

The heart in diabetes

JA KER

Diabetes mellitus is associated with a two- to four-fold increased risk of coronary artery disease, and in diabetic people, about two-thirds of deaths are cardiovascular (ischaemic heart disease, congestive heart failure and stroke).¹ Some have suggested diabetes mellitus to be a coronary heart disease risk equivalent (having the same event rates as people without diabetes but with prior cardiovascular disease).² However, this concept remains controversial, especially in younger patients.

In the Interheart study, a standardised, case-control study in 52 countries of the risk factors for acute myocardial infarction, diabetes had an odds ratio of 2.37 with a population-attributable risk of 9.9%.³ The Reach Registry, a prospective international observational registry of 68 236 patients with three or more cardiovascular risk factors or established atherothrombotic disease, had 30 043 participants with diabetes.⁴ The one-year cardiovascular event rate was 40% higher in the diabetic patients than in the non-diabetic patients.

The telomere length (on the far end of chromosomes) of leucocytes are shortened in persons with type 2 diabetes mellitus compared to healthy subjects, and even shorter in type 2 diabetes mellitus patients with coronary heart disease.⁵ Leucocyte telomere length might be a useful marker of tissue ageing and progression of both cardiovascular disease and diabetes.

Although chest pain (angina, acute coronary syndrome) is considered to be a cardinal symptom of myocardial ischaemia, both silent (asymptomatic) myocardial infarction and silent ischaemic episodes (as seen on Holter testing) are more common in diabetic patients, with a higher risk of cardiac events, including death. The prevalence of silent ischaemia in non-diabetic patients may range from 0.89 to 4% whereas in diabetic patients it is estimated to be 10 to 20%.⁶

A meta-analysis of 12 studies demonstrated a consistent association between cardiac autonomic neuropathy (CAN) and painless (silent) myocardial ischaemia, with a pooled rate of prevalence risk of 1.96 (95% CI: 1.53–2.51, $p < 0.001$) out of a total of 1 468 patients.⁷ Given the high prevalence of silent ischaemia in diabetics, an attractive but controversial concept is that of screening of asymptomatic diabetics. Some risk factors may assist in the decision of who to screen: conventional cardiovascular risk factors, breathlessness on exertion, abnormal resting ECG, presence of peripheral vascular disease, cardiac autonomic neuropathy and erectile dysfunction.⁶

Diabetes is associated with cardiovascular risk factors including hypertension, dyslipidaemia, hypercholesterolaemia and abnormalities in fibrinolysis. In particular, hypertension is a major co-morbid condition for diabetes and an important risk factor for



Prof J Ker

the development of cardiovascular and renal disease in diabetic patients. The co-existence of hypertension and diabetes provides an additive increase in the risk of vascular events: the concept of 'terrible twins'. The Swedish Gotteborg study found that men over 25 years of age with both conditions had a 66% greater risk of stroke or myocardial infarction compared to men with hypertension alone.⁸ Recent clinical trials with anti-hypertensive therapy stressed the need to use drugs that did not increase the risk of developing diabetes during treatment.

The Framingham Heart study showed heart failure to be twice as prevalent in diabetic men and five times as common in diabetic women aged 45 to 74 years than in age-matched control subjects.⁹ The cardiotoxic triad: myocardial ischaemia, hypertension and diabetic cardiac autonomic neuropathy, has led to the recognition of a specific cardiomyopathy of diabetes.¹⁰

Pathophysiological remodelling of the heart, ischaemia of the ventricle, hypertensive heart disease, left ventricular hypertrophy, diastolic dysfunction and diabetic cardiomyopathy alone or collectively are responsible for the high risk of heart failure in diabetic patients.¹¹ Recently, diastolic heart failure (i.e. heart failure with normal ejection fraction) has been recognised as a major adverse manifestation of hypertension and diabetes. However, convincing therapeutic strategies other than strict risk factor control are still lacking.¹¹

In conclusion, diabetes mellitus could be regarded also as a cardiovascular condition.

References

1. Beckman JA, Creager MA, Libby P. Diabetes and atherosclerosis: epidemiology, pathophysiology and management. *J Am Med Assoc* 2002; **287**: 2570–2581.
2. Haffner SM, Letito S, Rönnemaa T, Pyörälö K, Loakso M. Mortality from coronary heart disease in subjects with type 2 diabetes and in non-diabetic subject with and without prior myocardial infarction. *N Engl J Med* 1998; **339**: 229–234.
3. Yusuf S, Hawken S, Junpoo S, Dans T, *et al.* Effect of potentially modifiable risk factors associated with myocardial infarction in 52 countries (Interheart Study): case-control study. *Lancet* 2004; **364**: 937–952.
4. Krempf M, Parhofer KG, Steg G, Bhatt DL, *et al.* Cardiovascular event rates in

Correspondence to: JA Ker

Department of Internal Medicine, University of Pretoria, Pretoria
Tel: 27 (0)12 354-1121
Fax: 27 (0)12 329-1351
e-mail: jker@medic.up.ac.za

S Afr J Diabetes Vasc Dis 2010; **7**: 48–49

- diabetic and non-diabetic individuals with and without established atherosclerosis (from the Reduction of Atherosclerosis for Continued Health [REACH] registry). *Am J Cardiol* 2010; **105**: 667–671.
- Olivieri F, Lorenzi M, Antonicelli R, *et al*. Leucocyte telomere shortening in elderly type diabetes mellitus patients with previous myocardial infarction. *Atherosclerosis* 2009; **206**: 588–593.
 - Dweck M, Campbell IW, Miller D, Francis CM. Clinical aspects of silent myocardial ischaemia: with particular reference to Diabetes Mellitus. *Br J Diabetes Vasc Dis* 2009; **9**: 110–116.
 - Vinik AI, Moser RE, Mitchell BD, Freeman R. Diabetic autonomic neuropathy. *Diabetes Care* 2003; **26**: 1553–1579.
 - Almgren T, Wilhelmsen L, Samuelsson O, *et al*. Diabetes in treated hypertension is common and carries a high cardiovascular risk: results from a 28-year follow-up. *J Hypertens* 2007; **25**: 131–137.
 - Kannel WB, McGee DL. Diabetes and cardiovascular disease: The Framingham study. *J Am Med Assoc* 1979; **241**: 2035–2038.
 - Bell DSH. Heart failure: the forgotten and often fatal complication of diabetes. *Diabetes Care* 2003; **26**: 2433–2441.
 - Pieske B, Wachter R. Impact of diabetes and hypertension on the heart. *Current Opin Cardiol* 2008; **23**: 340–349.