Ventricular arrhythmias complicating weight reduction therapy in a patient with a prolonged QT interval

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Summary: Serious ventricular arrhythmias are known to occur in patients with long QT intervals. We describe a case of torsade de pointes occurring in a patient with a prolonged QT interval while taking a 1000 calorie diet, diethylpropion hydrochloride (Tenuate Dospan) and bendrofluazide. In patients with long QT intervals, hypokalaemia and drugs which further delay repolarization may facilitate the development of life threatening arrhythmias.

Case report

A 35 year old housewife presented with a 24 h history of brief episodes of loss of consciousness. She had been taking a 1000 calorie diet for 3 weeks; bendrofluazide 5 mg/d and diethylpropion hydrochloride 75 mg/d were added for 10 d prior to admission. On admission the pulse was irregular and the blood pressure was 120/80 mm Hg. Cardiovascular and neurological findings were otherwise normal. Biochemical investigations revealed a reduced serum potassium of 2.4 mmol/l (normal range 3.5–4.5 mmol/l). All other biochemical and haematological tests were normal. The electrocardiogram revealed sinus rhythm, with frequent unimorphological ventricular ectopics. The measured QT interval (QT_m) was 0.4 s during a heart rate of 100 beats/min, and the corrected QT interval (QT_c) according to Bazett (1920) was 0.52 s (normal less than 0.44 s). The QRS and ST segments were normal and U waves were present. Chest radiograph and echocardiogram were normal.

Cardiac monitoring showed episodes of ventricular tachycardia, of a torsade de pointes morphology (Figure 1), associated with episodes of loss of consciousness. Treatment included the withdrawal of bendrofluazide and diethylpropion hydrochloride, potassium replacement and an intravenous infusion of

Figure 1 Torsade de pointes.

mexiletine which suppressed ventricular arrhythmias. Two days later when the patient was normokalaemic, the QT_c was prolonged at 0.50 s (QT_m, 0.42 s, heart rate 85 beats/min) and U waves were absent (Figure 2).

Three months later investigations were performed when the serum potassium was 3.9 mmol/l. The electrocardiogram revealed that QT_c was persistently prolonged to 0.48 s (QT_m 0.42 s, heart rate 77 beats/min). No ventricular arrhythmias were induced by maximal treadmill exercise testing. An intracardiac electrophysiological study revealed normal conduction times and no ventricular arrhythmias were induced with programmed right ventricular stimulation, either before or after intravenous isoprenaline (7 µg/min for 5 min). The QT_m during identical rates of atrial pacing was unchanged following the isoprenaline infusion. Subsequently, 100 mg/d of atenolol has shortened the QT_c to 0.42 s (QT_m 0.43 s, heart rate 51 beats/min) and the patient has remained asymp-

Figure 2 Shows prolonged QT interval (QT_c 0.50 s) after correction of hypokalaemia.

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tomatic during 8 months follow up. In addition 6 first degree relatives were studied and found to have normal QT intervals.

Discussion

Torsade de pointes is an atypical ventricular tachycardia which has been described in patients with congenital long QT syndromes and acquired prolonged QT intervals (Kossman, 1978; Krikler & Curry, 1976; Soffer *et al.*, 1982). Its association with sudden death is well known (Jervell & Lange-Nielsen, 1957; Stubbs *et al.*, 1976). This patient's markedly prolonged QT interval on admission shortened following the withdrawal of drugs and correction of hypokalaemia. However, in the absence of metabolic abnormalities and any drugs, the QT interval remained moderately prolonged 3 months later. This suggested that the patient had a long standing prolonged QT. It has been previously reported that the QT interval prolongs during identical atrial pacing following isoprenaline in patients with congenital long QT syndromes (Milne *et al.*, 1982). In contrast, patients with acquired and idiopathic prolonged QT intervals have unaltered QT intervals after isoprenaline (Milne *et al.*, 1982). The diagnosis of idiopathic prolonged QT in this patient was suggested by the response of the paced QT interval to isoprenaline and the absence of affected relatives.

Rapid weight loss in patients using liquid protein near starvation diets, has been reported to prolong the QT interval and induce torsade de pointes and sudden death (Brown *et al.*, 1978; Isner *et al.*, 1979). The pathogenesis remains unknown. This patient's weight loss was not rapid, and torsade de pointes has not been associated with less rigorous weight reduction diets.

Torsade de pointes has been described after the use

of several drugs which prolong the QT interval including class I antiarrhythmic drugs and phenothiazines (Fowler *et al.*, 1976; Meltzer *et al.*, 1978). Although diethylpropion hydrochloride has sympathomimetic actions it has not been reported to prolong the QT interval (Schreiber *et al.*, 1968). The drug has a half life of 16 h and it is unlikely to have caused persistent QT interval prolongation 3 months later. Furthermore, as sympathetic stimulation does not prolong the QT interval in patients with idiopathic long QT syndrome, it is unlikely that diethylpropion hydrochloride contributed to the patient's markedly delayed repolarization at admission. However, sympathetic stimulation with isoprenaline has been reported to further prolong repolarization in patients with congenital long QT syndromes and diethylpropion hydrochloride may further delay repolarization in this particular group of patients (Milne *et al.*, 1982).

Hypokalaemia, hypomagnesaemia and, rarely, hypocalcaemia have been associated with the induction of torsade de pointes in patients with QT abnormalities (Stubbs *et al.*, 1976; Curry *et al.*, 1976; Khan *et al.*, 1981). Hypokalaemia, due to a variety of aetiologies, has been found to cause a high incidence of arrhythmias when the plasma-potassium falls below 3.2 mmol/l, but there are few reports of life threatening arrhythmias (Curry *et al.*, 1976). The incorrect use of diuretics and the development of hypokalaemia may have facilitated the induction of torsade de pointes in this patient with an underlying prolonged QT interval and a predisposition to ventricular arrhythmias.

Following the correction of hypokalaemia and withdrawal of drug, there was no spontaneous or inducible ventricular arrhythmia. Therefore great caution is required in the use of drugs which cause hypokalaemia or further delay ventricular repolarization in patients with long QT intervals.

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