A 55-Year-Old Obese Woman with Acute Onset of Psychosis

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The patient was a 55-year-old obese woman employed as a teacher with no psychiatric history and a medical history of hypertension. She came to our inpatient clinic with acute onset of psychosis in the form of auditory and visual hallucinations, delusions, grandiosity, paranoia, inappropriate affect, cognitive decline, and confusion.

She had been admitted at another facility for a few hours before being admitted to our facility. Records from the initial facility just before her admission to our hospital showed that the woman was telling her family members that she was God and that other people were the devil. She wanted other people to be quiet so she could hear God. She also told them her name was Peter and then repeatedly changed it to other biblical figures. She also punched a family friend in the mouth, slapped her mother, and had physical altercations with the police and paramedics. She said her son was the devil and if she closed her eyes then God would blow him up in 5 seconds.

According to a licensed medical health professional, the woman was alert and oriented to self only. She had illogical, tangential speech; labile affect; bizarre, incongruent affect; and an inappropriate smile. She was preoccupied with the notion that she had Alzheimer’s disease. She also had vague suicidal thoughts and had remote memory deficit, evidenced by an inability to recall the number of children she had.

She had recently been prescribed long- and short-acting steroid shots, an oral steroid pack (prednisone), clarithromycin, and hydrocodone/acetaminophen for sinusitis and a urinary tract infection for the previous 7 days prior to her admission.

At the time of admission to our inpatient psychiatric facility, she declined to answer any questions. However, she mentioned that she believed that she was God and could see people who were not there. She was easily distractible, irritable, withdrawn, and had mumbled speech. She had been taking verapamil at home for hypertension. She denied previous diagnosis of diabetes or any psychiatric history.

LABORATORY RESULTS

Urine drug screen, comprehensive metabolic panel, urine analysis, complete blood count with differential (CBCWD), blood alcohol level, acetaminophen, and salicylate levels were obtained. Glucose was 201 mg/dL, blood urea nitrogen (BUN) was 37 mg/dL, creatinine was 1.7 mg/dL, and BUN/creatinine ratio was 21.8. Potassium was 3.2 mEq/L, aspartate aminotransferase was 47 U/L, and serum osmolality calculated was 302 mOsm/kg. Urine analysis revealed urine glucose of 100, ketones of 15, and blood with trace intact. CBCWD revealed white blood cells of 26.8 (high), neutrophils of 82.2%, lymphocytes of 9.2%, and monocytes of 2% (high).

HOSPITAL COURSE

She was started on olanzapine 10 mg orally every night at bedtime at our facility and received a dose that was eventually discontinued. Repeat blood work was performed 2 days after admission, and the results showed that the patient had returned to baseline levels. Her blood glucose level had decreased and her urinary tract infection had cleared up. Her white blood cell count was lowered, and her kidney function had returned to normal. We talked to her husband and he stated that she was back to her baseline level of functioning.

At the time of discharge, she was off antipsychotic drugs for more than 24 hours, and her HbA1c level was 7.1%.
Delirium Secondary to Diabetic Ketoacidosis and Steroid Psychosis

Considering the patient’s quick recovery (within 24 hours), her recent urinary tract infection, high-dose steroid shots, undiagnosed type 2 diabetes mellitus, and no past psychiatric history, her presenting with a sudden onset of psychosis and mania was highly suspicious for delirium secondary to diabetic ketoacidosis (DKA) and steroid psychosis. She was subsequently diagnosed with type 2 diabetes mellitus at our psychiatric facility.

DELI R I UM

The American Psychiatric Association’s Diagnostic and Statistical Manual of Mental Disorders, 4th edition (DSM-IV\(^1\)) lists four key features that characterize delirium (Table 1). In addition to the four criteria in DSM-IV, DSM-5\(^2\) adds one more criteria of “an additional disturbance in cognition” (eg, memory deficit, disorientation, language, visuospastic ability, or perception).

Table 2 lists the rates of delirium occurrence in different populations.\(^3\) Specifiers/types of deliriums are substance intoxication delirium, substance withdrawal delirium, delirium due to another medical condition, delirium due to multiple etiologies. Other specifiers are acute (lasting few hours or days)/persistent (lasting weeks or months), and hyperactive/hypoactive/mixed level of activity.\(^2\) Delirium is a syndrome with multiple possible etiologies resulting in similar pattern of symptoms. Delirium is often underrecognized by health care professionals.\(^3\) Incidences of delirium during hospitalization ranges from 6% to 56% in a general hospital population.\(^2\)

Etiology

Delirium is typically caused by a medical condition, substance intoxication, or medication side effect. Table 3 summarizes some of the most common causes of delirium.\(^6\)

Neuropathology

The major neuroanatomic area involved in pathology of delirium is reticular formation, which regulates arousal and attention. The major pathway found in delirium is dorsal tegmental pathway projecting from the mesencephalic reticular formation to the tectum and thalamus.

The major neurotransmitter thought to be involved is acetylcholine. One of the most common causes of delirium is anticholinergic toxicity, which supports this hypothesis.\(^3\)

A study by Golinger et al.\(^6\) with surgical patient population found that anticholinergic activity for delirious patients was higher than that in patients without delirium.

The delirium associated with alcohol withdrawal is found to be result of hyperactivity of the locus ceruleus and its noradrenergic neurons. Other neurotransmitters that have been implicated are serotonin and glutamate.\(^3\)

An elevated level of cortisol was found to be an important factor involved in delirium after coronary artery bypass graft surgery.\(^7\)

Another study in individuals age 65 years or older found that S100B is the strongest independent marker.\(^8\)

Studies on structural and functional brain imaging, neurotransmitter studies, as well electrophysiologic tests suggest the importance of cerebral cortical and subcortical areas, especially the frontal lobe, subcortical regions, and the right hemisphere.\(^9\)

Clinical Presentation

Delirium is often overlooked, misdiagnosed as dementia or another psychiatric illness such as depression, or attributed to aging.\(^2\) Formal mental status testing with the use of examinations such as the Mini-Mental State examination should be performed. Delirium develops over a short period of time and tends to fluctuate during the course of the day.

continued on page 394
Delirium patients may also fluctuate rapidly between hyperactive and hypoactive states. The hyperactive state is more frequently noticed and may be more common. It is often associated with medication side effects and withdrawal from drugs. The hypoactive state may be more common in older patients.²

In the study by Ouimet et al.,¹⁰ the prevalence rate of subsyndromal delirium was found to be 33.3% in an intensive care unit population.

Patients with prevalent subsyndromal delirium had increased postdischarge mortality, longer acute care hospital stay, and a lower cognitive and functional level at the follow up than patients without subsyndromal delirium.¹¹

### Differential Diagnosis

The core symptoms of delirium and their respective most likely differential diagnosis can be seen in Figure 1.

### Diagnosis

**Recognizing the disorder:** Delirium is often under-recognized by health care professionals.

**History.** Recent illness, recent medications, history of alcoholism or drug abuse, and other etiologic factors should be explored.

**Physical examination.** Vital signs, potential infectious foci, and volume status should be evaluated. Altered mental status in patients with delirium makes neurologic examination challenging.

**Clinical instruments.** The Confusion Assessment Method (CAM). A study by Inouye et al.¹² detected CAM sensitivity of 94% and 100% in two different settings. They also found specificity to be 90% and 95% in those two settings.

Some of the other assessment instruments used to identify delirium include the following: the CAM for the Intensive Care Unit,¹³⁻¹⁶ the Delirium Symptom Interview,¹⁷ and the Intensive Care Delirium Screening Checklist.¹⁶

The Memorial Delirium Assessment Scale (MDAS), a continuous severity measure, was found to be useful adjunct to (CAM) in study of delirium in older hip fracture patients.¹⁸

### Laboratory Tests

Laboratory tests to confirm a diagnosis of delirium include complete blood count, serum electrolytes, renal function tests, glucose, ammonia level, urinalysis and urine culture, drug levels, blood gas determination, and liver function tests. Laboratory tests should be determined based upon the history and clinical examination.³
Neuroimaging such as head computed tomography may be used selectively, and lumbar puncture should be performed in cases of suspected meningitis.

**Treatment**

Treatment of delirium includes treatment of the underlying etiology, medical condition, and/or discontinuing medication(s) responsible for delirium.

A commonly used drug for psychosis is haloperidol. Use of second-generation antipsychotics may be considered for delirium management. Insomnia is best treated with benzodiazepines with short or intermediate half-lives. Benzodiazepines with long half-lives and barbiturates should be avoided unless they are being used as part of the treatment for the underlying disorder (eg, alcohol withdrawal).

As per a systematic review published in 2007 reviewing literature on antipsychotic use in delirium, it was found that there is limited evidence of uncontrolled studies supporting use of low dose antipsychotics. But, there was no published, double-blind, randomized, placebo-controlled trial to suggest safety of antipsychotic use in delirium until 2007.

In 2014, a double blind trial of haloperidol, chlorpromazine, and lorazepam in the treatment of hospitalized AIDS patient population was conducted with 244 patients. It was found that low-dose haloperidol and chlorpromazine were useful with few side effects in the population. Lorazepam alone was found to be ineffective.

The symptoms of delirium usually recede over a 3-day to 1-week period, although some symptoms may take up to 2 weeks to resolve completely after identification and removal of insulting factor causing delirium.

**DIABETIC KETOACIDOSIS**

DKA most frequently occurs in those who already have diabetes, but it may also be the first presentation in someone who has not previously been diagnosed with diabetes. DKA is characterized by the triad of hyperglycemia, anion gap metabolic acidosis, and ketonemia. Metabolic acidosis is often the major finding.

Serum glucose level >250 mg/dL is the characteristic of DKA. In non-ketotic coma, it was found that blood glucose is generally >900 mg/100 mL but in no cases was it found to be <600 mg/100 mL. But, in ketoacidosis, blood glucose level >600 mg/100 mL is found to be uncommon.

There is often a particular underlying problem that leads to a DKA episode. Some of the most common causes are infection, often pneumonia or urinary tract infection; medications; and failure of insulin pump.

DKA is a medical emergency that requires prompt recognition and management. Detailed initial history and careful physical examination should be performed. Possible precipitating events (eg, source of infection, steroid use, myocardial infarction) should be identified. In our case, specific tests such as beta-hydroxybutyrate, plasma osmolality, or blood gases could have been performed.

**STEROID-INDUCED PSYCHOSIS**

As per review of 29 studies of clinical efficacy of corticosteroids in medical illness by Lewis et al., it was found that average incidence of steroid-induced psychiatric illness was 5.7% with maximum incidence of 50%. High incidence of psychotic features (58%) was also found. The review also found that 23% of the patients received <40 mg/day of prednisone as opposed to 77% who received >40 mg/day.

Dosage is the most important risk factor for development of side effects. Side effects with dosage <40 mg/day...
were mild, and side effects with dosage between 40 and 80 mg/day were moderate. Most side effects were found with dosage of >80 mg/day. Most of the patients would develop side effects within 1 week of starting steroids. More than 90% of the patients will develop symptoms within 6 weeks. It was also found that onset, duration, and severity of psychiatric symptoms were not dependent on dosage or any other identifiable factors.\(^\text{23}\)

Women are at higher risk of corticosteroid-induced psychosis. Previous episodes of corticosteroid-induced psychosis, history of psychiatric illness, and age are not associated with corticosteroid-induced psychosis.\(^\text{22}\)

Corticosteroids should be tapered in an acute state. Other medications to treat psychosis could be added. Attempt should be made to decrease corticosteroids to the lowest possible dosage, desirably <40 mg/day. Gradually discontinuing therapy is recommended to prevent adrenal insufficiency. In addition to discontinuing corticosteroids, psychopharmacologic treatment may be indicated, and that depends on severity of psychosis or the underlying disease. Psychopharmacologic treatment is also indicated when corticosteroids cannot be tapered or discontinued. Sufficient placebo-controlled trials are lacking.\(^\text{24}\)

**DISCUSSION**

In our case, infection and steroids may have predisposed the patient to DKA because of her previously undiagnosed diabetes mellitus. Her DKA could have gone undetected and untreated before getting admitted to our hospital because of her psychotic presentation. Steroid psychosis is another possibility. Her HbA1c was elevated, which proves that she had long-stand-

**REFERENCES**