Brady 61-64 13/2/04 7:46 Page 1

Bradycardia and tachycardia occurring in older people: an introduction

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Abstract

Arrhythmias are more common in the elderly and in many situations are of prognostic importance. The incidence of arrhythmias in the elderly is increasing, most likely due to enhanced longevity. Alterations in heart rate and rhythm may occur because of age-related change within the heart. Elderly people are more likely to experience co-morbid health problems, intercurrent illness and adverse drug reactions, all of which may result in arrhythmias. Falls are a common problem in elderly people; an arrhythmic cause should always be considered.

Key words: arrhythmia, bradycardia, tachycardia, falls.

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Introduction

Elderly people are more likely to experience altered cardiac conduction and symptomatic arrhythmia. This is due to age-related changes within the heart, an increased likelihood of co-morbid health problems, and a reduced tolerance of anti-arrhythmic drug therapy.

In an earlier article, we discussed atrial fibrillation in the elderly.[1] In this article we discuss the background to bradycardias and tachycardias, including epidemiology and presentation. The investigations needed for bradycardias and tachycardias, and its management, with particular emphasis on device therapy, will be reviewed in the next issue.

Age-related change in the heart

Ageing of cardiac tissues results in a reduction of pacemaker cells within the sinus node and degenerative changes in the conduction system.[2,3] Fibrocalcification can also affect atrial and ventricular tissues, and the coronary arteries. Co-morbid health problems, such as hypertension, coronary artery disease and heart failure, are more common in the elderly and aggravate age-related degenerative change.

These pathological changes provide a substrate for arrhythmias, including prolongation of atrioventricular (AV) conduction (PR interval), and reductions in both heart rate variability and heart rate-response to exercise.[4] (For a review of this area, see reference 5.) Mean heart rate tends to fall with increasing age in both men and women.[6]

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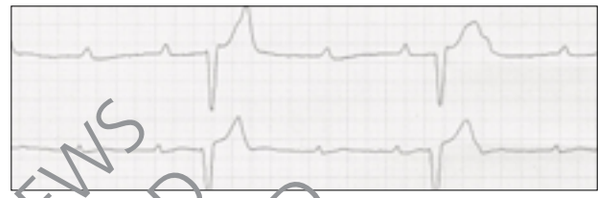
Figure 1. Electrocardiogram showing complete heart block



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Definition and characterisation of atrioventricular block

Conduction system disease may manifest as first degree, second degree (types I and II), or third degree heart block (HB). First degree HB manifests on the electrocardiogram (ECG) as a prolonged PR interval (> 0.2 s), where every P wave is conducted. This may occur because of delayed conduction in the AV node or His-Purkinje system. Second degree HB is defined as the presence of a non-conducted P wave, which may be intermittent or frequent, at regular or irregular intervals, associated with a PR interval that may be fixed or prolonged.[7] Second degree HB may be type I or type II. The former, also known as Wenckebach block, manifests as progressive prolongation of the PR interval, followed by a non-conducted P wave. It can often be difficult to diagnose which type of second degree HB may be present. Complete (or third) degree heart block, manifests on the ECG as a dissociation of P and QRS wave activities (figure 1).

Epidemiology of bradyarrhythmias in elderly people

Symptomatic bradycardias are much more common in the elderly. In one recent study, sinus bradycardias occurred in 1.4% of women and 4.4% of men, sinus pauses occurred in 1% of both sexes.[8] First, second and third degree HB were reported to occur in up to 8%, 1% and 1% of elderly people, respectively.[8]

Brady 61-64 13/2/04 7:46 Page 2

Figure 2. Electrocardiogram showing sinus arrest

Figure 3. Electrocardiogram showing asystolic pause occurring after termination of atrial fibrillation

Prognosis of bradycardias in the elderly

Arrhythmias may be asymptomatic, or may result in palpitations, pre-syncopal episodes, such as dizziness, or true syncope. In the elderly, arrhythmias are an important cause of falls,[9] disability and hospitalisation.[10]

Wenckebach block, when present in younger patients, does not usually indicate significant conduction system disease, and is often due to increased vagal tone or the effect of drugs.[5] In older patients, Wenckebach may indicate conduction system disease, particularly in those with structural heart disease, or QRS prolongation.

Bradycardias, which constitute an adverse prognosis, include sinus bradycardia < 40/min, second degree AV block (type II) and third degree (complete) AV block. First degree HB is not associated with an adverse prognosis.[11] However, those who have a prolonged PR interval should not be treated with rate-limiting therapies and, in most cases, a suitable alternative can be prescribed.

Sometimes, bradycardias may provoke, and therefore manifest, as a tachycardic escape rhythm. This occurs because of increased automaticity of other cardiac tissues outwith the sinus node. Longer diagnostic intervals within the SA node increase the potential for other cardiac cells to generate an ectopic rhythm.

Sick sinus syndrome

Sinus node abnormalities include spontaneous, or inappropriate, sinus bradycardia, sinus arrest (figure 2) or exit block, sinus and AV node conduction abnormalities, and alternation of rapid (regular or irregular) atrial tachyarrhythmias, atrial fibrillation (figure 3), and bradycardias (bradycardia-tachycardia syndrome).[12-14]

Hypersensitive carotid sinus syndrome

The carotid sinus, located at the bifurcation of the common carotid artery, integrates arterial pressure with the autonomic nervous system.[12] The prevalence of carotid sinus hypersensitivity increases with age and may affect up to 5% of elderly people. Syncope occurs predominately in those over 70 years, and/or with co-morbid coronary heart disease or hypertension.[12] Antihypertensive drugs, while needed, can aggravate carotid hypersensitivity.

Intraventricular conduction abnormalities

Altered intraventricular conduction is more common in the elderly. Left (LBBB) and right bundle branch block (RBBB) are revealed on the electrocardiogram (ECG) by QRS prolongation > 0.12s. The prevalence of each is approximately 3% in healthy elderly individuals and rises in those with heart disease.[5] LBBB, but not RBBB, is associated with increased morbidity and mortality.[15] When these abnormalities are evident on an ECG, investigations, such as an echocardiogram or exercise test, should be considered in the light of the patient's history (e.g. possible ischaemic heart disease [LBBB] or pulmonary disease [RBBB]).

Supraventricular arrhythmias in the elderly

With the exception of atrial fibrillation (AF) and atrial flutter, supraventricular arrhythmias are generally not associated with an adverse prognosis in the elderly.[5,8] Atrial tachycardia is associated with the presence of chronic pulmonary disease.

Supraventricular tachycardia (SVT) can give rise to troublesome palpitations in the elderly. SVT include atrial and junctional tachyarrhythmias. The latter include atrioventricular node re-entrant tachycardia (AVNRT) and atrioventricular re-entrant tachycardia, which involves an accessory pathway. SVT arising above the level of the AV node, and those with re-entrant circuits involving the AV node, can be distinguished in the acute situation by administration of AV node blocking drugs, such as adenosine or verapamil.

AF and atrial flutter commonly affect elderly patients. These arrhythmias are associated with an increased risk of cardiovascular events, and death.[16,17] Atrial flutter is a macro-re-entrant tachycardia which usually arises as a re-entrant circuit in the right atrium (figure 2), but may also arise because of atrial scar tissue, for example, after cardiac surgery. AF was discussed in an earlier article in this series.[1]

Wolff-Parkinson-White (WPW) syndrome usually presents with palpitations in young adult life; its incidence declines with advancing age. There is, however, a small rise in the incidence of WPW in the elderly,[18] which is believed to be due to calcification within the conducting system leading to the unmasking of a previously concealed accessory pathway. The risk of death from malignant arrhythmias arising from 1:1 atrioventricular conduction in WPW is not affected by age.[19]

Epidemiology of ventricular arrhythmias

Ventricular ectopy is a very common finding with ambulatory ECG monitoring in the elderly (> 80%). Ventricular tachycardia (VT) occurs in approximately 2%–4%.[5] The incidence of VT increases with age, and is causally related to the presence of

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Brady 61-64 13/2/04 7:46 Page 3

underlying structural heart disease.[20] For example, left ventricular hypertrophy, as a consequence of hypertension, is associated with ECG repolarisation abnormalities, such as prolonged QT duration and increased QT dispersion. These abnormalities are associated with an increased risk of sudden arrhythmic death.[21,22] In hypertensive patients with left ventricular hypertrophy, the incidence of ventricular arrhythmias and sudden cardiac death was reduced by therapy which included the angiotensin receptor blocker, losartan, compared to therapy which includes atenolol.[23] Myocardial scarring due to infarction is an important substrate for ventricular arrhythmias. Consequently, VT and ventricular fibrillation (VF) occur more commonly in patients with impaired ventricular function, and are a common cause of death in these patients.[21,24,25]

The presence of ventricular arrhythmias in the elderly, and particularly those with cardiac abnormalities, is associated with an adverse prognosis.[5,8] A broad complex tachycardia arising in any patient, and particularly in an elderly person with coronary heart disease (CHD), with or without impaired left ventricular function, should be managed as VT/VF until proven otherwise.

A supraventricular arrhythmia with aberrant conduction (e.g. LBBB) may have similar appearances to VT. Features of VT which discriminate it from a supraventricular arrhythmia include atrioventricular dissociation, and capture and fusion beats. Adenosine administration can aid the differentiation of these arrhythmias and is recommended for the initial management of a broad-complex tachycardia. Adenosine induces membrane hyperpolarisation and L-type calcium channel blockade, leading to transient interruption of AV nodal conduction. This will reveal underlying atrial activity in the case of a supraventricular arrhythmia (and may terminate it if an AV circuit is involved), but will have no effect on most types of VT.

Elderly patients, arrhythmias and precipitant causes

Arrhythmias and intercurrent illness

Systemic illness, such as infection, endocrine disturbances such as thyrotoxicosis, gastrointestinal upset, and electrolyte abnormalities, may be associated with arrhythmias. AF may be an early manifestation of ischaemic heart disease. Chest infections and alcoholism are also associated with AF.

Arrhythmias as an adverse effect of medication

Elderly persons are more prone to experiencing arrhythmias as a side effect of a variety of medications. Beta blockers may be less well tolerated because of symptomatic bradycardia and hypotension. Elevated plasma digoxin concentrations can be proarrhythmic, triggering, for example, supraventricular tachyarrhythmias, or ventricular bigeminy.

Malignant arrhythmias may also occur in elderly patients who have chronic illness, such as chronic heart failure, who then subsequently experience an intercurrent illness, such as gastrointestinal upset. In this case, dehydrated patients are prone to systemic upset due to the toxic side effects of medications, such as angiotensin-converting enzyme inhibitors and spironolactone.[26,27] Electrolyte imbalance may be enough to generate an arrhythmia.

Key messages

- Arrhythmias are common in the elderly
- The incidence of arrhythmias in the elderly population is increasing probably because of enhanced longevity
- Elderly people are more likely to experience arrhythmias because of age-related change within the heart, co-morbid health problems, intercurrent illness and adverse drug reactions
- Falls are a common problem in elderly people and an arrhythmic cause should always be considered

Patients who are administered neuroleptic medication for psychiatric problems are also at risk of malignant ventricular arrhythmias. One recent report from our hospital described torsades de pointes occurring in two patients who were receiving chronic therapy with 50 mg of thioridazine daily.[28] One of these patients presented with collapse requiring cardiopulmonary resuscitation, the other presented with presyncope. Each patient had experienced diarrhoea over several days prior to presenting.

Some antidepressants have a type IA anti-arrhythmic profile. Careful consideration should be given to the choice of agent in depressed elderly patients, particularly those with known cardiovascular disease. In these patients, selective serotonin reuptake inhibitors, which have lesser pro-arrhythmic properties, may be the most appropriate choice of agent.[29]

Falls in the elderly

Arrhythmias, and the drugs used to treat them, are an important cause of falls in elderly people. Inappropriately rapid or slow heart rates can lead to a reduction in cardiac output, which in turn, leads to cerebral hypoperfusion and symptoms of pre- or overt syncope.

In one recent study of 54 consecutive patients referred to a geriatric medical service for investigation of falls, 41 patients (76%) had a causal factor implicated – 33 of these patients experienced syncope, of whom 23 (70%) had a cause identified.[9] Syncope was due to a vasovagal episode or arrhythmia in 24 patients. Syncope also occurred due to the effects of hypotensive drugs in five patients, orthostatic hypotension in two patients, and major anxiety with hyperventilation in one patient, respectively. The cause of syncope remained uncertain in 10 patients. Arrhythmias are therefore, an important cause in the differential diagnosis of a fall in an elderly person. Clinicians should refer to published guidelines to assist in the investigation and management of syncope.[30]

Editors' note

This is the sixth article in our clinical cardiology series and the next issue will review the management of bradycardias and tachycardias. Previous articles include: the future of cardiology –

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heart disease in older patients (*Br J Cardiol* 2003;**10**:45–8); heart disease in older patients – myocardial infarction (*Br J Cardiol* 2003;**10**:123–7); thrombolytic therapy for acute ischaemic stroke (*Br J Cardiol* 2003;**10**:197–205); percutaneous coronary intervention in the elderly (*Br J Cardiol* 2003;**10**:293–6); atrial fibrillation in the elderly (*Br J Cardiol* 2003;**10**:373–8).

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