Case Report

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Successful Recovery of a Catatonic Patient with Severe Pneumonia and Respiratory Failure: Modified Electroconvulsive Therapy Following Tracheotomy

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Abstract

Backgroud: Catatonia encompasses a group of severe psychomotor syndromes affecting patients' motor, speech, and complex behaviors. Common features include rigidity, reduced mobility, speech, sputum production, defecation, and eating. Risks associated with catatonia, such as increased muscle tension and reduced swallowing and coughing reflexes, along with risks from therapeutic approaches like prolonged bed rest and sedative drugs, can elevate the risk of aspiration pneumonia, severe pneumonia, and acute respiratory failure. These complications significantly impede catatonia treatment, leading to poor prognosis and jeopardizing patient safety.

Case Description: In this report, we present a case of catatonia complicated by severe pneumonia and respiratory failure, successfully managed with modified electroconvulsive therapy alongside tracheotomy. We hope this case provides valuable insights for psychiatrists encountering similar scenarios, facilitating the development of rational therapeutic strategies for prompt improvement of patient condition.

Keywords

catatonia; sever pneumonia; tracheotomy; modified electroconvulsive therapy

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Introduction

Catatonia, first identified by Karl Kahlbaum in 1874 [1], is a severe neuropsychiatric syndrome characterized by pronounced motor features such as mutism, rigidity, staring, stereotypy, and stupor. Historically considered a subtype of schizophrenia, catatonia is now recognized as a psychomotor syndrome caused by a variety of factors, including physical illnesses (e.g., infections, endocrine, metabolic, and neurological disorders), psychiatric disorders (particularly affective disorders and psychotic disorders), and certain medications [2]. Catatonic states can result in complications related to immobility, dehydration, or inability to feed, such as deep vein thrombosis (DVT), pulmonary embolism, infections, pulmonary aspiration, and secondary pneumonitis and/or pneumonia [3–5]. A high mortality rate of 20% has been reported in hospitalized patients with schizophrenia presenting with catatonia [5–7]. General prevention recommendations, including monitoring, are provided for patients with catatonia [4,5]. However, psychiatrists who do not work in general hospitals may lack the experience to promptly recognize and manage catatonia-related complications such as pneumonia and, in rare cases, refractory respiratory failure.

Both benzodiazepines and modified electroconvulsive therapy (mECT) are effective treatments for catatonia [4–8]. However, the associated risks of benzodiazepines such as oversedation and respiratory depression, and the potential complications of ECT, including aspiration and pneumonia [8–11], can present a dilemma when treating a patient with catatonic, severe pneumonia, and respiratory failure. In this report, we share our experience with a catatonic patient who could not be weaned from mechanical ventilation. The patient was ultimately weaned and recovered from pneumonia following mECT administered with ventilator support and continuous monitoring.

Case Description

On January 4, 2021, a 64-year-old woman with a 30-year history of schizophrenia was admitted to the emergency department of a general hospital due to shortness of breath and fever. Two weeks before admission, she became mute and stuporous, barely eating or drinking by herself, and experienced persistent coughing and poor expectoration after being fed by her husband. Upon admission, her blood gas analysis revealed a PO_2 of 35.7 mmHg, and a chest computered tomography (CT) scan (Fig. 1a) showed inflammatory infiltration across multiple lobes. Endotracheal intubation and tracheotomy were performed, and all psychotropic medications were discontinued. By the 4th day, her respiratory failure and pneumonia had significantly improved, but the endotracheal tube could not be removed due to persistent stiffness and rigidity. She had to be reintubated for ventilation. The patient was then transferred to our hospital for further treatment. Our facility is a tertiary psychiatric center equipped with an intensive care unit and specializes in treating psychiatric patients with complex physical conditions.

The patient had a long history of antipsychotic use, including risperidone, clozapine, sulfanilide, and sulpiride. Recently, she had been maintained on 250 mg of clozapine and 0.5 g of sulpiride per day. Physical examination revealed mild cyanosis of the labial concha, coarse breath sounds in both lungs, and increased muscle tension in the limbs. Laboratory tests showed a white blood cell (WBC) count of 6.9×10^9/L, neutrophil (NE) at 83.4%, C-reactive protein (CRP) at 95.9 mg/L, whole blood lactate at 2.6 mmol/L, partial pressure of carbon dioxide ($PaCO_2$) at 35 mmHg, PO_2 at 56 mmHg, and oxygen saturation at 91%. A chest CT scan performed on January 4, 2021, revealed a small amount of pleural effusion and inflammation in both lungs. Upon admission, she was diagnosed with aspiration pneumonia, type I respiratory failure, schizophrenia, and catatonia.

Following admission, the patient remained under mechanical ventilation and received piperacillin-tazobactam sodium, in addition to supportive care, including the placement of a nasogastric feeding tube. Following the Chinese treatment guidelines for schizophrenia [12], a daily dose of 0.2 g of sulpiride was administered to alleviate catatonia symptoms. By the third day, the patient exhibited limited verbal communication but persisted with rigidity and demonstrated weak voluntary coughing. Despite moist skin, she did not present with fever. A chest CT scan conducted on January 15, 2021 (Fig. 1b), indicated improvement in pneumonia. Subsequently, an extubation trial was initiated, and intermittent ventilation was provided. However, the symptoms of catatonia showed no improvement over the ensuing 5 days.

She remained stiff, with weakened coughing ability, unable to breathe independently or voluntarily clear airway secretions. A chest CT on February 1, 2021 (Fig. 1c) revealed a worsening of pneumonia compared to the scan on January 15, 2021 (Fig. 1b), attributed to persistent symptoms of catatonia, muscle rigidity, impaired swallowing, and a weakened cough reflex, leading to ongoing unnoticed aspiration. Following a multidisciplinary consultation, which addressed considerations of mECT, anesthesia risks, anesthesia planning, and airway management, the patient was assessed for the first time using the Bush-Francis Catatonia Rating Scale (BFCRS), scoring 26, indicative of significant catatonia symptoms. Following the exclusion of neurological and somatic disorders through cranial CT, electroencephalogram, and cerebrospinal fluid examination, mECT was performed three times a week for a total of eight sessions, with tracheotomy in place. The patient's husband was informed of the risks associated with mECT and provided signed consent. To minimize excessive sedation and adverse effects on breathing, swallowing, and sputum clearance, it was recommended to combine mECT with nightly Clozapine (25 mg) and benzhexol (2 mg twice daily).

The initial bedside mECT session was conducted in the intensive care unit on the 15th day post-admission. Nasal enteral feeding was ceased four hours prior to the procedure. Medications administered during the operation included Atropine (0.5 mg), etomidate (13 mg), and choline succinate (40 mg). Oxygen was supplied to the ventilator through the tracheotomy cannula, with bedside electrocardiographic monitoring utilized to track blood pressure, heart rate, and oxygen saturation. The Spectrum 5000Q electroconvulsive therapy device (Thymatron System IV) was employed, utilizing the DGX mode and employing double temporal lateral electrode placement. Parameters were set with a wave width of 1.00 ms, a current of 255 mA, seizure energy at 50%, and a sustained discharge time of 78 seconds. Post-procedure, continuous oxygen supplementation was provided, and timely suctioning was performed.

Following the second and third mECT sessions, the patient began to exhibit gradual improvements, including spontaneous speech with simple responses, complaints of fatigue, spontaneous coughing with expectorated sputum, partial self-clearance of sputum, improved muscle tension allowing for turning over and sitting up, albeit without the ability to independently leave the bed and walk. Subsequent to the fourth and fifth mECT treatments, the patient

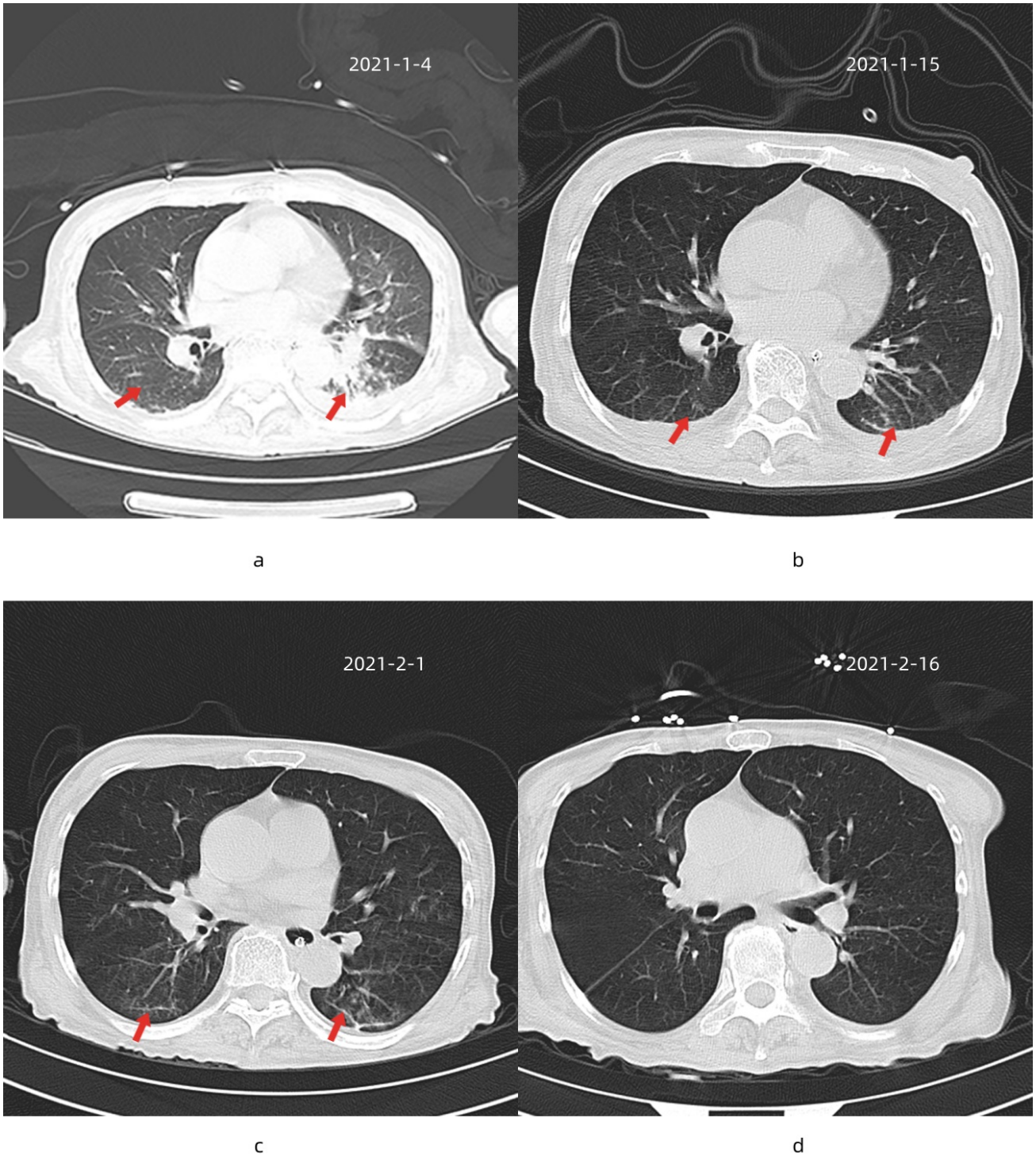

Fig. 1. The evolution process of inflammatory lesions shown in the patient's chest computered tomography (CT) scan. Chest CT images were scanned on January 4, 2021 (a), January 15, 2021 (b), February 1, 2021 (c), and February 16, 2021 (d) respectively, with arrows indicating the areas of inflammation in the lung. (a) was taken when the patient was admitted to the emergency department due to shortness of breath and fever, revealing severe inflammatory infiltration over several lobes. (b) showed that the pneumonia had improved four days after her transfer to our psychiatric hospital. However, the situation shown in (c) deteriorated due to the patient's unimproved symptoms of catatonia, along with persistent aspiration. Finally, inflammation in the lungs was relieved in (d) after eight sessions of modified electroconvulsive therapy (mECT) treatment, and she recovered from catatonia.

demonstrated further progress, with the capacity for simple responses, self-feeding and drinking, spontaneous sputum clearance, enhanced muscle tone, ability to transfer to a wheelchair, and maintenance of the airway for extended periods. Following the sixth to eighth mECT sessions, the patient's condition continued to improve, with the ability to respond to questions, spontaneous coughing and expectoration, significant enhancement in muscle tone, mobility around the bed, consumption of liquids without aspiration, and maintenance of the tracheal cannula for extended durations. Subsequent management involved maintaining sulpiride at 0.1 g per day, gradually increasing clozapine to 200 mg per day, ongoing supportive therapy, intermittent closure of the tracheotomy cannula, and respiratory muscle exercises. A fourth chest CT scan conducted on February 16, 2021 (Fig. 1d), indicated improved infections in the right and left lobes and decreased bilateral pleural effusions. Ultimately, the patient was successfully weaned from mechanical ventilation and transferred to the psychiatric ward on day 43, subsequently being discharged on day 57, with a BFCRS score of 6, signifying significant improvement in catatonia symptoms.

Discussion

Catatonia is a severe and relatively common syndrome characterized by motor and behavioral dysfunction, often leading to significant morbidity and mortality [6]. Catatonic patients are at elevated risk of experiencing severe or life-threatening complications, such as pneumonia, decubitus ulcers, malnutrition, dehydration, contractures, and thrombosis. However, if diagnosed accurately, catatonia is a treatable condition, with reported remission rates ranging from 60% to 70% [8].

Uniform treatment protocols for catatonia have yet to be established. The Guidelines for the Prevention and Treatment of Schizophrenia in China (second edition) [12] recommend ECT or intravenous sulpiride, while benzodiazepines (BDZs) have emerged as the primary first-line treatment, boasting remission rates as high as 70–80% [13]. Typically, treatment initiates with 1 to 2 mg of lorazepam, with doses titrated to 20 to 30 mg/day to achieve complete symptom resolution [14,15]. Close monitoring for sedation and respiratory depression is imperative when escalating the benzodiazepine dosage, a process feasible within a general medical or psychiatric unit of a hospital [4]. mECT should be considered a first-line intervention for patients who do not respond to or have contraindications for BDZs, those necessitating a swift response due to life-threatening conditions, or when features of malignant catatonia are present [7].

Response rates in catatonia patients treated with mECT range from 80% to 100% [16,17]. Despite mECT being administered with intravenous anesthesia and airway management, there remains a possibility of complications such as aspiration and aspiration pneumonia, which require preventive measures [10,11]. Prior to conducting mECT in catatonia patients, anesthesiologists should thoroughly review the patients' medical history, encompassing cardiovascular diseases (such as ischemic heart disease, arrhythmia), pulmonary conditions (including chronic obstructive pulmonary disease, asthma, and pneumonia), as well as their current medications (such as heparin for deep vein thrombosis).

Pneumonia and respiratory failure resulting from muscle rigidity, decreased swallow/cough reflex, excessive salivation, and prolonged bed rest are major contributors to short-term mortality in catatonic patients [3]. In a clinical study conducted in 2018 by a Japanese researcher, which enrolled 140 patients with catatonic schizophrenia and 1579 patients with non-catatonic schizophrenia, the mortality rate in the catatonic group (7.1%) was significantly higher than that in the non-catatonic group (1.6%). Notably, 40% of the deaths in the catatonic group were attributed to pneumonia and respiratory failure. Therefore, the risk of respiratory failure should be carefully considered in catatonic patients, and intensive management, including prompt endotracheal intubation, may be warranted. The restoration of cough reflex, spontaneous coughing, and effective sputum clearance are crucial indicators for successful extubation [18,19].

Nevertheless, patients with chronic catatonia who persist in a state of stupor and rigidity may develop dysphagia, increasing the risk of recurrent, unnoticed aspirations, which can result in repeated failures of extubation. Prolonged placement of a tube or mechanical ventilation can exacerbate these complications [19,20].

Upon admission, the patient presented with at least three symptoms, including stupor, mutism, and rigidity, consistent with the diagnosis of catatonia and meeting the criteria for validated catatonia ($\geq$2 catatonia items as assessed by BFCRS [5]). Given the severe pneumonia, respiratory failure, and ongoing ventilation, we suspected that the overly sedative and negative inotropic effects of benzodiazepines might suppress the cough reflex, exacerbate sputum retention, and induce respiratory depression [18]. Consequently, we opted to manage catatonic schizophrenia with sulpiride, alongside other somatic and supportive therapies. As attempts to extubate and remove the tracheal cannula were met with worsening pneumonia, we recognized that effective treatment of catatonia was essential for improving

pneumonia outcomes. Thus, a course of mECT was proposed. To ensure close monitoring, mECT sessions were conducted at the bedside in the intensive care unit. Following eight sessions of mECT, both the catatonia symptoms and respiratory condition showed improvement, allowing for the continuation of oral antipsychotic therapy.

Indeed, there is limited literature on the treatment of patients with catatonia concurrent with severe pneumonia and respiratory failure, particularly in China. One case report from 1999 documented a 47-year-old male patient with catatonia (malignant syndrome) and severe pneumonia. Despite receiving a combination of lorazepam, clonazepam, amantadine, valproate, dantrolene, and bromocriptine over 32 days, there was no improvement in catatonia symptoms or pneumonia. Subsequently, the patient underwent 11 sessions of ECT treatment with mechanical ventilation, ultimately recovering from respiratory impairment and catatonia [21].

The management of the present case involving catatonia and severe pneumonia under tracheotomy has provided valuable insights. As recently highlighted by Toshinori [22], timely administration of ECT in the intensive care unit, while the patient with catatonia is under systemic control, can effectively alleviate catatonia symptoms and respiratory failure while minimizing the risk of complications associated with prolonged hospitalization. Ultimately, ECT emerges as the first-line treatment for catatonia patients facing life-threatening complications, necessitating careful assessment and monitoring before and during anesthesia administration.

Conclusion

We highlight here, when a psychiatrist encounters patient with schizophrenia and severe pneumonia or respiratory failure, electroconvulsive therapy (ECT) should be administered as early as possible to improve the symptoms of catatonia in order to reducing recurrent aspirition and facilitate the improvement of severe pneumonia.

Availability of Data and Materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Author Contributions

QH, LZ, and FGL conducted clinical observations, diagnoses, and treatments for the patient, and made decisions on MDT and mECT. YJW performed the research. TL provided assistance and advice during the discussion. All authors contributed to editorial changes in the manuscript. All authors read and approved the final manuscript. All authors have participated sufficiently in the work and agreed to be accountable for all aspects of the work.

Ethics Approval and Consent to Participate

This study was approved by the Human Research Ethics Committee at Affiliated Mental Health Center & Hangzhou Seventh People's Hospital (certificate number: 2021094). The entire experimental procedure was explained to the patient or their family, and the study was carried out in compliance with the Declaration of Helsinki.

Acknowledgment

We thank the patient for granting permission to publish this information.

Funding

This research received no external funding.

Conflict of Interest

The authors declare no conflict of interest.

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