atrial fibrillation (AF) is a supraventricular tachyarrhythmia characterised by unco-ordinated atrial activation. It is one of the most common of all cardiac arrhythmias. Patients in AF have increased morbidity and mortality when compared with the general population. The burden of AF worldwide is increasing as a result of increasing longevity and the increase in prevalence of hypertension, diabetes and atherosclerosis. Fortunately exciting new advances have taken place in our understanding of the role of the pulmonary veins as both trigger and substrate in the maintenance AF. As a direct result of these insights curative ablation of AF is now a reality.

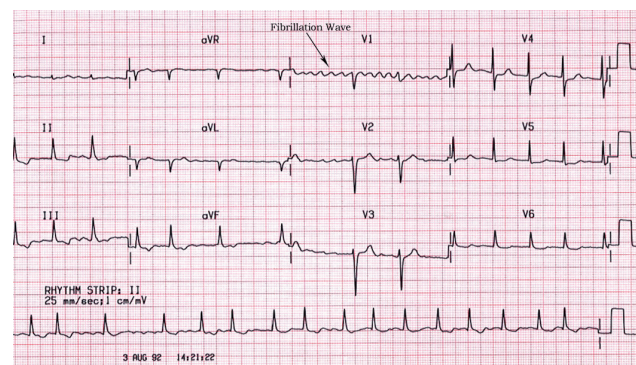


Fig. 1. A 12-lead ECG demonstrating atrial fibrillation.

## DIAGNOSIS OF ATRIAL FIBRILLATION

AF is readily diagnosed both clinically and on electrocardiogram (ECG). A characteristic feature of the arrhythmia is its irregularity both in pulse rate and pulse volume (irregularly irregular). ECG diagnosis is also relatively straightforward since it is an irregular narrow complex tachycardia and a fibrillation wave that varies in size, shape and timing can frequently be seen between QRS-complexes (Fig. 1). No consistent P waves can be seen.

## APPROACH TO NEWLY DIAGNOSED ATRIAL FIBRILLATION

Look for potential underlying causes. AF is frequently associated with hypertension, ischaemic heart disease, valvular heart disease and alcohol ingestion (holiday heart syndrome). Less frequently, AF may be associated with thyroid dysfunction, blood disorders, surgery, infection or dehydration. A basic history and physical examination often

provides a clear underlying cause for the AF. If not, a full blood count, serum electrolytes, TSH, chest X-ray and an ECG may provide additional clues to the underlying cause. Not infrequently no underlying cause can be found, the heart is structurally normal and the diagnosis of 'lone atrial fibrillation' is made.

## MANAGEMENT OF ATRIAL FIBRILLATION

The management of AF is complex and best individualised to each patient. The arrhythmia itself may lead to ventricular dysfunction (tachycardia cardiomyopathy) when the ventricular rate response is poorly controlled. In addition to ventricular rate control, the other major issue is the prevention of thromboembolism. Important considerations include the pattern and duration of the arrhythmia (paroxysmal versus persistent), the symptomatic status of the patient and the absence or presence of an underlying cause. If an underlying cause is present this should be treated first, and frequently AF will spontaneously revert into sinus rhythm. Careful consideration should, however, be given



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to anticoagulation to prevent embolic complications while waiting for sinus rhythm to be restored.

### Cardioversion

If haemodynamic compromise is present or if AF is causing myocardial ischaemia then urgent pharmacological or electrical cardioversion should be performed irrespective of anticoagulation status (particularly in the setting of acute myocardial infarction). Electrical cardioversion has much greater efficiency than drugs but requires conscious sedation or anaesthesia. The electric shock should be properly synchronised and a minimum of 200 J should be used for cardioversion of AF. The efficiency of restoring sinus rhythm can be improved by placing the paddles in the front to back position, particularly in obese patients. There is no difference in thromboembolic risk when comparing electrical cardioversion with pharmacological cardioversion.

Amiodarone and flecainide have proven efficacy in this setting and are generally available in South Africa. Both can be administered orally or intravenously depending on how urgently sinus rhythm must be restored. The usual dose of flecainide is 100 mg 12-hourly when taken orally. Flecainide titrated intravenously will often restore sinus rhythm within an hour, but this drug should not be used in patients with structurally abnormal hearts or ischaemic heart disease. Amiodarone is modestly effective

and acts less rapidly (restoring sinus rhythm within about 12 hours), but has a lower side-effect profile when used acutely. The dose of amiodarone ranges between 600 mg and 1 200 mg depending on the weight of the patient. Adverse effects of these drugs include hypotension, bradycardia and visual disturbance. Flecainide may induce a rapid ventricular rate response because it facilitates AV nodal conduction. In patients with rapid AF and structurally normal hearts it is often useful to pretreat with 5 - 10 mg of intravenous verapamil prior to administration of flecainide to prevent this complication. The induction of malignant ventricular arrhythmias with flecainide is an ever-present risk. These drugs should therefore only be used by experienced physicians, in monitored patients.

### Rate versus rhythm control

In stable patients with persistent AF a fundamental decision has to be made: to restore and maintain sinus rhythm (rhythm control) or to allow AF to continue and ensure that the ventricular rate response is controlled (rate control). It is probably reasonable to try to restore sinus rhythm at least once in all patients with AF. This may be attempted with pharmacological therapy or electrical cardioversion or a combination of the two. It is considered reasonably safe to perform cardioversion within 48 hours of the onset of AF. If the arrhythmia is present for longer then it is safer to anticoagulate for 3 - 4 weeks, aiming for an International Normalised Ratio (INR) between 2 and 3 before attempting cardioversion. The AFFIRM trial suggested that there was no significant advantage to either rate or rhythm control but careful analysis of the data raised concerns about the validity of generalising the findings to all patients with AF. A particular concern was the lack of efficiency in maintaining sinus rhythm in the rhythm control arm of the trial. Now that catheter ablation of AF has become a reality these issues are being addressed and the answers will be available soon.

### Rhythm control

Once a decision has been made to maintain sinus rhythm, maintenance drug therapy is usually indicated. Selection of an agent is based first on safety and tailored to any underlying heart disease that may be present. Generally, beta-blockers are first-line therapy. If beta-blockers fail then sotalol or flecainide may be used in patients with structurally normal hearts. Amiodarone is an alternative but should be considered a last-resort drug due to its quite significant toxicity profile when used as maintenance therapy. Patients on maintenance treatment with amiodarone should have routine 6-monthly thyroid function tests, liver function tests and an annual chest X-ray. Digoxin and calcium channel blockers have no role in maintaining sinus rhythm. In patients with paroxysmal AF and structurally normal hearts, intermittent drug therapy (the 'pill in the pocket approach') is not an unreasonable strategy. Flecainide has been successfully used in this manner. With this approach the drug is only taken when an episode of AF becomes established. If sinus rhythm is not restored within 48 hours then an electrical cardioversion is performed. The limitations of current drug therapies are driving a search for new drugs but none have so far lived up to expectations. On the contrary, most are significantly pro-arrhythmic, which ultimately limits widespread use.

### Rate control

If a decision is made to opt for rate control alone then beta-blockers and non-dihydropyridine calcium channel blockers (verapamil and diltiazem) are indicated. Sometimes combination therapy is required. Calcium channel blockers should be avoided in patients with ventricular impairment. Digoxin may have a role in patients with heart failure but, importantly, it has no effect on exercise heart rate. When assessing the efficacy of the rate control strategy it is important to measure heart rate response both at rest and during exercise. 24-hour ECG monitoring is frequently a useful technique in assessing the efficacy of rate control.

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**Catheter ablation**

If pharmacological therapy fails either to alleviate symptoms or to provide adequate rate control, catheter ablation should be considered. Two options are available: AV nodal ablation and permanent pacemaker implant (ablate and pace strategy) or AF substrate modification ablation, also known as the pulmonary vein isolation procedure.

**AV nodal ablation and permanent pacemaker implant**

The ablate and pace strategy has the advantage of having a success rate of nearly 100% in terms of providing both rate control and symptom relief. This can be achieved by careful patient selection and the liberal use of biventricular pacing after AV ablation. This procedure has a major downside in that patients are rendered pacemaker-dependent after AV ablation. It is therefore best reserved for elderly patients with intractable symptoms or poor rate control causing or threatening to cause left ventricular dysfunction. Another downside of this procedure is that AF is not eliminated in the left atrium but merely blocked from being transmitted through to the ventricles by AV ablation, so anticoagulation with warfarin is still indicated in high-risk patients. However, well-conducted quality of life studies have confirmed the benefit of this procedure.

**AF substrate modification ablation**

In younger patients, or patients resistant to having a pacemaker, an

AF substrate modification ablation should be considered when medical therapy has failed or if patients are intolerant of medical therapy. This procedure has now come of age and the success rate for cure from AF is in the region of 80%. Both paroxysmal AF and chronic persistent AF can be treated by catheter ablation. Success rates for paroxysmal AF are higher after a single procedure. Patients with chronic persistent AF may require 2 and sometimes 3 procedures. In the early days of the procedure pulmonary vein stenosis was a significant complication. However, this has now been almost eliminated with the advent of new mapping systems such as CARTO, which employ a 3-dimensional magnetic global positioning system which allows the construction of virtual atrial maps in the electrophysiology laboratory. Real-time ablation lines can then be performed well away from the pulmonary vein itself. The procedure is safe and displays an excellent risk-to-benefit ratio, but is not without risk and should therefore be reserved for patients who are significantly symptomatic or who have poor rate control and have failed or are intolerant of medical therapy. Much as is the case for other routine ablations, just an overnight hospital stay is required and the procedure is performed via the right femoral veins under local or general anaesthesia depending on patient and operator preference.

**Anticoagulation in AF**

Numerous trials have documented the benefit of formal anticoagulation with warfarin in patients with AF. Unfortunately this treatment option requires careful dose titration due to inter-individual variation and this involves frequent INR blood tests. This has significant negative impact on quality of life and, if neglected, increases the hazards of the treatment. Being albumin-bound, warfarin is also particularly sensitive to interactions with other commonly used drugs such as antibiotics and antiarrhythmic agents, particularly amiodarone. For these reasons warfarin is used selectively in patients with AF and the

decision to anticoagulate should be individualised. The largest benefit in reducing thromboembolic events has been demonstrated in older patients (over 75 years), patients with left ventricular impairment, history of previous transient ischaemic attack or cerebrovascular accident or other risk factors such as hypertension and diabetes. These patients should all be on warfarin and the target INR should be 2 - 3. The incidence of embolic stroke is low in young patients with lone AF so it is considered reasonable to treat these patients with aspirin alone. Unfortunately aspirin is not adequate in high-risk patients. A recent study also demonstrated the combination of aspirin and clopidogrel to be inferior to warfarin in high-risk patients in the prevention of embolic events. Other newer agents have also been tested. Ximelegatran is a direct thrombin inhibitor which showed equivalence to warfarin in trials. This drug has the advantage of not requiring any specific monitoring. Unfortunately the drug was withdrawn from the market due to what was considered unacceptable hepatic toxicity. It is probably a matter of time before safer analogues of this drug become available.

**CONCLUSION**

The management of AF remains challenging but is evolving rapidly and will probably become much simpler in time due to the rapid evolution of catheter ablation techniques, new antiarrhythmic drugs and anticoagulants. Trials are currently underway comparing catheter ablation with medical therapy and if superiority is demonstrated in terms of mortality and morbidity, it is conceivable that most patients with AF will undergo ablation therapy in the future.

**Further reading**

Fuster V, Rydén LE, Asinger RW, *et al.* ACC/AHA/ESC guidelines for the management of patients with atrial fibrillation. *J Am Coll Cardiol* 2001; **38**: 1266-1xx or [http://www.acc.org/clinical/guidelines/atrial\\_fib](http://www.acc.org/clinical/guidelines/atrial_fib)

(This is a 64-page document which is freely available on the internet and has all the necessary detail and additional references.)

**IN A NUTSHELL**

AF is a common irregular narrow-complex supraventricular tachyarrhythmia.

AF is often associated with an underlying condition which frequently can be diagnosed after a basic history and physical examination.

In newly diagnosed AF without an obvious underlying cause minimum investigations include a blood count, serum electrolytes, thyroid function, chest X-ray and an echocardiogram.

AF is associated with increased morbidity and mortality related to its rate-related impact on left ventricular function and its association with thromboembolism.

Management of AF is determined by symptoms, ventricular rate and thromboembolic risk and is individualised to each patient.

Drug therapy remains the mainstay of treatment and beta-blockers are still first-line therapy due to proven safety and efficacy.

AV nodal ablation and pacemaker implant is indicated in older patients with intractable symptoms or poor rate control who have failed or are intolerant of medical therapy.

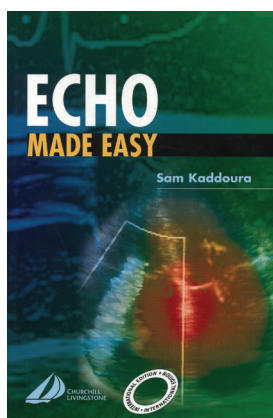
Catheter ablation of AF (without requirement for a pacemaker) is now an additional therapeutic option with an excellent efficacy and safety profile particularly indicated for young patients who have failed or are intolerant of medical therapy.

**SINGLE SUTURE**

**INTERNET SMOKING PROGRAMME**

Researchers from the Oregon Center for Applied Science, Eugene, Oregon, have found that Internet-based smoking cessation programmes are successful, at least in the short term. The intervention consisted of a video-based Internet site that presented current strategies for smoking cessation and motivational materials tailored to the person's demographic grouping and age. They looked at 351 people, recruited at work, who had to be over 18, smokers and interested in stopping within 30 days. They were followed up 90 days later. They were compared with a similar group of people who did nothing for 90 days and were then given access to the Internet site. After 90 days 24% of the intervention group were still not smoking compared with 8% in the control group.

Swartz LHG, et al. *Tobacco Control* 2006; **15**: 7.



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