

# Practical management of common atrial arrhythmias 2: common atrial flutter

*This is the second in a series of four practical articles highlighting the important management steps for non-cardiologists and non-cardiac electrophysiologists dealing with patients with atrial fibrillation and common atrial flutter. This article will deal with care pathways and management principles for common atrial flutter.*

Common atrial flutter must be distinguished from atrial fibrillation (AF) because modern treatments demand it. Atrial flutter is a common arrhythmia in structurally normal and abnormal hearts. Approximately 30% of atrial flutter patients have no underlying cardiac disease, 30% have coronary artery heart disease, and 30% have hypertensive heart disease. Other predisposing conditions include heart failure, chronic pulmonary disease and excess alcohol intake (Van Gelder et al, 1991).

The Marshfield epidemiological study area (MESA) was conducted on 58 820 residents in Wisconsin, USA and has shown atrial flutter to have an overall incidence of 88 per 100 000 person years. Incidence rates increase with age, and ranged from 5 per 100 000 in those under 50 years of age to 587 per 100 000 over 80 years. Atrial flutter is 2.5 times more common in men than women (Granada et al, 2000). Extrapolating to the UK, 60 000 new cases of atrial flutter would be expected each year, of which roughly 24 000 would be 'lone atrial flutter' with no major co-morbidity. These patients are eligible for cure by radiofrequency catheter ablation (RFCA), and are less likely to have further problems with AF. Patients presenting with atrial flutter in the setting of structural heart or lung disease are more likely to develop post-RFCA-AF but may still be eligible for palliation by RFCA. Often this AF is easier to manage than recurrent atrial flutter. Unfortunately in the UK the vast majority of these patients are not being offered curative or palliative RFCA and catheter ablation is much underused in the treatment of atrial flutter in the UK.

## Mortality and morbidity

Atrial flutter is an independent predictor of mortality, reducing survival. One study identified 577 patients with a first episode of atrial flutter and compared outcomes to 577 controls. Mortality in the first 6 months increased from 2% in controls to 5% in atrial flutter. Long-term mortality in atrial flutter was 41% vs 22% in controls, suggesting that early intervention is important. Long-term mortality in atrial flutter was similar to that in AF (45%) (Vidaillet et al, 2002).

Thromboembolism is now known to be as important in atrial flutter as in AF. One study showed a 7% incidence of thromboembolism over 4 years, with higher

risk in organic heart disease, depressed ejection fraction, hypertension and diabetes mellitus (Seidl et al, 2004). In another study stroke occurred in 3.2% of patients with lone atrial flutter each year (Halligan et al, 2004). There are no randomized controlled trials of anticoagulation in atrial flutter. However, the American College of Cardiology/American Heart Association/European Society of Cardiology guidelines recommend the same indications for anticoagulation as for AF (Blomström-Lundqvist et al, 2003).

Anticoagulation is indicated in patients over 65 years of age, in structural heart disease, diabetes mellitus, hypertension, or a previous thromboembolic episode.

## Electrophysiology and anatomy

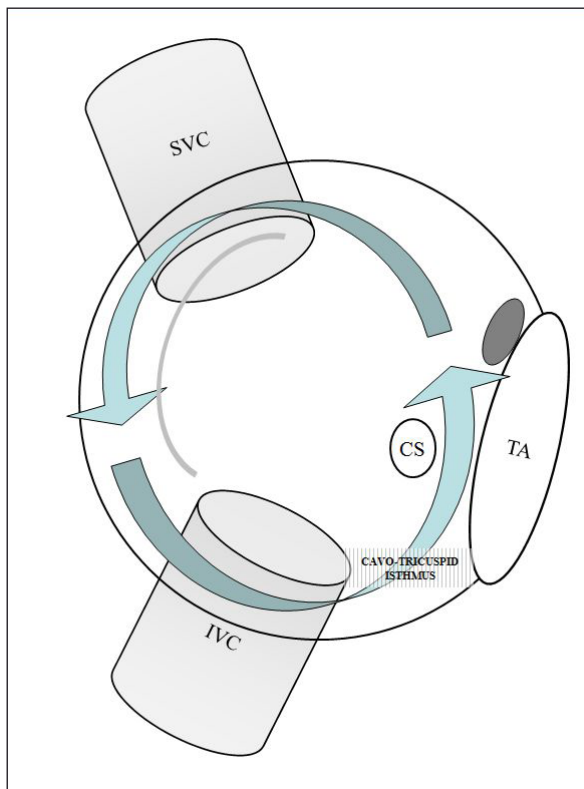
Most atrial flutter is of the 'common' form, caused by a re-entrant circuit in the right atrium (*Figure 1*). This is also known as 'isthmus-dependent' atrial flutter, referring to the cavotricuspid isthmus which is the muscle tissue lying in the floor of the right atrium between the tricuspid annulus anteromedially and the orifice of the inferior vena cava (IVC) posterolaterally. It forms the slowest and narrowest part of the tachycardia circuit (Saoudi et al, 2001). The flutter circuit rotates around the tricuspid valve. In common atrial flutter, the wavefront travels down the right atrial wall, through the isthmus and then up the inter-atrial septum and the left atrium (Nakagawa et al, 1996; Saoudi et al, 1996).

## Diagnosis

Atrial flutter has a characteristic electrocardiogram appearance. There is organized atrial activity with no intervening iso-electric baseline giving a characteristic saw-tooth appearance. These flutter waves are seen most prominently in the inferior leads II, III, and aVF and are negative in the majority of cases of common atrial

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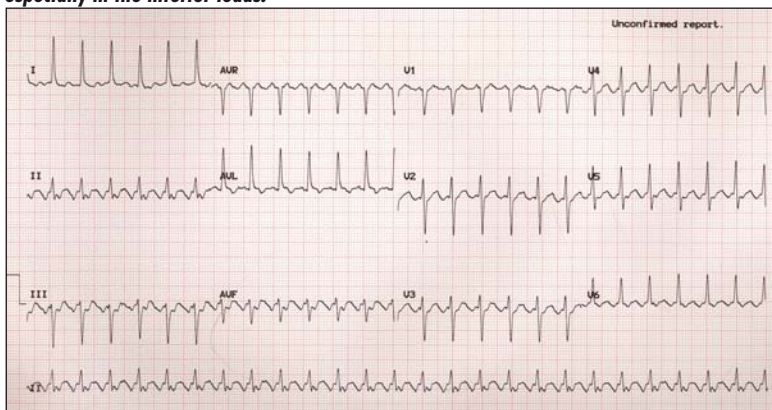
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**Figure 1. Atrial flutter re-entry circuit.** CS = coronary sinus; IVC = inferior vena cava; SVC = superior vena cava; TA = tricuspid annulus.

flutter. Flutter waves may be difficult to see when there is 1:1 and sometimes 2:1 conduction to the ventricles. In these cases intravenous (IV) adenosine, carotid sinus massage, or other vagal manoeuvres that slow the ventricular rate may uncover the typical saw-tooth appearance. The atrial rate is around 300 beats per minute in most cases and the ventricular rate usually has a mathematical relationship to the flutter rate 1:1, 2:1 or 3:1. Therefore atrial flutter is usually regular with a pulse rate of around 300, 150, 100, or 75 beats per minute depending on the state of atrioventricular (AV) node conduction (Figure 2).

**Figure 2. Atrial flutter with 2:1 conduction. Note the typical saw-tooth appearance especially in the inferior leads.**



## Management

Most patients with atrial flutter are haemodynamically stable, but cardiac decompensation can lead to unplanned hospital admission or collapse. Unstable patients usually present with 1:1 AV conduction and may need immediate direct current cardioversion (DCV) (see first article in this series). Other patients have more stable chronic atrial flutter presenting with 2:1 or 3:1 conduction or variable conduction to the ventricle.

Rate control means administration of drugs that act on the AV node to slow conduction to the ventricles. Rate control is similar to that in AF and may be achieved by the use of IV beta-blockers, calcium antagonists and digoxin (Blomström-Lundqvist et al, 2003). However, rate control may be easier in AF than in atrial flutter. This is because in AF some fibrillation waves penetrate the AV node but are not conducted and may enhance the refractoriness of the AV node, allowing slower conduction and fewer conducted beats. In contrast, atrial flutter waves reach the node less frequently, and all may be conducted.

Acute conversion of AF to atrial flutter can lead to faster heart rates and precipitate collapse (Falk, 1992). This is especially of concern if intravenous flecainide (or a similar drug) is used for chemical conversion of AF. One-to-one conduction of atrial flutter may occur with flecainide because it has an anticholinergic effect, and this may enhance the conductivity of the AV node so that every flutter wave is conducted. IV flecainide is very effective for chemical cardioversion of AF, but an AV-nodal blocking agent, such as verapamil, should be given first.

Chemical cardioversion of atrial flutter is difficult and several classes of antiarrhythmics have been used. The most effective of these appear to be IV ibutilide and dofetilide and successful cardioversion rates of up to 76% have been reported (Abi-Mansour et al, 1998). Of concern with these drugs is the occurrence of torsade de pointes. Class IA and IC drugs used intravenously have a modest benefit (Kingma and Suttorp, 1992). Atrial flutter can often be electrically cardioverted easily using 50 J delivered externally in many cases, and for this reason DCV is preferable, and should be immediately available if chemical conversion is chosen instead. However, recurrences are common in atrial flutter, and patients often report recurrent unplanned admissions when they are finally referred for RFCA (Figure 3).

## Radiofrequency catheter ablation for atrial flutter

RFCA is now the treatment of choice for common atrial flutter after one failed cardioversion. This is a quality standard of the national service framework (NSF) for arrhythmias and sudden cardiac death (National Service Framework for Coronary Heart Disease, 2005). RFCA interrupts the re-entrant flutter circuit by creating a line of block between two anatomical barriers in the cavo-

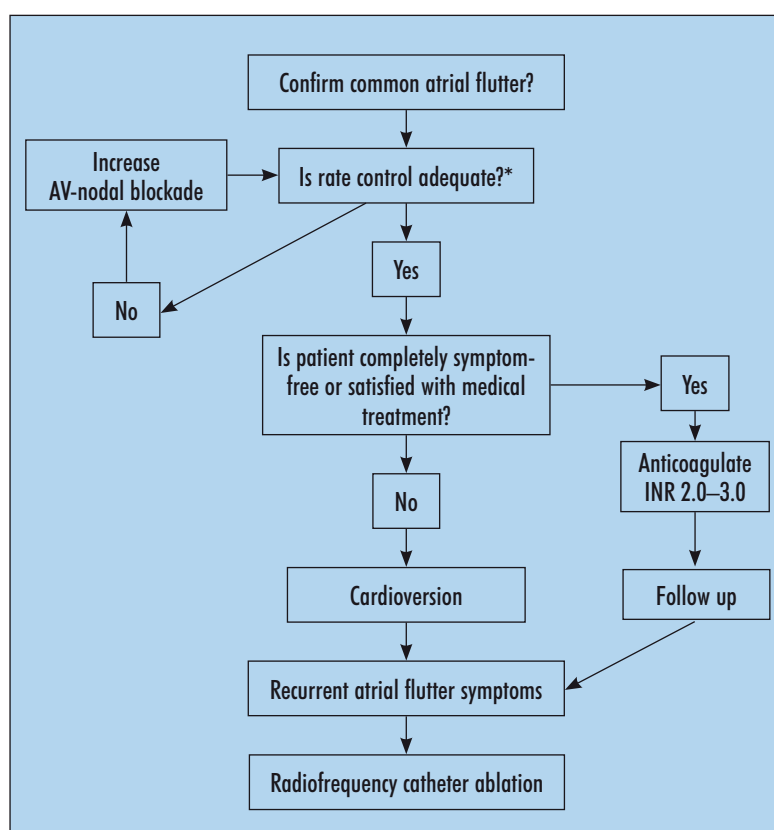
tricuspid isthmus. The full thickness of atrial myocardium is cauterized between the tricuspid valve annulus and the IVC. Ablation often terminates atrial flutter abruptly, and pacing techniques are then used to confirm that conduction is abolished in both directions through the isthmus. Achieving bi-directional block is important, since isthmus-dependent atrial flutter usually goes anti-clockwise around the tricuspid valve, but can also rotate in a clockwise direction. A recording catheter can record activation on both sides of the 'line of block' simultaneously, showing that there is no longer a way through the isthmus for flutter waves (Cauchemez et al, 1996; Shah et al, 1999).

Success rates of 86–98% have been reported for RFCA in atrial flutter. Studies report recurrence rates of 4–13%, but new techniques are reducing this. One important limitation is the 8–36% risk of new AF occurring within 12 months of RFCA for flutter. AF post ablation continues in up to 70% of patients who have had recognized AF in addition to flutter before ablation (Scheinman and Huang, 2000; Calkins et al, 2004). This is likely to be because the RFCA prevents recurrence of atrial flutter, and AF continues by default (Figure 4).

RFCA for atrial flutter significantly improves symptoms and quality of life, and significantly reduces health-care spending, off-setting the cost of an ablation (typically about £4000). In a study of 100 patients at 1 and 6 months post-procedure, RFCA significantly improved quality of life and the frequency of significant symptoms (Lee et al, 1999). Hospital admissions and emergency room visits were significantly reduced, and there was less need for antiarrhythmic drugs. These beneficial effects were maintained over a 6-month period. In the majority of patients with recurrence of symptoms after flutter ablation, the symptoms were caused by AF, and only a minority suffered a true recurrence of flutter (Lee et al, 1999).

Finally, in terms of cost effectiveness, catheter ablation was compared to cardioversion and drug treatment as first-line management of patients with isthmus-dependent atrial flutter in the USA. The incremental cost effectiveness of catheter ablation relative to cardioversion and drug therapy was calculated over time intervals of up to 5 years using a decision analytic Markov model. The average cumulative 1- and 2-year costs for ablation (£6385 and £6680 respectively) were higher compared to cardioversion and drug therapy (£3030 and £5330 respectively). However, by 2.5 years, the cost of conventional care by cardioversion and drug therapy exceeded that of the ablation strategy (Lee et al, 2005).

RFCA is therefore curative in many cases, it improves life quality, and it saves hospital admissions and money. These data support more rapid uptake of the quality standards of the NSF for arrhythmias, since many patients are suffering repeated hospital admissions and poor quality of life with conventional management.



**Figure 3.** Management pathway for common atrial flutter. AV = atrioventricular; INR = international normalized ratio. \*Heart rate <80 beats per minute at rest, <120 beats per minute during moderate exercise.

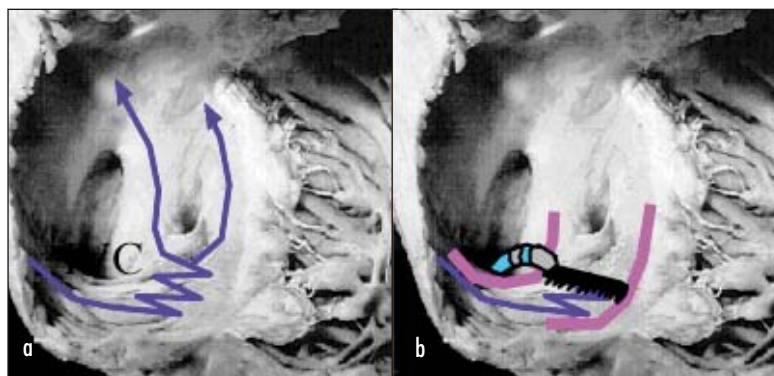
## Conclusions

Common atrial flutter should be singled out for special treatment as distinct from AF. This is because RFCA is very safe and cost effective for common atrial flutter, and can have a very important impact on a cycle of readmissions. In the UK it is under-utilized in the atrial flutter patient with recurrent problems. **BJHM**

*Conflict of interest: none.*

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**Figure 4.** Anatomy of the cavo-tricuspid isthmus in common atrial flutter. **a.** Propagation of the flutter wavefront. **b.** Illustration of how an ablation catheter can interrupt the flutter circuit in the isthmus. IVC = inferior vena cava.



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### KEY POINTS

- Atrial flutter is a common arrhythmia in normal and abnormal hearts. Approximately 60 000 new cases are expected in the UK each year.
- Common atrial flutter is a regular re-entrant atrial rhythm with a typical 'saw-tooth baseline' appearance of inverted flutter waves in electrocardiogram leads II, III and aVF.
- Atrial flutter increases mortality and health costs significantly.
- Radiofrequency catheter ablation (RFCA) for common atrial flutter is safe and curative in around 90% of cases, but many patients also have coincident problems with atrial fibrillation. Often this is easier than atrial flutter to manage medically.
- RFCA for atrial flutter is cost effective. RFCA costs at least £4000 in the UK, but a RFCA strategy would save the NHS money after 2.5 years compared to conventional treatment.

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