Heartbeat: Causes and consequences of atrial fibrillation

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The prevalence of atrial fibrillation (AF) is increasing dramatically as our population ages.¹ A better understanding of risk factors associated with AF is needed to allow earlier detection, or even prevention, of this common arrhythmia which, hopefully, will reduce the population incidence of stroke.² In this issue of *Heart*, Tikhonoff and colleagues² hypothesised that ambulatory blood pressure (BP) 'may represent a potentially modifiable risk factor for the development of AF in a European population study'. Based on data from almost 4000 subjects (mean age 43.1 ± 15.1 years, 52% women) with a median follow-up of 14 years, they found only a borderline association of conventional systolic BP measurements with incident AF. However, 24 hours ambulatory BP measurements were strongly associated with the risk for incident AF (figure 1). Patients in the upper quartile of daytime systolic BP load (38% or more of BP readings were over 135 mm Hg) had a 46% higher risk of incident AF compared with the average population risk.

In the accompanying editorial, Dr Wachtell³ points out that 'although the phenotype presentation of atrial fibrillation may have many causes, the most common aetiology is pressure overload as hypertension and the consequent cardiac changes in left atrial and ventricular structure and function'. He goes on to conclude 'that atrial fibrillation should, in fact, be considered as target organ damage even when blood pressure is in the normal range. Thus, when blood pressures are in the normal or high normal range, occurrence of atrial fibrillation should be considered as impaired haemodynamics with increased blood pressure load and central blood pressures. Preventing and treating atrial fibrillation should include reducing cardiovascular risk factors such as reducing blood pressure, improving central haemodynamics and improving the left atrial and ventricular structure and function'.

Coexisting heart failure (HF) is common in patients with AF but often is underdiagnosed because symptoms are attributed to AF. In a meta-analysis of data from four

Figure 1 Cumulative incidence estimates (1-Kaplan-Meier survival estimates) for atrial fibrillation events by quartiles of conventional systolic blood pressure (SBP) (A), daytime systolic blood pressure (B) and daytime systolic blood pressure load (C). P values are for the differences between groups according to the log-rank test.

studies including 1941 community-based older adults at high risk of HF, van Doorn and colleagues⁴ found that HF was present in 43% of patients with AF, compared with 20% of those without AF at baseline. HF diagnosis was based on echocardiographic evidence of structural or functional abnormalities at rest in patients with symptoms or signs of HF. Using this definition as the reference standard, elevated serum

natriuretic peptide levels in the overall population had a sensitivity of 78% and specificity of 62% for diagnosis of HF. However, when AF was present, while sensitivity was even higher (93%) specificity was very low (35%) for diagnosis of HF (figure 2).

Bettencourt and Lourenço⁵ remind us that 'there is now robust and extensive evidence that natriuretic peptides can

Figure 2 Amino-terminal pro B-type natriuretic peptide (NTproBNP) in patients with/without heart failure (HF) and atrial fibrillation (AF) across studies. Rutten *et al. BMJ* 2005; 331:1379; Winter *et al. Diabetologia* 2012; 55: 2154–62; van Mourik *et al. BMC Public Health* 2012; 12: 385; van Riet *et al. BMC Cardiovasc Disord* 2014; 12:1.

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help clinicians in the diagnosis of acute HF. Even when physicians are uncertain on the mechanism of acute dyspnoea (pulmonary vs cardiac), the knowledge of natriuretic peptide levels gives crucial information. In ambulatory patients, the evidence is not so strong'. In the context of the study by von Doorn *et al*, it is clear that 'patients with AF are heterogeneous and share common clinical features with patients with HF. Both HFpEF [HF with preserved ejection fraction] and AF are associated with older age, hypertension and diastolic dysfunction; therefore, these conditions are intimately linked. Not all studies have been able to differentiate whether HFpEF or AF comes first, and there are clear diagnostic challenges in clinical practice'.

From a worldwide perspective, there are many barriers to ideal cardiovascular health, particularly in low resource setting. The American Heart Association defines ICH by three clinical metrics (BP, untreated total cholesterol and glucose) and four health behaviours (smoking, body mass index, physical activity and diet) (table 1). In a cohort of over 3000 Peruvian adults, Benziger and colleagues⁶ found that 'no one had all seven ideal metrics; only 41 (1.3%) had 6 ideal health metrics and 322 (10.5%) had ≤ 1 ideal health metric. Females, aged 35–44 years, those living in rural Puno, and those in the lowest socioeconomic tertile had the highest percentage of ideal cardiovascular health' (figure 3).

In an editorial, Brant and Ribeiro⁷ emphasise that improving cardiovascular health (CVH) in low-income and middle-income countries requires that we 'address the first step of the chain, which is to promote ideal CVH. If we want to pursue CVH, we need to keep the populations free from cardiovascular risk factors and thus invest in primordial

Table 1 Cardiovascular health metrics according to the American Heart Association

CVH metric	Category	Definition
Diet	Ideal	4–5 components*
	Intermediate	2–3 components*
	Poor	0–1 component*
Physical activity	Ideal	≥ 150 min/week moderate intensity or ≥ 75 min/week vigorous intensity or combination
	Intermediate	1–149 min/week moderate intensity or 1–74 min/week vigorous intensity or 1–149 min/week moderate/vigorous
	Poor	None
Body mass index	Ideal	<25 kg/m ²
	Intermediate	25–29.9 kg/m ²
	Poor	≥ 30 kg/m ²
Smoking	Ideal	Never or previous smoker+quit >12 months ago
	Intermediate	Previous smoker+quit ≤ 12 months ago
	Poor	Current smoker
Blood pressure	Ideal	$<120/80$ mm Hg
	Intermediate	SBP 120–139 or DBP 80–89 mm Hg or treated to goal
	Poor	SBP ≥ 140 or DBP ≥ 90 mm Hg
Fasting plasma glucose	Ideal	<100 mg/dL
	Intermediate	100–125 mg/dL or treated to goal
	Poor	≥ 126 mg/dL
Total cholesterol	Ideal	<200 mg/dL
	Intermediate	200–239 mg/dL or treated to goal
	Poor	≥ 240 mg/dL

*Components: (1) fruits and vegetables: ≥ 4.5 cups per day, (2) fish: $\geq$ two 3.5 oz servings per week (preferably oily fish), (3) fibre-rich whole grains (≥ 1.1 g of fibre per 10 g of carbohydrate): $\geq$ three 1 oz-equivalent servings per day, (4) sodium: <1500 mg per day and (5) sugar-sweetened beverages: ≤ 450 kcal (36 oz) per week. CVH, cardiovascular health; DBP, diastolic blood pressure; SBP, systolic blood pressure.

prevention. The challenge of primordial prevention is that it implies a solid integration of diverse areas—such as health professionals, educators and policy makers—to develop and implement strategies that will help counteract the unhealthy habits brought by modernisation'. Perhaps we need to consider whether this vision for promoting global health is relevant to high-income countries as well.

The *Education in Heart* article⁸ in this issue provides algorithms to select which patients with HF should receive cardiac

resynchronisation therapy (eg, biventricular pacing) and why some patients fail to show improvement with this approach.

The *Image Challenge*⁹ question shows some interesting images in a patient with an incidental murmur; perhaps the stethoscope is still useful sometimes after all!

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Figure 3 Prevalence estimates for poor, intermediate and ideal cardiovascular health for each of the seven American Heart Association Cardiovascular Health metrics in adults aged ≥ 35 years (n=3058).

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