**Investigation vignette**

**A 19 Year old Woman Admitted to Hospital Confused and Agitated with Intermittent Twitching of her Upper and Lower Limbs**

**CASE REPORT**

A 19 year old woman was admitted to the accident and emergency department (A & E) confused and agitated with intermittent twitching of her upper and lower limbs. She had a past history of depression and pseudoseizures and had been managed by her local medical practitioner for the previous 4 years with numerous antidepressant agents. The morning of her admission she had a violent argument with her partner and locked herself in the bathroom.

Her partner called the police who forcibly opened the bathroom door and found the woman curled up in one corner of the room drowsy, confused and agitated, with an empty amitriptyline packet by her side. She was taken by ambulance to hospital for further assessment.

In the A & E department her vital signs revealed a pulse rate of 60 beats per minute, blood pressure 95/45 mmHg and temperature of 36.1°C. She was obtunded but occasionally responded non-purposefully to pain. She was intubated using 150 mg thiopentone and 75 mg suxamethonium intravenously and mechanically ventilated.

The plasma biochemistry on admission revealed a sodium of 142 mmol/L, potassium 4.4 mmol/L, chloride of 106 mmol/L and bicarbonate 28 mmol/L. The haemoglobin was 115 g/L and the white cell count was 6.3 x 10^9/L. A blood gas taken just prior to intubation revealed a PO₂ of 75 mmHg, PCO₂ 54 mmHg and pH 7.29 and a plasma lactate 3.1 mmol/L. A cerebral computed tomography (CT) was performed which revealed no abnormality. An ECG performed on admission is shown in figure 1.

![Figure 1. A 12 lead ECG taken on admission to the accident and emergency department](image-url)
Diagnosis: Amitriptyline poisoning with a Brugada syndrome electrocardiographic pattern

The Brugada syndrome describes a group of patients with the ECG findings of an apparent RBBB pattern with ST segment elevation in the right precordial leads (‘Brugada sign’) who have no definable structural heart disease and who are at risk for the recurrence of sudden death due to ventricular fibrillation.1,2,3 The ECG findings may normalise transiently in up to 40% of cases or be concealed in up to 50% of cases, with the latter being provoked by flecainide,4 procaïnamide,4 α-adrenergic agonists,4 β-adrenergic blockers,4 fever5,6 or insulin and glucose.7,8 The ECG changes may also be found with tricyclic9,10,11 phenothiazine15 and antihistamine overdosage, acute myocardial ischaemia or infarction (particularly right ventricular infarction or ischaemia), acute pulmonary embolism,13 right ventricular dysplasia, pericarditis, 24 hours following cardioversion or defibrillation, dissecting aortic aneurysm, central nervous system abnormalities (e.g. acute subdural haemorrhage), electrolyte abnormalities (e.g. hypercalcaemia, hyperkalaemia), cocaine intoxication, thiamine deficiency, Duchenne muscular dystrophy, Friedreich’s ataxia, and acute myocarditis or other infiltrative cardiomyopathies.2,3,14 These conditions should be excluded before the diagnosis can be made.

The disorder is inherited as an autosomal dominant with incomplete penetrance2 and arises from genetic defects of the α subunit of the cardiac sodium channel causing a reduction in the sodium current (INa).4 Approximately 20% of Brugada patients have documented SCN5A gene mutations (the gene encoding for the α subunit of the cardiac sodium channel).15,16 Inactivation of the INa current (Phase 0 of the myocardial action potential) can leave Ito (Phase 1 of the myocardial action potential) unopposed, an effect that is observed largely in the right ventricle which has a denser Ito current than the left ventricular myocardium thereby causing ST segment elevation in the right precordial leads. Agents that block both INa and Ito (e.g. quinidine, disopyramide) restore the electrical homogeneity and suppress antiarrhythmic activity,17 whereas agents that block INa but not Ito (e.g. flecainide, procaïnamide) exacerbate or unmask the Brugada syndrome.7 Agents that increase the calcium current including isoproterenol (a β2-adrenergic agonist) and cilostazol (a phosphodiesterase III inhibitor) also normalise the ST segment.2,8

The prognosis is poor in symptomatic patients with the Brugada syndrome who have spontaneous ECG abnormalities, and who do not receive an implantable cardioverter-defibrillator,18,19 whereas the risk of ventricular tachyarrhythmias is low in asymptomatic patients who have drug induced ECG changes only.20

Figure 2. A 12 lead ECG taken on discharge from the intensive care unit
Tricyclic antidepressants are a group of compounds that may cause adverse cardiovascular effects particularly when taken as an overdose. They have a mixture of anticholinergic, antiadrenergic and quinidine-like effects; thus their resultant effect on the heart is complex. The ECG effects include widened QRS, prolonged QTc and RAD, and the arrhythmias associated with tricyclic poisoning include ventricular tachycardia, torsade de pointes and ventricular fibrillation.21

An ECG pattern similar to that observed with the Brugada syndrome has been reported with tricyclic overdose,9,10,11 with one report finding an incidence of 15.3% in 98 cases. In this report, one patient with the Brugada ECG pattern and one patient without it died from refractory ventricular fibrillation with the mortality rate being 6.7% among patients with the Brugada ECG pattern and 2.4% among patients without it (p = 0.39).9

In the case I report, the patient was hyperventilated and treated with intravenous sodium bicarbonate (100 mL 8% in 24 hr). She was extubated within 18 hours slightly drowsy but otherwise oriented in time and place. The patient was discharged from the intensive care unit 24 hours later without developing any ventricular arrhythmias during her admission and with the ECG returning to within normal limits (Figure 2).

K. DESHPANDE
Department of Critical Care Medicine, Flinders Medical Centre, Bedford Park, SOUTH AUSTRALIA

REFERENCES