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Dr. Tavakoli: A tale of 3 disciplines and the role of EEG

Paranoid, agitated, and manipulative

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Mrs. M is paranoid and disoriented. She has a history of bipolar disorder and alcohol dependence, but says she stopped drinking 4 months ago. What could be causing her mental status changes?

CASE Agitation

Mrs. M, age 39, presents to the emergency department (ED) with altered mental status. She is escorted by her husband and the police. She has a history of severe alcohol dependence, bipolar disorder (BD), anxiety, borderline personality disorder (BPD), hypothyroidism, and bulimia, and had gastric bypass surgery 4 years ago. Her husband called 911 when he could no longer manage Mrs. M's agitated state. The police found her to be extremely paranoid, restless, and disoriented. Her husband reports that she shouted "the world is going to end" before she escaped naked into her neighborhood streets.

On several occasions Mrs. M had been admitted to the same hospital for alcohol withdrawal and dependence with subsequent liver failure, leading to jaundice, coagulopathy, and ascites. During these hospitalizations, she exhibited poor behavioral tendencies, unhealthy psychological defenses, and chronic maladaptive coping and defense mechanisms congruent with her BPD diagnosis. Specifically, she engaged in splitting of hospital staff, ranging from extreme flattery to overt devaluation and hostility. Other defense mechanisms included denial, distortion, acting out, and passive-aggressive behavior. During these admissions, Mrs. M often displayed deficits in recall and attention on Mini-Mental State Examination (MMSE), but these deficits were associated with concurrent alcohol use and improved rapidly during her stay.

In her current presentation, Mrs. M's mental status change is more pronounced and atypical compared with earlier admissions. Her outpatient medication regimen includes lamotrigine, 100 mg/d, levothyroxine, 88 mcg/d, venlafaxine extended release (XR), 75 mg/d, clonazepam, 3 mg/d, docusate as needed for constipation, and a daily multivitamin.

What likely accounts for Mrs. M's change in mental status?

a) alcohol intoxication
b) substance-induced delirium
c) delirium due to a general medical condition
d) psychosis due to BD

The authors' observations

Delirium is a disturbance of consciousness manifested by a reduced clarity of awareness (impairment in attention) and change in cognition (impairment in orientation, memory, and language).[1,2] The disturbance develops over a short time and tends to fluctuate during the day. Delirium is a direct physiological consequence of a general medical condition, substance

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use (intoxication or withdrawal), or both (***Table, page 47***).[3]

Delirium generally is a reversible mental disorder but can progress to irreversible brain damage. Prompt and accurate diagnosis of delirium is essential,[4] although the condition often is underdiagnosed or misdiagnosed because of lack of recognition.

Patients who have convoluted histories, such as Mrs. M, are common and difficult to manage and treat. These patients become substantially more complex when they are admitted to inpatient medical or surgical services. The need to clarify between delirium (primarily medical) and depression (primarily psychiatric) becomes paramount when administering treatment and evaluating decision-making capacity.[5] In Mrs. M's case, internal medicine, neurology, and psychiatry teams each had a different approach to altered mental status. Each team's different terminology, assessment, and objectives further complicated an already challenging case.[6]

How would you proceed with Mrs. M's care?

a) administer IV lorazepam for acute agitation and monitor her closely
b) restart her outpatient psychotropics and begin an alcohol withdrawal protocol
c) order an EEG
d) recommend inpatient psychiatric hospitalization

EVALUATION Confounding results

The ED physicians offer a working diagnosis of acute mental status change, administer IV lorazepam, 4 mg, and order restraints for Mrs. M's severe agitation. Her initial vital signs reveal slightly elevated blood pressure (140/90 mm Hg) and tachycardia (115 beats per minute). Internal medicine clinicians note that Mrs. M is not in acute distress, although she refuses to speak and has a small amount of dried blood on her lips, presumably from a struggle with the police before coming to the hospital, but this is not certain. Her abdomen is not tender; she has normal bowel sounds, and no asterixis is noted on neurologic exam. Physical exam is otherwise normal. A noncontrast head CT scan shows no acute process. Initial lab values show elevations in ammonia (277 µg/dL) and γ-glutamyl transpeptidase (68 U/L). Thyroid-stimulating hormone is 1.45 mIU/L, prothrombin time is 19.5 s, partial thromboplastin time is 40.3 s, and international normalized ratio is 1.67. The internal medicine team admits Mrs. M to the intensive care unit (ICU) for further management of her mental status change with alcohol withdrawal or hepatic encephalopathy as the most likely etiologies.

Mrs. M's husband says that his wife has not consumed alcohol in the last 4 months in preparation for a possible liver transplant; however, past interactions with Mrs. M's family suggest they are unreliable. The Clinical Institute Withdrawal Assessment (CIWA) protocol is implemented in case her symptoms are caused by alcohol withdrawal. Her vital signs are stable and IV lorazepam, 4 mg, is administered once for agitation. Mrs. M's husband also reports that 1 month ago his wife underwent a transjugular intrahepatic portosystemic shunt (TIPS) procedure for portal hypertension. Outpatient psychotropics (lamotrigine, 100 mg/d, and venlafaxine XR, 75 mg/d) are restarted because withdrawal from these drugs may exacerbate her symptoms. In the ICU Mrs. M experiences a tonic-clonic seizure with fecal incontinence and bitten tongue, which results in a consultation from neurology and the psychiatry consultation-liaison service.

Psychiatry recommends withholding psychotropics, stopping CIWA, and using vital sign parameters along with objective signs of diaphoresis and tremors as indicators of alcohol withdrawal for lorazepam administration. Mrs. M receives IV haloperidol, 1 mg, once during her second day in the hospital for severe agitation, but this medication is discontinued because of concern about lowering her seizure threshold.[7] After treatment with lactulose, her ammonia levels trend down to 33 µg/dL, but her altered mental state persists with significant deficits in attention and orientation.

The neurology service performs an EEG that shows no slow-wave, triphasic waves, or

Clinical Point

Clarifying delirium and depression is paramount when administering treatment and evaluating decision-making capacity

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epileptiform activity, which likely would be present in delirium or seizures (see this article at CurrentPsychiatry.com for an example of triphasic waves on an EEG [***Figure 1***] and Mrs. M's EEG results [***Figure 2***]). Subsequent lumbar puncture, MRI, and a second EEG are unremarkable. By the fifth hospital day, Mrs. M is calm and her paranoia has subsided, but she still is confused and disoriented. Psychiatry orders a third EEG while she is in this confused state; it shows no pathologic process. Based on these examinations, neurology posits that Mrs. M is not encephalopathic.

Clinical Point

EEG can help recognize delirium, and, in some cases, elucidate the underlying cause

See this article at CurrentPsychiatry.com for an example of triphasic waves in an EEG and Mrs. M's EEG results

The authors' observations

Mrs. M had repeated admissions for alcohol dependence and subsequent liver failure. Her recent hospitalization was complicated by a TIPS procedure done 1 month ago. The incidence of hepatic encephalopathy in patients undergoing TIPS is >30%, especially in the first month post-procedure, which raised suspicion that hepatic encephalopathy played a significant role in Mrs. M's delirium.[8]

Because of frequent hospitalization, Mrs. M was well known to the internal medicine, neurology, and psychiatry teams, and each used different terms to describe her mental state. Internal medicine used the phrase "acute mental status change," which covers a broad differential. Neurology used "encephalopathy," which also is a general term. Psychiatry used "delirium," which has narrower and more specific diagnostic criteria. Engel et al[9] described the delirious patient as having "cerebral insufficiency" with universally abnormal EEG. Regardless of terminology, based on Mrs. M's acute confusion, one would expect an abnormal EEG, but repeat EEGs were unremarkable.

Interpreting EEG

EEG is one of the few tools available for measuring acute changes in cerebral function, and an EEG slowing remains a hallmark in encephalopathic processes.[10,11] Initially, the 3 specialties agreed that Mrs. M's presentation likely was caused by underlying medical issues or substances (alcohol or others). EEG can help recognize delirium, and, in some cases, elucidate the underlying cause.[10,12] It was surprising that Mrs. M's EEGs were normal despite a clinical presentation of delirium. Because of the normal EEG findings, neurology leaned toward a primary psychiatric ("functional") etiology as the cause of her delirium vs a general medical condition or alcohol withdrawal ("organic").

A literature search in regards to sensitivity of EEG in delirium revealed conflicting statements and data. A standard textbook in neurology and psychiatry states that "a normal EEG virtually excludes a toxic-metabolic encephalopathy."[13] The American Psychiatric Association's (APA) practice guidelines for delirium states: "The presence of EEG abnormalities has fairly good sensitivities for delirium (in one study, the sensitivity was found to be 75%), but the absence does not rule out the diagnosis; thus the EEG is no substitute for careful clinical observation."[6]

At the beginning of Mrs. M's care, in discussion with the neurology and internal medicine teams, we argued that Mrs. M was experiencing delirium despite her initial normal EEG. We did not expect that 2 subsequent EEGs would be normal, especially because the teams witnessed the final EEG being performed while Mrs. M was clinically evaluated and observed to be in a state of delirium.

OUTCOME Cause still unknown

By the 6th day of hospitalization, Mrs. M's vitals are normal and she remains hemodynamically stable. Differential diagnosis remains wide and unclear. The psychiatry team feels she could have atypical catatonia due to an underlying mood disorder. One hour after a trial of IV lorazepam, 1 mg, Mrs. M is more lucid and fully oriented, with MMSE of 28/30 (recall was 1/3), indicating normal cognition. During the exam, a psychiatry resident notes Mrs. M winks and feigns a yawn at the medical students and

nurses in the room, displaying her boredom with the interview and simplicity of the mental status exam questions. Later that evening, Mrs. M exhibits bizarre sexual gestures toward male hospital staff, including licking a male nursing staff member's hand.

Although Mrs. M's initial confusion resolved, the severity of her comorbid psychiatric history warrants inpatient psychiatric hospitalization. She agrees to transfer to the psychiatric ward after she confesses anxiety regarding death, intense demoralization, and guilt related to her condition and her relationship with her 12-year-old daughter. She tearfully reports that she discontinued her psychotropic medications shortly after stopping alcohol 4 months ago. Shortly before her transfer, psychiatry is called back to the medicine floor because of Mrs. M's disruptive behavior.

The team finds Mrs. M in her hospital gown, pursuing her husband in the hallway as he is leaving, yelling profanities and blaming him for her horrible experience in the hospital. Based on her demeanor, the team determines that she is back to her baseline mental state despite her mood disorder, and that her upcoming inpatient psychiatric stay likely would be too short to address her comorbid personality disorder. The next day she signs out of the hospital against medical advice.

Table

DSM-IV-TR diagnostic criteria for delirium

A) Disturbance of consciousness (ie, reduced clarity of awareness of the environment) with reduced ability to focus, sustain or shift attention
B) A change in cognition (such as memory deficit, disorientation, language disturbance) or the development of a perceptual disturbance that is not better accounted for by a preexisting, established, or evolving dementia
C) The disturbance develops over a short period of time (usually hours to days) and tends to fluctuate during the course of the day
D) There is evidence from the history, physical examination, or laboratory findings demonstrating that: • the disturbance is caused by the direct physiological consequences of a general medical condition (delirium due to a general medical condition) • criteria A and B developed during substance intoxication or during medication use (substance intoxication delirium) • criteria A and B developed during, or shortly after, a withdrawal period (substance withdrawal delirium) • that the delirium has >1 etiology (delirium due to multiple etiologies)

Source: Reference 3

The authors' observations

We never clearly identified the specific etiology responsible for Mrs. M's delirium. We assume at the initial presentation she had toxic-metabolic encephalopathy that rapidly resolved with lactulose treatment and lowering her ammonia. She then had a single tonic-clonic seizure, perhaps related to stopping and then restarting her psychotropics. Her subsequent confusion, bizarre sexual behavior, and demeanor on her final hospital days were more indicative of her psychiatric diagnoses. We now suspect that Mrs. M's delirium was briefer than presumed and she returned to her baseline borderline personality, resulting in some factitious staging of delirium to confuse her 3 treating teams (a psychoanalyst may say this was a form of projective identification).

We felt that if Mrs. M truly was delirious due to metabolic or hepatic dysfunction or alcohol withdrawal, she would have had abnormal EEG findings. We discovered that the notion of "75% sensitivity" of EEG abnormalities cited in the APA guidelines comes from studies that include patients with "psychogenic" and "organic" delirium. Acute manias and agitated psychoses were termed "psychogenic delirium" and acute confusion due to medical conditions or substance issues was termed "organic delirium."[9,12,14-16]

continued

Clinical Point

If Mrs. M truly was delirious due to metabolic or hepatic dysfunction or alcohol withdrawal, she would have had an abnormal EEG

Clinical Point

It would be constructive if all disciplines could agree on a single term when evaluating a patient with acute confusion

Related Resources

- Meagher D. Delirium: the role of psychiatry. Advances in Psychiatric Treatment. 2001;7:433-442.
- Casey DA, DeFazio JV Jr, Vansickle K, et al. Delirium. Quick recognition, careful evaluation, and appropriate treatment. Postgrad Med. 1996;100(1):121-4, 128, 133-134.

Drug Brand Names

Clonazepam • Klonopin	Lorazepam • Ativan
Docusate • Surfak	Levothyroxine • Levoxyl, Synthtoid
Haloperidol • Haldol	Venlafaxine XR • Effexor XR
Lamotrigine • Lamictal	

Disclosure

The authors report no financial relationship with any company whose products are mentioned in this article or with manufacturers of competing products.

Acknowledgment

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This poses a circular reasoning in the diagnostic criteria and clinical approach to delirium. The fallacy is that, according to DSM-IV-TR, delirium is supposed to be the result of a direct physiological consequence of a general medical condition or substance use (criterion D), and cannot be due to psychosis (eg, schizophrenia) or mania (eg, BD). We question the presumptive 75% sensitivity of EEG abnormalities in patients with delirium because it is possible that when some of these studies were conducted the definition of delirium was not solidified or fully understood. We suspect the sensitivity would be much higher if the correct definition of delirium according to DSM-IV-TR is used in future studies. To improve interdisciplinary communication and future research, it would be constructive if all disciplines could agree on a single term, with the same diagnostic criteria, when evaluating a patient with acute confusion.

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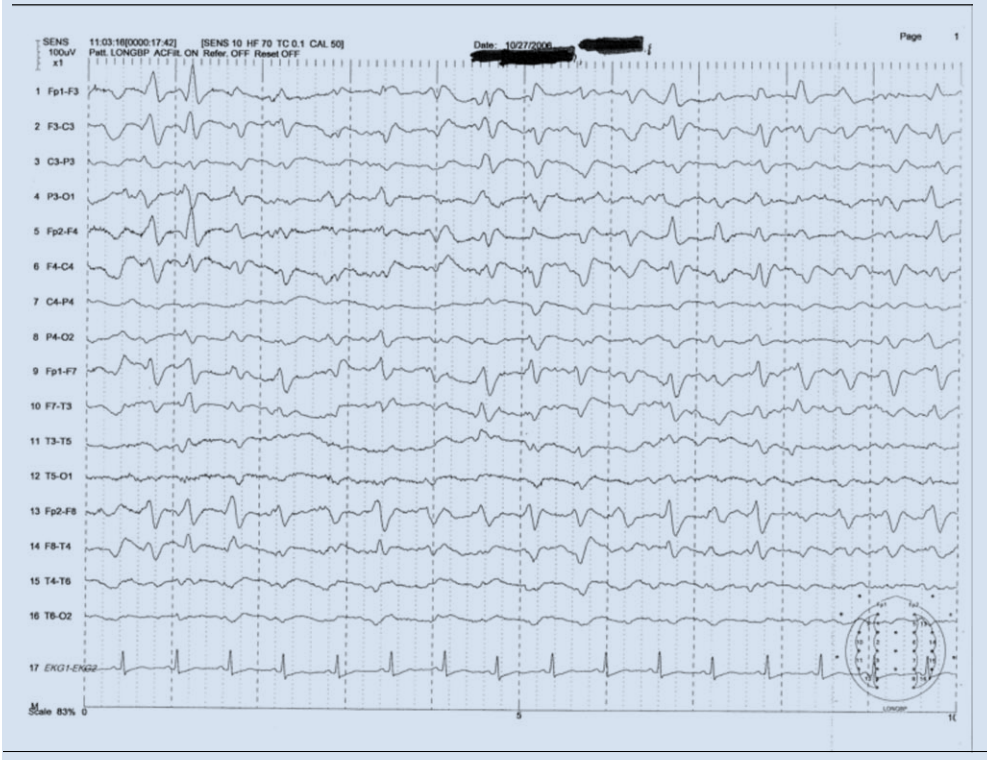
Bottom Line

Evaluation of acute mental status changes in a patient with a complex psychiatric and medical history requires collaboration among treatment teams. Using different terms to describe a patient's symptoms can lead to communication difficulties. Treatment guidelines state that EEG abnormalities have a 75% sensitivity for delirium, which we suspect would be much higher if a correct definition of delirium is used.

Figure 1

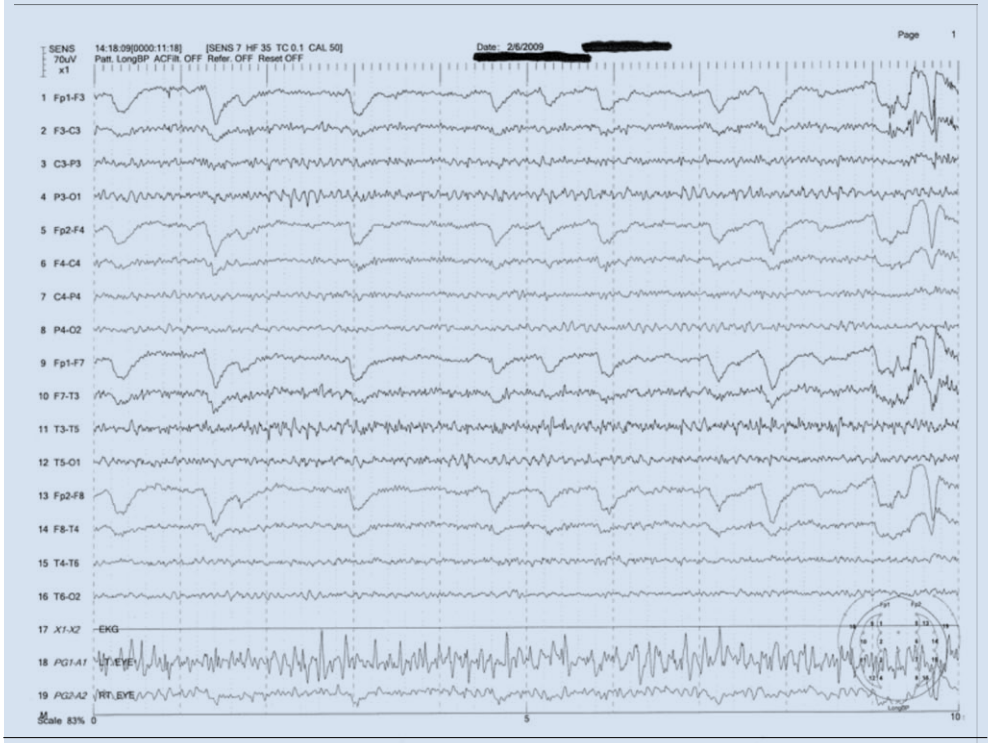
Representative sample of triphasic waves



This EEG tracing is from a 54-year-old woman who underwent prolonged abdominal surgery for lysis of adhesions during which she suffered an intraoperative left subinsular stroke followed by nonconvulsive status epilepticus. The tracing demonstrates typical morphology with the positive sharp transient preceded and followed by smaller amplitude negative deflections. Symmetric, frontal predominance of findings seen is this tracing is common

Figure 2

Mrs. M's EEG results



This is a representative tracing of Mrs. M's 3 EEGs revealing an 8.5 to 9 Hz dominant alpha rhythm. There is superimposed frontally dominant beta fast activity, which is consistent with known administration of benzodiazepines