Electrical storm secondary to theophylline prescription in a patient with implantable cardioverter defibrillator

Burza elektryczna u chorego z wszczepialnym kardiowerterem defibrylatorem wtórna do przyjętej theofiliny

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We report the case of a 73-year-old obese man (body mass index 32 kg/m²), with sleep apnoea syndrome, atrial fibrillation, and non-ischaemic dilated cardiomyopathy (left ventricular ejection fraction 30%), who received a biventricular implantable cardioverter defibrillator (ICD) 10 years ago as secondary prevention after several episodes of ventricular tachycardia. He was on optimal medical therapy (candesartan 8 mg/d, bisoprolol 2.5 mg/d, spironolactone 25 mg/d, amiodarone 200 mg/d, and oral anticoagulation). No ventricular arrhythmia was detected since ICD implantation. The patient was referred to the emergency department for dizziness, palpitations, and several ICD shocks. No signs of heart failure were observed on clinical examination. Electrocardiograms showed several premature cardiac complexes. Telemetry revealed an electrical storm with 9 episodes of ventricular fibrillation and tachycardia appropriately treated with shocks and anti-tachycardia pacing (Fig. 1). No abnormalities were found on blood tests. The patient reported theophylline intake for an asthma-like bronchitis for the two preceding weeks at a dose of 400 mg/day concomitant with beta-blocker withdrawal. A favourable outcome was obtained after theophylline suppression, even in the absence of beta-blocker reintroduction. At follow-up, no ventricular arrhythmia was observed during the next 12 months. Triggering factors precipitating an electrical storm in ICD patients are only identified in less than 25% of cases. Theophylline is a phosphodiesterase inhibitor that increases calcium concentration, leading to an increased inotropism and promoting the emergence of post-diastolic late potentials involved in arrhythmogenesis (Fig. 2).

The pharmacokinetics of theophylline are moderately vulnerable with a narrow therapeutic range, and are largely influenced by the patient’s age and weight. Indeed, in elderly and obese patients, the theophylline half-life can be easily doubled. Furthermore, the clearance of theophylline is significantly reduced in heart failure. For the above reasons, the arrhythmogenic effect of theophylline was potentialised in our patient. To the best of our knowledge, this is the first case of electrical storm due to theophylline prescription in an ICD patient. To conclude, caution should be paid when prescribing theophylline in patients with arrhythmic vulnerability.