■ Case vignette

Epileptic Disord 2022; 24 (6): 1120-1123

Epileptic Disorders

Tardive myoclonic focal seizures after electroconvulsive therapy, lithium and bupropion treatment

Pablo Mayo Rodríguez[1], Ana Fernández Revuelta[2], María Romeral Jiménez[1], Beatriz Parejo Carbonell[1], Alejandro Horga Hernández[2], Isabel Ramos García[3], Carmen Polidura Arruga[4], Irene Garcia-Morales[1]

[1] Hospital Clinico San Carlos Ringgold standard institution - Unit Epilepsy, Neurology, Madrid, Spain
[2] Hospital Clinico San Carlos Ringgold standard institution – Neurology, Madrid, Madrid, Spain
[3] Hospital Clinico San Carlos Ringgold standard institution – Psychiatry, Madrid, Madrid, Spain
[4] Hospital Clinico San Carlos Ringgold standard institution – Radiology, Madrid, Madrid, Spain

Received May 12, 2022; Accepted July 25, 2022

VIDEOS ONLINE

• **Correspondence:**
Pablo Mayo Rodríguez
Hospital Clinico San Carlos - Neurology
Professor Martin Lagos St
Madrid 28040, Spain
<pablo.mayo92@gmail.com>

doi:10.1684/epd.2022.1483

Electroconvulsive therapy (ECT) is an effective neurostimulation therapy for major depressive disorders [1, 2]. Seizures during ECT (early prolonged seizures) and post ECT (tardive seizures) have been described [1]. The seizure threshold may be lowered in patients concomitantly treated with other drugs [2]. There is controversy regarding the association with lithium and ECT [3]. The use of high doses of bupropion has been associated with an increased incidence of uncontrolled seizures, especially in ECT patients [4].

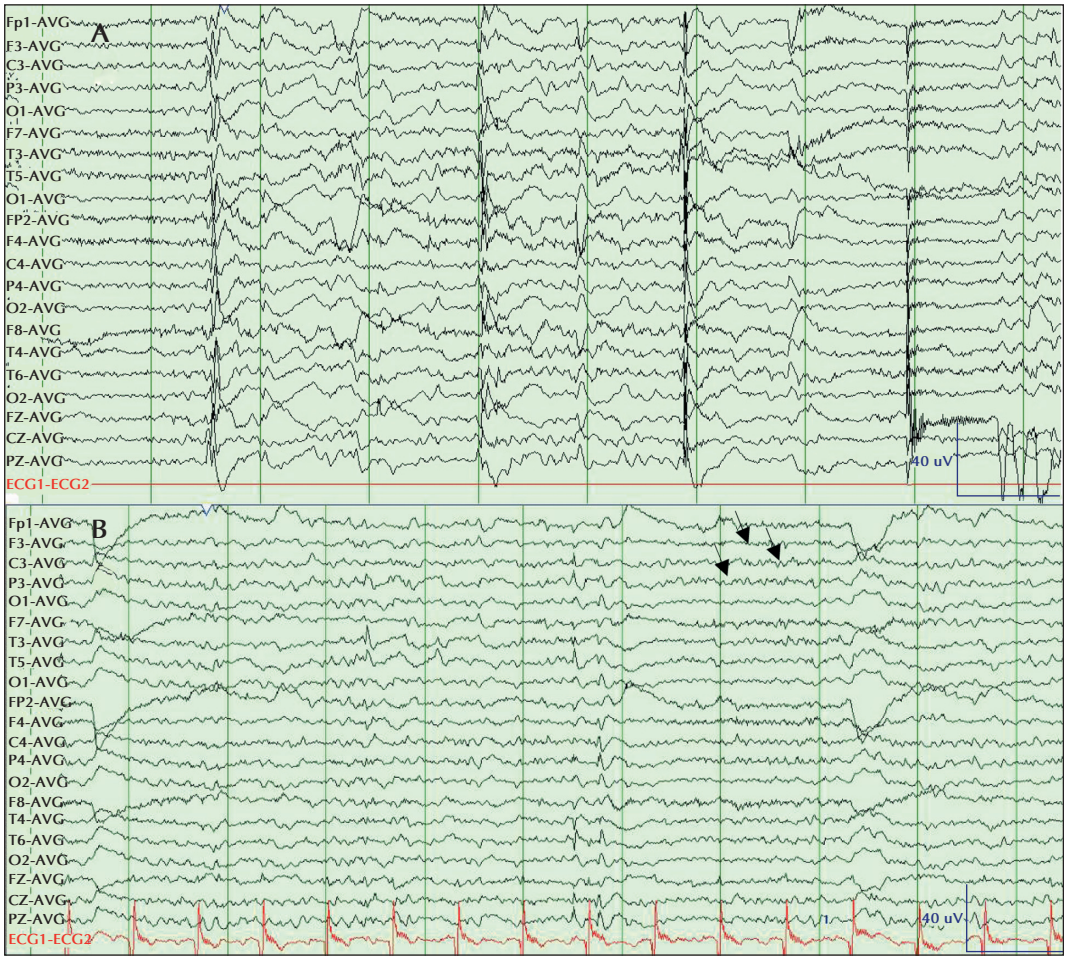
We describe the case of a patient on antidepressant treatment who developed tardive persistent focal myoclonic seizures with and without an altered level of consciousness after various ECT sessions.

A 77-year-old woman with vascular risk factors and a history of ischaemic heart disease had major depressive disorder resistant to antidepressants. She was being treated with 400 mg lithium twice a day, 300 mg bupropion daily, 50 mg quetiapine daily, and 20 mg methylphenidate daily. She had received ECT on several occasions in the past with favourable response and without complications.

She was admitted to the hospital due to worsening of her underlying psychiatric pathology.

Due to a lack of response to pharmacological treatment, ECT was started. During the ECT sessions, the pharmacological treatment was maintained, except for lithium, which was reduced by half. Anaesthesia with propofol and succinylcholine was administered and bilateral frontotemporal stimulation was carried out. Energy dosage was progressively titrated, reaching the maximum dose of 50%. During the three ECT sessions, she developed epileptic seizures, the last one with a clinical duration of 19 seconds and an electrical duration of 41 seconds with subsequent complete recovery. At six hours after the third ECT session, the patient developed multifocal myoclonus. At first, the myoclonus was subtle and was not interpreted as epileptic seizures. These progressively increased in frequency, presenting as almost continuous myoclonus after 48 hours of ECT. On neurological examination, spontaneous, multifocal, asynchronous, axial and appendicular myoclonus worsened with voluntary movements. Occasionally, the myoclonus was followed by brief episodes of loss of consciousness (*see videos*).

Complete blood tests were carried out with a normal liver and renal profile and normal lithium level (0.67 mmol/L). Brain MRI showed no abnormalities. Video-EEG (*figure 1A*) registered epileptic seizures with myoclonus and an ictal pattern consisting of a generalised spike-wave discharge, predominantly



■ **Figure 1.** (A) Epileptic seizures with myoclonus and an ictal pattern consisting of a generalised spike-wave discharge, predominantly in the frontal and central región, at 1 Hz. (B) Fast activity (black arrows) and spikes persisting in the frontal, central and parietal bilateral region, mainly on the left.

in the frontal and central region, at 1 Hz. Interictal EEG showed fast activity and spikes in the frontal and central region and in the bilateral parietal and occipital region, mostly on the left.

Treatment was started with levetiracetam with disappearance of the myoclonus. A new video-EEG was performed (*figure 1B*) and no electrical seizures were recorded, nevertheless, fast activity and spikes persisted in the same region.

Maintenance treatment was changed to lamotrigine due to reduced adverse effects regarding psychiatric features. After two months, ECT was restarted without further complications and energy dosage was progressively titrated up to 80%. After 18 months, the patient is currently on antiseizure treatment.

Prolonged seizures after ECT are described in the literature and usually occur at the beginning of ECT [1]. Tardive seizures are less frequent [2]. Both are more frequently described in patients with treatment with other drugs that lower the seizure threshold (including lithium, bupropion and quetiapine) and with previous epileptiform abnormalities on EEG and brain lesions [4, 5].

The use of lithium during ECT remains controversial, and there are numerous reports of neurological complications including seizures [4, 5]. However, other authors have found no association between complications and treatment with ECT combined with lithium [6]. In this case, the lithium dose was decreased by half, maintaining a blood lithium level that was at the lower limit of normal. Bupropion has also been described as a cause of dose-dependent seizures in patients treated with ECT [4, 7]. In our case, the patient was receiving doses of 300 mg per day; seizures are reported as a rare complication in patients with daily doses of less than 450 mg.

Nevertheless, the use of low doses of methylphenidate has not been shown to increase the risk of seizures [8]. Finally, the use of antipsychotics, such as quetiapine, is thought to be safe with ECT [5].

There are several hypotheses regarding the aetiology of these epileptic seizures [7, 9]. On the one hand, as described above, treatment with lithium and bupropion lower the seizure threshold [4]. On the other hand, it is speculated that ECT leads to an increase in the permeability of the blood-brain barrier [9]. This increased permeability is also influenced by other factors, such as age [2]. Thus, concomitant use of ECT and these drugs may increase the passage of lithium and bupropion into the central nervous system, further lowering the seizure threshold. This could explain the facilitation of seizures with these drugs despite the fact that blood lithium levels are maintained at low doses and within normal range [3, 9]. No cases of focal seizures in the form of myoclonus with or without an altered level of consciousness have been reported in the literature; those described are more commonly generalised tonic-clonic seizures [2]. The cases described in the literature usually appear very early and usually last 10-30 minutes [1]. These seizures usually subside with treatment with benzodiazepines [1]. In our case, the seizures started several hours after ECT, progressively increasing in frequency and duration and persisting up to 48 hours later. Furthermore, treatment with benzodiazepines was not carried out, and levetiracetam was initially administered due to its antiseizure and antimyoclonic action, with disappearance of the myoclonus. Subsequently, treatment was changed to lamotrigine due to the beneficial antiseizure and antimyoclonic effects.

In conclusion, the occurrence of tardive seizures in patients treated with ECT seems to be favoured by several factors, mainly the use of other drugs. Studies are needed to clarify that the administration of these drugs is suitable when combined with ECT. ■

Supplementary material.
Summary slides accompanying the manuscript are available at www.epilepticdisorders.com.

Disclosures.
None.

References

1. Bernardo Arroyo M, González-Pinto A, Urretavizcaya M. *Consenso español sobre terapia electroconvulsive*. Madrid: Sociedad Española de Psiquiatría Biológica, 2018. http://www.sepsiq.org/

2. Warren N, Eyre-Watt B, Pearson E, O'Gorman C, Watson E, Lie D, *et al*. Tardive seizures after electroconvulsive therapy. *J ECT* 2022; 38(2): 95-102.

3. Sartorius A, Wolf J, Henn FA. Lithium and ECT-concurrent use still demands attention: three case reports. *World J Biol Psychiatry* 2005; 6(2): 121-4.

4. Conway CR, Nelson LA. The combined use of bupropion, lithium and venlafaxine during ECT: a case of prolonged seizure activity. *J ECT* 2001; 17(3): 216-8.

5. Rucker J, Cook M. A case of prolonged seizure after ECT in a patient treated with clomipramine, lithium, L-tryptophan, quetiapine, and thyroxine for major depression. *J ECT* 2008; 24(4): 272-4.

6. Dolenc TJ, Rasmussen KG. The safety of electroconvulsive therapy and lithium in combination: a case series and review of the literature. *J ECT* 2005; 21(3): 165-70.

7. Dersch R, Zwernemann S, Voderholzer U. Partial status epilepticus after electroconvulsive therapy and medical treatment with bupropion. *Pharmacopsychiatry* 2011; 44(7): 344-6.

8. Andrade C. Methylphenidate and the risk of new-onset seizures. *J Clin Psychiatry* 2020; 81(4): 20f13586.

9. Augustin M, Karakavuz R, Riester L, Grözinger M. Lithium is likely to persist in the brain: clinical implications for electroconvulsive therapy. *J ECT* 2021; 37(1): 67-70.

Legends for video sequences

The videos 1, 2 and 3 show spontaneous, multifocal, asynchronous, axial and appendicular myoclonus.

Key words for video research on www.epilepticdisorders.com
Phenomenology: myoclonic seizure
Localization: generalized, frontal lobe (bilateral), central (bilateral)
Syndrome: focal non-idiopathic (localization not specified)
Aetiology: variable

TEST YOURSELF

(1) For a patient with major depressive disorder treated with lithium and bupropion, who is scheduled to receive electroconvulsive therapy, which of the following is correct:

A. All drugs should be withdrawn because of the increased risk of seizures
B. Lithium and bupropion should be replaced by antipsychotics, such as clozapine
C. There is controversy about drug management in these patients

(2) The permeability of the blood-brain barrier can:

A. be affected by electroconvulsive therapy
B. be affected by age
C. is not modified by any factor
D. A and B are correct

Note: Reading the manuscript provides an answer to all questions. Correct answers may be accessed on the website, www.epilepticdisorders.com.