

Post-electrocution persistent manic-depressive syndrome: a unique diagnostic syndrome and a red flag against electroconvulsive therapy?

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SUMMARY

Bipolar mood disorder is an established psychiatric disorder affecting 1% of the population and it is a highly disabling disease. As of today, its aetiology is still a confounding question. This case is interesting as the patient presented with a full-blown mania after suffering from electrical injury. The persistent syndrome in this case could point to a unique diagnostic entity and offer possible explanation of the pathophysiology of manic depressive as well as a consideration for caution when prescribing electroconvulsive therapy (ECT).

INTRODUCTION

Electrical injury is becoming more common in community following greater electricity consumption in domestic and industrial sectors. It is an indirect trauma to the brain causing physical, cognitive and emotional changes to an individual. The effects are varied, and they include burns, loss of consciousness, cardiac arrest, impaired attention and memory, depression and dementia.¹

Extensive literature review shows that manic depressive disorder rarely presents after electrical injury and reports that post-traumatic stress disorder (PTSD) and depression as the most common psychological sequela after an electrical injury.² Ameen et al., did report a case of chronic mania which occurred six months after an electrical injury but that was a more reactive disorder rather than a primary causation in view of the long delay.³

We report a case of manic depression in a previously mentally healthy individual, presenting with classical three phase presentation following an electrical injury who responded poorly to Sodium Valproate and Olanzapine.

CASE REPORT

This is a 49-year-old Malay man with no known medical or psychiatric comorbid. His wife described him as a normal responsible man who spends his time mostly in his orchard and mosque. He was admitted to surgical ward after sustaining electrical injury with second degree burns over his palms and feet, complicated with rhabdomyolysis while working at his palm plantation. He was using an iron rod to pluck palm fruits and accidentally hit a 240-volt electrical

cable. He noticed a spark at the wire and fell flat on the ground. Post event, he had no loss of consciousness, dyspnoea or chest pain. He was discharged home after seven days. Other than initial confusion, he did not demonstrate any major psychiatric symptoms. There were no signs of brain damage or neurological damage clinically.

Three days after being discharged, he was presented back to emergency department with abnormal behaviour such as irritability, poor sleep and irrelevant speech. Physical examination was not remarkable. Blood investigations such as full blood count, renal profile and liver function test were within normal range. Computed tomography (CT) brain and electroencephalography (EEG) was arranged as outpatient appointment. He was initially treated as delayed onset delirium as he responded well to antipsychotic and according to his wife, was "back to normal self".

However, two weeks after discharge when we met the patient for follow up in the clinic, manic symptoms were very prominent. He displayed grandiose delusions, increased goal-directed activity, pressure of speech, irritability, reduced need for sleep with poor insight and judgment. His disturbed behaviour was so severe that his wife ran away and filed for separation from him.

He was tentatively diagnosed as having Bipolar Type I secondary to electrical injury even though secondary mania associated with electrical injury is uncommon and not found in our literature search. He was started on the standard regime for psychotic affective disorder using Sodium Valproate and Olanzapine but unlike the typical bipolar patients, his response to treatment was much slower and the patient is still under treatment to control his symptoms at time of writing this report two month after the incident.

DISCUSSION

The pathophysiology of electrical injury causing psychiatric disorder is still poorly understood. According to Fink et al., nerve tissue has the lowest resistance and highest conductive potential due to the billions of neurons it contains compared to bone or skin tissue. Therefore, electric current will go through the central nervous system preferentially once it enters through the palms and before it exits through the feet.⁴

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As a result, the current may significantly alter the microstructure and neurochemistry in the brain either by the electrical energy in the current itself, the electromagnetic induction from the current or the thermal effect of the large current entering the brain. Either of these mechanisms are known to cause psycho-neurological damage to the brain.⁵

What happens next can be described in three phases. Phase 1: Acute injury/delirium - the patient recovered uneventfully through this phase. Phase 2: Apparent normalcy – patient recovered fully from phase 1 and was discharged with no psychiatric complications. This phase lasted for a couple of weeks. Phase 3: Acute onset and persistent major psychiatric syndrome fitting the description of mania. If the disorder were to present without history of electrical injury, he would have been diagnosed as Bipolar Mood Disorder (BMD) based on DSM-5.

A noteworthy difference from the BMD in this case was the sudden change of mental state from normalcy, its prominent resistance to treatment with mood stabilisers and atypical antipsychotic compared to the functional variety and the long duration for the symptoms to subside with treatment. These differences suggest a possibility that this is a unique syndrome and could have been undiagnosed had it been less severe.

We proposed several theories to explain this case. Electrical injury is known to have residual effect on the brain causing impaired attention, concentration and verbal memory causing inability to return to normal function, which may lead to a psychiatric disorder. However, the duration of stress is too short to have caused such a severe disease. Additionally, PTSD and depression are the most commonly reported in literature¹ and BMD is uncommon.

Secondly, the electrical energy and the thermal effect of a sufficiently strong current at the right location may permanently damage brain neurons, receptor proteins and enzymes causing persistent treatment-refractory bipolar features. If this is the case, we propose that physicians and surgeons who treat electrical burns and psychiatrists who are usually not involved in the earlier phases, to be vigilant to detect manic depressive syndromes after apparent recovery from electrocution, to consider prophylactic mood stabilizer therapy in high risk patients.

Psychiatrists should also be wary of prescribing high dose ECTs in bipolar patients as although the ECT use therapeutic kinds of electricity, it is still potentially capable of causing a vicious cycle of more treatment refractory bipolar-like manic depressive episodes such as in this case and necessitating higher doses of ECTs.

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