MINI-SYMPOSIUM

Identification, diagnosis and assessment of atrial fibrillation

R I Dewar, G Y H Lip, on behalf of the Guidelines Development Group for the NICE clinical guideline for the management of atrial fibrillation

Heart 2007;93:25–28. doi: 10.1136/hrt.2006.099861

Atrial fibrillation is the most common sustained arrhythmia, affecting 2% of the population and about 10% of those aged >80 years,¹ and accounts for 1% of all National Health Service expenditure in the UK.² Atrial fibrillation coexists with common conditions, both cardiovascular (such as hypertension, heart failure, coronary artery disease and diabetes mellitus) and non-cardiovascular (thyroid disease, chest disease, etc), as well as with an increasingly older general population.¹ Indeed, hospitalisation rates for atrial fibrillation have increased by nearly 2–3-fold.¹ Thus, atrial fibrillation (and its comorbidities) will become an increasing healthcare burden.

The importance of this arrhythmia is reflected by the considerable morbidity and mortality associated with it. As atrial fibrillation is often asymptomatic, it is often diagnosed only when it has caused a (potentially serious) complication, such as an ischaemic stroke.

Appreciation of the clinical subtypes of atrial fibrillation may guide the approach to subsequent management. Atrial fibrillation is considered recurrent when a patient develops two or more episodes, which may be “paroxysmal” if they terminate spontaneously (defined by consensus as 7 days) or “persistent” if the arrhythmia requires electrical or pharmacological cardioversion for termination. Successful termination of atrial fibrillation does not alter the classification of persistent atrial fibrillation in these patients. Longstanding atrial fibrillation (defined as over a year) not successfully terminated by cardioversion, or when cardioversion is not pursued or deemed inappropriate, is classified as “permanent” (fig 1).

IDENTIFICATION

Screening for atrial fibrillation was outwith the scope of the National Institute for Health and Clinical Excellence (NICE) guideline, but was recently addressed in the Screening for Atrial Fibrillation in the agEd (SAFE) study, which reported, in

terms of a screening programme, that the only strategy that improved on routine practice was opportunistic screening, rather than targeted screening.³ As atrial fibrillation commonly occurs in association with risk factors, such as hypertension, diabetes and ischaemic heart disease, opportunistic assessment of such patients for the presence of atrial fibrillation may be prudent, especially as such patients are often seen for check-ups in primary care.

Atrial fibrillation can present in any health setting, with a wide variety of different symptoms that are often non-specific. In a hospital-based series, atrial fibrillation most commonly presents with breathlessness, palpitations, syncope, dizziness and chest discomfort.^{1–6} In the Euro Heart Survey of Atrial Fibrillation, as many as 69% of patients were symptomatic at the time of the survey; among asymptomatic patients, 54% of the symptoms were previously experienced.⁷ However, there may be important differences between hospital-based cohorts compared with community-based or population-based studies, as many do not present to hospital, and if they do, it is often in the context of associated comorbidity, such as ischaemic heart disease or heart failure. Indeed, many patients with atrial fibrillation, in general practice, remain asymptomatic.

The presence of an irregular pulse is a clinical sign that can be quickly, simply and reliably elicited in any healthcare situation. Two studies in a UK primary care population have found that an irregular pulse has a sensitivity of 95% and a specificity of 75% in the detection of atrial fibrillation.^{8–9} If the irregularity is found to be continuous over a 20-s period, the specificity is improved to 98%, although the sensitivity falls to 50%.

Identification of those with undiagnosed atrial fibrillation is important, as these patients can receive treatment sooner if

Figure 1 Diagnosis of atrial fibrillation (AF).

Box 1: Mortality and morbidity associated with atrial fibrillation

Haemodynamic

- Heart failure/hypotension
- Reduced exercise tolerance
- Quality of life

Thromboembolic

- Stroke/transient ischaemic attack/cognitive function
- Systemic thromboembolism
- Pulmonary thromboembolism (rarely)

Treatment

- Antiarrhythmic drugs/antithrombotic agents
- Devices
- Hospitalisations

Box 2: Recommendations for identification of atrial fibrillation

In patients presenting with:

- breathlessness/dyspnoea
- palpitations
- syncope/dizziness
- chest discomfort
- stroke/transient ischaemic attack

Manual pulse palpation should be performed to determine the presence of an irregular pulse that may indicate underlying atrial fibrillation

opportunistic case finding is undertaken using manual pulse palpation in those presenting with symptoms commonly associated with atrial fibrillation. It was therefore considered a good practice to check the blood pressure and pulse (manually) in all patients who present with breathlessness, dyspnoea, palpitations, syncope/dizziness or chest discomfort. Many patients presenting with stroke are also found to be in atrial fibrillation, indicating a missed opportunity to diagnose the pre-existing atrial fibrillation and give appropriate antithrombotic treatment.

The timely performance and interpretation of an electrocardiogram (ECG) is thus essential to establish the diagnosis. Accurate interpretation of the ECG is vital, although computer-aided diagnostic machines may be inaccurate in 20% of cases.¹⁰

ASSESSMENT

As most interventions are highly dependent on individual circumstances, a thorough clinical assessment is required in any patient in whom atrial fibrillation is diagnosed. It is important to establish the clinical pattern of atrial fibrillation (ie, paroxysmal or persistent or permanent), its time of onset, its possible aetiology, any complications and other major coexisting disorders. It is also important to consider and document factors that will affect the suitability for possible therapeutic interventions, such as anticoagulation. Such assessment will guide management and optimise outcomes such as stroke prevention.

A full history and clinical examination will provide most of this information, but basic blood tests, including thyroid function tests, will also be required. The most common investigation that usually requires access to secondary care is echocardiography.

Echocardiography

A transthoracic echocardiogram (TTE) may provide useful information, and is clearly required for optimal management in certain situations. For example, the presence of moderate to severe left ventricular dysfunction has been shown to increase the risk of stroke and thromboembolism.¹¹ Left ventricular hypertrophy and measures of left atrial size and function have yielded conflicting results.^{11–12} Also, TTE may inform the

Box 3: Recommendations on diagnosis of atrial fibrillation

Electrocardiography should be performed on all patients, whether symptomatic or not, in whom a diagnosis of atrial fibrillation is suspected based on the detection of an irregular pulse

Box 4: Recommendations for echocardiography in the assessment of atrial fibrillation

Transthoracic echocardiography (TTE) should be performed on patients with atrial fibrillation:

- for whom a baseline echocardiogram is important for long-term management, such as younger patients
- for whom a rhythm control strategy including cardioversion (electrical or pharmacological) is being considered
- in whom there is a high risk or a suspicion of an underlying structural/functional heart disease (such as heart failure or heart murmur) that influences its subsequent management (eg, choice of arrhythmia drug)
- in whom refinement of clinical risk stratification for antithrombotic treatment is needed

TTE should not be routinely performed solely for the purpose of further stroke risk stratification in patients with atrial fibrillation for whom the need to initiate anticoagulation treatment has already been agreed on appropriate clinical criteria

Transoesophageal echocardiography (TOE) should be performed in patients with atrial fibrillation:

- when TTE demonstrates an abnormality (such as valvular heart disease) that warrants further specific assessment
- in whom TTE is technically difficult and/or of questionable quality, and when there is a need to exclude cardiac abnormalities
- for whom TOE-guided cardioversion is being considered

likelihood of maintaining sinus rhythm after cardioversion. Measures of left atrial function seem to predict recurrence of atrial fibrillation,¹³ but being TOE derived and operator dependent may not have utility in routine practice. Left atrial size, the presence of mitral incompetence and left ventricular dysfunction were not found to be major indicators in most reports^{14–16} (box 1).

The NICE guidelines recommend that a TTE is useful in those in whom a baseline TTE is important for long-term management, as well as in those being considered for a rhythm control strategy including cardioversion. Furthermore, echocardiography is useful when there is a high risk or suspicion of underlying structural/functional heart disease that influences its subsequent management. In some patients, TTE may assist in refinement of clinical risk stratification, when antithrombotic treatment is needed—for example, when left ventricular impairment is present. In patients with atrial fibrillation in whom the need to initiate anticoagulant treatment has already been agreed on appropriate clinical criteria, TTE should not be routinely performed solely for the purpose of further stroke risk stratification. In one study, for example, echocardiography yielded cardiac abnormalities in many patients with atrial fibrillation, although most of the patients had other clinical risk factors for thromboembolism and often echocardiography did not alter the management decision.¹⁷

On transoesophageal echocardiography (TOE), complex aortic plaque has been found to relate to stroke risk,¹³ as has the presence of left atrial thrombus, dense spontaneous echo contrast and low atrial appendage velocities. TOE is recommended when TTE shows an abnormality that warrants further specific assessment, as well as in those patients in whom TTE is technically difficult or is of questionable quality, and when

Box 5: Recommendations for ambulatory electrocardiogram in the identification and assessment of paroxysmal atrial fibrillation

In patients with suspected paroxysmal atrial fibrillation undetected by standard electrocardiogram (ECG) recording:

- a 24-h ambulatory ECG monitor should be used in those with suspected asymptomatic episodes or symptomatic episodes less than 24 h apart
- an event-recorder ECG should be used in patients with symptomatic episodes more than 24 h apart

there is a need to exclude cardiac abnormalities. A TOE is also used in those being considered for TOE-guided cardioversion.

AMBULATORY ECG RECORDING

Ambulatory ECG recordings can be useful in establishing the diagnosis of paroxysmal atrial fibrillation in people with appropriate symptoms or in those who are at risk of this arrhythmia. They can also help document the frequency of the arrhythmia, as many episodes of atrial fibrillation are asymptomatic.

Where symptoms are frequent (ie, daily), a 24-h or 48-h Holter monitor may yield a positive diagnosis. However, with less frequent episodes, a 7-day Holter or an event recorder, which is either patient-triggered or ECG-triggered, may be needed to document the arrhythmia. Implantable loop recorders and pacemakers can record continuous data over prolonged periods. Nonetheless, all modalities have their limitations and at best provide useful information in only 5–20% of cases, even with prolonged recordings.^{18–22}

DISCUSSION

A prerequisite to the effective management of atrial fibrillation in our communities is the early identification of people with atrial fibrillation and, after appropriate assessment, the implementation of agreed management plans after discussion with the patient (box 2). Most cases occur in the elderly population, many with other common disorders such as hypertension or diabetes, and so these affected elderly people will be in regular contact with a member of the health community. Clinical suspicion and a reliable physical sign seem to make this an ideal candidate for case finding. Potential difficulties such as the increased use of automated blood pressure recorders that do not require pulse palpation and difficulties in ECG interpretation can be overcome with educational support.

Most of the information on which to base a clinical decision can be gathered clinically, without access to complicated investigations. However, the balancing of the risks and benefits of some potentially hazardous interventions can be problematic and can necessitate active patient involvement. Rapid access to specialist assessment has been proposed as an aid to improving initial assessment and optimal management. The high prevalence and incidence of this condition would make that difficult, and these guidelines should enable better early management in primary care and among non-specialists.

Many patients in secondary care are also at high risk of atrial fibrillation, either on admission or during their stay. Despite the availability of the appropriate personnel and technology, identification and management of atrial fibrillation remains suboptimal on general medical and surgical wards.

Most cardiologists would consider that an echocardiogram is essential in the optimal management of a patient with atrial fibrillation. However, as in many cases, its findings will not

affect initial decisions regarding anticoagulation and cardioversion—thus, any delay in obtaining an echocardiogram should not postpone the implementation of effective strategies to minimise adverse events. The NICE guideline recommendations would suggest that an echocardiogram has a role in the long-term management of most cases of atrial fibrillation, but with clear prioritisation (boxes 3 and 4). Likewise, transoesophageal echocardiography has a defined role in management, as outlined in the recommendations.

Paroxysmal atrial fibrillation seems to carry a similar risk of stroke and other morbidity as persistent atrial fibrillation, and thus ambulatory ECG can be useful in establishing this diagnosis (box 5). None of the available modalities has a high diagnostic yield, and relating the ECG to patient symptoms and events still remains problematic—for example, whether the burden of paroxysmal atrial fibrillation (ie, one short episode per year or several prolonged episodes per day) relates to thromboembolic risk remains unproven.

Authors' affiliations

R I Dewar, Department of Medicine, Royal Glamorgan Hospital, Llantrisant, Wales, UK

G Y H Lip, University Department of Medicine, City Hospital, Birmingham, UK

Competing interests: None declared.

Correspondence to: R I Dewar, Department of Medicine, Royal Glamorgan Hospital, Llantrisant, Wales CF728XR, UK; richard.dewar@pr-tr.wales.nhs.uk

Accepted 1 August 2006

Published Online First 4 September 2006

REFERENCES

- 1 **Freestone B**, Lip GYH. Epidemiology and costs of cardiac arrhythmias. In: Lip GYH, Godtfredsen J, eds. *Cardiac arrhythmias: a clinical approach*. Edinburgh: Mosby, 2003:3–24.
- 2 **Stewart S**, Murphy N, Walker A, *et al*. Cost of an emerging epidemic: an economic analysis of atrial fibrillation in the UK. *Heart* 2004;**90**:286–92.
- 3 **Hobbs FD**, Fitzmaurice DA, Mant J, *et al*. A randomised controlled trial and cost-effectiveness study of systematic screening (targeted and total population screening) versus routine practice for the detection of atrial fibrillation in people aged 65 and over. The SAFE study. *Health Technol Assess* 2005;**9**:1–90.
- 4 **Zarifis J**, Beevers G, Lip GYH. Acute admissions with atrial fibrillation in a British multicentric hospital population. *Br J Clin Pract* 1997;**51**:91–6.
- 5 **Lip GY**, Tean KN, Dunn FG. Treatment of atrial fibrillation in a district general hospital. *Br Heart J* 1994;**71**:92–5.
- 6 **Lok N-S**, Lau C-P. Presentation and management of patients admitted with atrial fibrillation: a review of 291 cases in a regional hospital. *Int J Cardiol* 1995;**48**:271–8.
- 7 **Nieuwlaet R**, Capucci A, Camm AJ, *et al*. Atrial fibrillation management: a prospective survey in ESC member countries: the Euro Heart Survey on Atrial Fibrillation. *Eur Heart J* 2005;**26**:2422–34.
- 8 **Sudlow M**, Rodgers H, Kenny RA, *et al*. Identification of patients with atrial fibrillation in general practice; a study of screening methods. *BMJ* 1998;**317**:327–8.
- 9 **Morgan S**, Mant D. Randomised trial of two approaches to screening for atrial fibrillation in UK general practice. *Br J Gen Pract* 2002;**52**:373–4, 373–80.
- 10 **Bogun F**, Anh D, Kalahasty G, *et al*. Misdiagnosis of atrial fibrillation and its clinical consequences. *Am J Med* 2004;**117**:636–42.
- 11 **Atrial Fibrillation Investigators**. Echocardiographic predictors of stroke in patients with atrial fibrillation: a prospective study of 1066 patients from three clinical trials. *Arch Intern Med* 1998;**158**:1316–20.
- 12 **Pearce LA**, *et al*. Predictors of thromboembolism in atrial fibrillation. Echocardiographic features of patients at risk. *Ann Intern Med* 1992;**116**:6–12.
- 13 **Zabalgoitia M**, Halperin Pearce LA, Blackshear JL, *et al*. Transoesophageal echocardiogram correlates of clinical risk of thromboembolism in non valvular atrial fibrillation. SPAFIII Investigators. *JACC* 1998;**31**:1622.
- 14 **Antonelli E**, Pizzuti A, Palinkas A, *et al*. Clinical value of left atrial appendage flow for prediction of long term sinus rhythm maintenance in patients with non valvular atrial fibrillation. *JACC* 2002;**39**:1443–9.
- 15 **Omran H**, Jung W, Schimpf R, *et al*. Echocardiographic parameters for predicting maintenance of sinus rhythm after internal atrial defibrillation. *Am J Cardiol* 1998;**81**:1446–9.
- 16 **Dittrich HC**, Erichson JS, Schneiderman T, *et al*. Echocardiographic and clinical predictors of the outcome of elective cardioversion of atrial fibrillation. *Am J Cardiol* 1989;**63**:193–7.

- 17 **Cantley P**, McKinstry B, Macaulay D, *et al*. Atrial fibrillation in general practice: how useful is echocardiography in selection of suitable patients for anticoagulation? *Br J Gen Pract* 1999;**49**:219–20.
- 18 **Jabaudon D**, Sztajzel J, Sievert K, *et al*. Usefulness of ambulatory 7 day ECG monitoring for the detection of atrial fibrillation and flutter after stroke and transient ischaemic attack. *Stroke* 2004;**35**:1647–51.
- 19 **Plummer CJ**, McComb JM, Stop AF. Detection of atrial fibrillation by permanent pacemakers, observations from the STOP AF trial. *Cardiac Electrophys Rev* 2003;**7**:333–40.
- 20 **Barthelemy JC**, Feasson-Gerard S, Garnier P, *et al*. Automatic cardiac event recorders reveal paroxysmal atrial fibrillation after unexplained strokes or transient ischaemic attacks. *Ann Noninvasive Electrocardiol* 2003;**8**:194–9.
- 21 **Kinlay S**, Leitch JW, Neil A, *et al*. Cardiac event recorders yield more diagnoses and are more cost effective than 48-hour Holter monitoring in patients with palpitations. *Ann Intern Med* 1996;**124**:16–20.
- 22 **Defaye P**, Dournaux F, Mouton E. Prevalence of supraventricular arrhythmias from the automated analysis of data stored in the DDD pacemakers of 617 patients: the AIDA study. The AIDA study group. *Pacing Clin Electrophysiol* 1998;**21**:250–5.

IMAGES IN CARDIOLOGY

doi: 10.1136/hrt.2006.087395

Left atrial tachycardia and inferior vena cava thrombotic occlusion complicating atrial fibrillation ablation successfully treated from the right subclavian vein

Fluoroscopic image demonstrating thrombotic occlusion of the inferior vena cava. There is evidence of collateralisation and, although possible to pass a guidewire past the obstruction, passage of a sheath was deemed unsafe.

Wide area pulmonary vein circumferential ablation was performed in the left atrium (LA) via two transseptal punctures from the right femoral vein in a man with persistent atrial fibrillation. Post-procedure, warfarin was re-commenced with full anticoagulation with low molecular weight heparin until the international normalised ratio (INR) was > 2.0 . There were no immediately apparent complications. Three months later he presented in atrial flutter and further catheter ablation was undertaken. Passage of a guidewire into the inferior vena cava (IVC) was difficult and venography demonstrated asymptomatic IVC thrombosis with stenosis and collateralisation (panel A). Access was therefore gained via two sheaths in the right subclavian vein. Transseptal puncture was performed under transoesophageal echocardiographic guidance from this superior approach. The Brockenbrough needle was reshaped to permit a similar angle of entry across the interatrial septum (panel B) to that with a femoral approach. This was performed without complication. Mapping of the LA demonstrated a re-entrant tachycardia. A single radiofrequency lesion resulted in termination of the arrhythmia. The patient remains on warfarin to prevent propagation of his IVC thrombus. Catheter ablation within the LA is increasingly common. Access via one or

Fluoroscopic image showing transseptal puncture being performed under transoesophageal echocardiographic (TOE) guidance. The Brockenbrough needle (arrow) is seen with the TOE probe behind.

more transseptal punctures is required, usually from the femoral approach. As far as we are aware this is the first description of a transseptal puncture from a superior approach for catheter ablation of an LA arrhythmia. When the usual access sites are unavailable it is clearly still possible to perform these procedures safely using alternative approaches.

K Rajappan, S C Sporton, R J Schilling
kim@rajappan.freemove.co.uk

The authors have no competing interests to disclose