The many facets of cardiac complications in epilepsy

People with chronic epilepsy have an increased risk of dying prematurely. Sudden unexpected death in epilepsy (SUDEP) is the most common directly epilepsy-related cause and defined as a sudden, unexpected, witnessed or un-witnessed, nontraumatic and non drowning death in a patient with epilepsy, with or without evidence of a seizure excluding documented status epilepticus, and in which postmortem examination does not reveal a toxicological or anatomical cause of death. Insufficient seizure control with frequent generalized tonic-clonic seizures (GTCS) is the most important risk factor. The pathomechanisms of SUDEP are not fully understood, but seizure-related respiratory and cardiovascular dysfunction are the most plausible candidates.[1]

Cardiac dysfunction in chronic epilepsy can have many sources including iatrogenic causes as well as acute and chronic effects of recurrent seizure activity. Administration of anticonvulsant drugs, especially of those which inhibit voltage-gated sodium channels, may block atrioventricular (AV) conduction and dampen sinus node activity, whereas abrupt withdrawal of anticonvulsants can lead to frequent premature ventricular contractions and runs of supraventricular tachycardia.[2,3] Intermittent AV-block induced by vagus nerve stimulation can occur even many years after implantation of the stimulation device.[4] Recurrent seizures and a long-lasting intake of anticonvulsant drugs appear to alter interictal properties of the cardiovascular autonomic nervous system. For instance, sympathetic tone tends to be increased, whereas parasympathetic tone appears to be decreased in chronic epilepsy, ultimately leading to depressed heart rate variability (HRV).[5] Depressed HRV, in turn, is associated with increased cardiovascular mortality.[1,5] Interictal cardiac repolarization indices such as QT dispersion and late ventricular potentials are abnormal in a considerable proportion of people with epilepsy, possibly enhancing the risk of ventricular tachyarrhythmias and sudden cardiac death.[6,7] Acute seizures commonly lead to transitory sinus tachycardia. The extent and duration of the heart rate increase depend on the seizure type.[8] Although sinus tachycardia can exceed 150 beats per minute and last for up to 30-60 minutes after a GTCS, it is usually of benign character. However, seizure-related and potentially malignant alterations of QT intervals, ST-segments and T-waves, which are established risk factors of ventricular tachyarrhythmias or may be indicative of cardiac ischemia, have recently been reported.[8-10] Importantly, one near-SUDEP event with life-threatening ventricular tachycardia and fibrillation after a secondarily GTCS in a patient without cardiac disease was documented during video-EEG telemetry, suggesting that the aforementioned modifications of cardiac repolarization may be clinically relevant.[11] Seizure-induced bradyarrhythmias such as sinus bradycardia, high degree AV-blocks and mostly self-limiting asystole with syncope are nowadays well known phenomena in chronic epilepsy, prompting implantation of a cardiac pacemaker in some of the patients.[12,13] Recently, prolonged episodes of atrial fibrillation have been described in association with GTCS.[14] GTCS can also severely impair ventricular contractility in the absence of coronary pathology. This stress-induced cardiomyopathy (which is also known as Takotsubo cardiomyopathy) can dramatically decrease cardiac output, thereby leading to a cardiogenic shock in up to 25% of the cases with seizure-associated Takotsubo cardiomyopathies.[15]

Recently, Babarao and colleagues have added a novel type of arrhythmia to the growing list of seizure-related cardiac complications.[16] They report on a male patient who developed, after a GTCS, symptomatic bradycardia and hypotension due to an AV junctional rhythm. The mechanisms by which GTCS lead to an AV junctional rhythm and to other types of cardiac complications (in particular abnormal cardiac repolarization, atrial fibrillation and Takotsubo cardiomyopathy) probably involve seizure-related sympathetic hyperactivity

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and massive release of catecholamines.[17-19] This case highlights the many facets of cardiac complications in epilepsy, raises alertness in those who treat people with frequent GTCS and strengthens the hypothesis of seizure-associated cardiac failure as one plausible cause of SUDEP.

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