occur in patients with CRF. A shortened life span of red blood cells would ensure that the erythrocytes in circulation were relatively young and that they had a relatively short time to glycosylate haemoglobin. We ruled out the possibility that HbA_{1c} measurement might have been interfered with by factors in the plasma of uraemic patients. Our observations disagree with those reported in a study on patients on haemodialysis in which raised HbA_{1c} levels were found.⁵ Most patients in that study, however, had blood glucose concentrations greater than 7 mmol/l (126 mg/100 ml).

Clinically it is important to appreciate that CRF is associated with subnormal HbA_{1c} concentrations since HbA_{1c} values would have to be interpreted with caution before and after transplantation in patients with diabetic nephropathy. This is especially relevant if HbA_{1c} is to be used as a marker of diabetic control in studies relating the quality of long-term glycaemic control to the development of diabetic complications.

We were surprised to find a direct correlation between HbA_{1c} and total haemoglobin concentration in patients with CRF since the anaemia in this condition is thought to be mainly due to marrow suppression.

In conclusion, the primary effect of CRF on HbA_{1c} is that of a reduction due to shortened red blood cell survival. The superimposition of hyperglycaemia on CRF could lead to a normal or raised HbA_{1c}. The significant linear correlation between HbA_{1c} and haemoglobin concentrations in a condition with an anaemia due to multiple factors would suggest that HbA_{1c} has the potential for being developed into a rapid and cheap quantitative test for haemolysis.

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Sotalol intoxication with prolonged Q-T interval and severe tachyarrhythmias

The main clinical features after massive doses of beta-blocking agents include bradycardia, hypotension, low-output cardiac failure, and cardiogenic shock. Whether the features are influenced by the various pharmacological properties of different beta-blockers is unknown.¹ Sotalol hydrochloride is a non-selective beta-blocking drug devoid of intrinsic sympathomimetic and membrane-stabilising activity. Interestingly, sotalol has been classified as a group 3 antiarrhythmic drug,² and in contrast to other beta-blockers high concentrations prolong the duration of action potential in canine ventricular muscle and Purkinje fibres.³

We report what we believe to be the first two cases of severe sotalol poisoning. Each was characterised by a concentration-dependent prolongation of the Q-T interval and a pronounced susceptibility to severe tachyarrhythmias.

Case reports

Case 1—A 39-year-old man taking 160 mg sotalol daily for mild hypertension was admitted to the emergency room two hours after ingesting 2.4 g sotalol (30 80-mg tablets) with small amounts of diazepam and chlordiazepoxide and some alcohol. He was drowsy but orientated, with a blood pressure of 130/80 mm Hg and heart rate 50/min. Gastric lavage yielded a tablet mass. Four hours after ingestion blood pressure could be maintained at 80/50 mm Hg only with a dopamine infusion (0.5 mg/min), and heart rate by intracardiac pacing with a bipolar electrode. Nine hours after ingestion two episodes of ventricular fibrillation occurred with transient loss of consciousness: the first episode ceased spontaneously, and the second disappeared with pacing. Subsequent numerous multifocal ventricular

extrasystoles disappeared with lignocaine and pacing at 140/min. Pacing and dopamine infusion were needed for up to 40 hours and lignocaine for up to 70 hours after ingestion. Thirteen hours after ingestion the serum sotalol concentration was 16 mg/l (therapeutic concentration about 1-2 mg/l). The electrocardiogram showed a maximum Q-T interval of 0.68 s (at a heart rate of 70/min normal Q-T interval is 0.37 s). The serum half life of sotalol was 13 hours, the decline in concentration correlating closely with return to normal of the Q-T interval.

Case 2. Electrocardiograms 3, 10, 11, and 80 hours after ingestion of 8 g sotalol. Tracings at 3, 10, and 80 hours recorded with lead I at 50 mm/s; tracing at 11 hours recorded from monitor at 25 mm/s.

Case 2—A 59-year-old man was admitted three hours after ingesting 8 g sotalol (100 tablets). Blood pressure was 85/55 mm Hg and heart rate 60/min. Gastric lavage was performed and 50 g activated charcoal given. He was infused with isoprenaline and the blood pressure rose to 100/70 mm Hg. Six hours after ingestion multifocal ventricular extrasystoles (up to 24/min), some clearly aberrantly conducted beats, and short episodes of ventricular tachycardia were observed. Twenty-two hours after ingestion the serum sotalol concentration was 7.5 mg/l, the half life being 15 hours. A maximum Q-T interval of 0.70 s at a heart rate of 45/min was recorded 10 hours after ingestion (see figure) (normal Q-T interval at this heart rate 0.45 s). The Q-T interval decreased with an apparent half life of 14 hours, being normal three days after ingestion.

Comment

The most important findings in these two patients were hypotension, bradycardia, a prolonged Q-T interval, ventricular extrasystoles, ventricular tachycardia, and, in case 1, ventricular fibrillation. A prolonged Q-T interval predisposes to ventricular tachyarrhythmias but the exact mechanism is obscure. In contrast to propranolol and alprenolol, sotalol at concentrations of 10-100 µmol/l (about 3-30 mg/l) has been shown in vitro to delay repolarisation and lengthen the effective refractory period and duration of the action potential in Purkinje fibres as well as in atrial and ventricular muscle.³ These effects occurred in our patients as a prolonged Q-T interval with a susceptibility to tachyarrhythmias. These phenomena are not typical after poisoning with other beta-blocking agents.¹

The close correlation observed between the serum sotalol concentration and the Q-T interval suggests that the Q-T interval could be used as an index of the severity of sotalol intoxication.

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