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Steroid-induced delirium in a patient with asthma: report of one case

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Systemic steroids are highly effective for patients with moderate-to-severe asthma exacerbations. Steroid-induced psychosis is known to be one of the adverse effects of steroid therapy, although infrequent. However, there is no reliable method of predicting steroid psychosis. We experienced the case of a 40-year-old asthmatic man who had previously taken steroids without any psychological side effect, but became acutely delirious after receiving some doses of steroids, higher than the previous doses, under a condition of emotional stress. The mean dose of prednisolone administered was 82 mg/day (1.37 mg/kg/day) for 10 days but the patient had taken two courses of steroids (0.82 mg/kg/day and 0.5 mg/kg/day, respectively) for asthma exacerbations without any psychiatric episodes during the previous year.At this time, the patient was under a condition of emotional stress related to family reasons. The asthmatic exacerbation of this case may be precipitated from sudden emotional stress and the following treatment with a high dose of steroida should be used cautiously due to the possibility of psychotic side reactions.

Key Words : *Asthma, Steroids, Delirium, Stress*

INTRODUCTION

Systemic corticosteroid is an essential drug for the management of severe persistent symptoms and the control of asthmatic exacerbation that occurs in a patient with otherwise mild asthma. Steroid psychosis is a known, although infrequent, complication of steroid therapy[1-3]. Although there is no reliable method of predicting the psychological reaction to steroid therapy, it has been suggested that there is a relationship between the dosage of steroid and the risk of developing acute psychosis[3]. Some studies have suggested that psychosocial stressors, such as occupational difficulties or marital problems and emotional instability in children or their families, may also predispose to steroid-induced psychological problems[4, 5]. On the other hand, a previous history of psychological tolerance to steroids does not necessarily ensure the safety of subsequent courses[6].

We experienced the case of a 40-year-old asthmatic man who had previously taken steroids without any psychological side effect, but became acutely delirious after receiving some doses of steroids higher than the previous doses, under a condition of emotional stress.

CASE

A 40-year-old man was admitted to our emergency department because of progressively worsening shortness of breath, cough, wheezing and chest tightness. His physical examination revealed an alert and cooperative man. He talked in words. He had diffuse wheezes throughout all lung fields and showed accessory muscle

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use and suprasternal retractions. His forced expiratory flow in one second (FEV_1) and peak expiratory flow were 29% and 32% of predicted values, respectively. His pulse and respiratory rates were 118/min and 28/min, respectively. Arterial blood gas analysis on room air revealed a pH of 7.40, Pco_2 of 42.3 mmHg, Po_2 of 73.4 mmHg and bicarbonate of 25.9 mmol/L. Chest radiographs showed no abnormal findings. He was diagnosed as having a severe exacerbation of asthma. He inhaled short-acting β_2-agonist and received intravenous methylxanthine and methylprednisolone. Salmeterol xinofoate (50 mg twice a day), fluticasone propionate (500 mg twice a day) and nedocromil sodium (4 mg twice a day) were also inhaled. He was given 125 mg of methylprednisolone intravenously every 8 h on the first day and once on the second day. From the third day, 40 mg of oral prednisolone was administered once daily. His asthma symptoms improved markedly and FEV_1 was 72% of predicted value on the ninth day. On day 10, however, he abruptly showed a clouded consciousness, disorientation to time and place and concentration difficulty, which were accompanied with vivid visual hallucination, irritability and insomnia. He claimed to be seeing "his dead father on the ceiling". He stated, "I must go home because my father wants me to go home and take a gift". He had attempted several times to go out to meet his dead father. He ignored the nursing staff, was uncharacteristically hyperactive and fought with another patient. He was referred to our psychiatric department for further evaluation. His psychotic symptoms were regarded as fluctuated fragmented and unsystemized. His Mini-Mental State Examination (MMSE) score was 13, indicative of cognitive impairment. Brain CT scan showed no abnormal findings. His family insisted that he had never had any psychological problem in the past and a review of his outpatient chart revealed no past behavioral, neurological or psychiatric concerns. His serum theophylline concentration ranged from 6.0 to 6.3 mg/mL. A mean dose of prednisolone administered over 10 days was 82 mg/day (1.37 mg/kg/day). His bizarre behavior appeared to be a substance (steroid)-induced delirium, according to the DSM-IV diagnostic criteria for a "substance intoxication delirium". On day 13, the steroid therapy was discontinued and lorazepam and risperidone were administered. However, during the previous year, he had taken two courses of steroids for asthma exacerbations without any psychiatric episodes. At that time, the mean doses of prednisolone were 49 mg/day (0.82 mg/kg/day) and 30 mg/day (0.5 mg/kg/day), respectively.

His family said that he had been missing his father who had passed away 15 years before. One day before his admission, he and his family moved his father's grave to another place which is an old Korean custom to worship ancestors. However, the work had not been completed because of some domestic problems before his admission. After admission, he regretted not being able to finish the work for family reasons.

On day 16, he left our hospital of his own will, although his psychotic symptoms had not yet improved. His family said that he went to his father's new grave. Two days after discharge, his family took him to our emergency department because of his visual hallucination and irritable and aggressive behavior. Eight days after discontinuation of steroids, his delirious symptoms began to improve. The lorazepam and risperidone were tapered and discontinued 8 days and 13 days after the beginning of the improvement, respectively. His psychotic symptoms resolved completely. His MMSE score was normal. He was alert and oriented, demonstrated appropriate affect and had no evidence of psychotic symptoms. His asthma was also controlled with asthma medications, except oral prednisolone and thus he was discharged. He has been reportedly back to his usual level of functioning for at least nine months until now.

DISCUSSION

The most likely explanation for our patient's delirium is his steroid therapy, in view of the time course of events and disappearance of the symptoms after discontinuation of the steroid. It was unlikely that theophylline was a culprit for the delirium because its serum concentration was normal, although theophylline psychosis was reported as the manifestation of theophylline toxicity[7]. Likewise, it was not possible that the inhaled asthma medications induced the delirium because the medications did not produce any adverse effects until discharge. Furthermore, he had no past history of psychiatric disturbances and no evidence for psychotic symptoms for at least nine months since the steroid-induced psychotic episode, indicating that he did not have underlying psychiatric disorders.

Our case showed that steroid-induced psychosis might occur in association with relatively high-dose steroids under a condition of emotional stress, although psychologically tolerable in two previous courses of relatively low-dose steroids. There is a well-documented

relationship between the dosage of prednisone and the risk of developing acute psychosis. The Boston Collaborative Drug Surveillance Program[3] monitored 718 patients who had received prednisone. Only 1.3% of these patients developed psychosis when taking less than 40 mg/day, while 4.6% of those taking 41 to 80 mg/day and 18% of those taking more than 80 mg/day had psychotic reactions. This might in part explain why our patient developed substance-induced delirium after receiving relatively high-dose steroids, but not after receiving relatively low-dose steroids. The time of onset of mental disturbances varies widely from patient to patient. In most cases, psychotic symptoms appeared within a few days to one or two weeks after initiation of drug treatment[2, 8]. In addition to the dose of steroids, the emotional stress is likely to have contributed to the occurrence of the psychotic reaction in our patient[4]. Our patient felt regret for his unfinished work concerning his dead father whom he was missing.

It has been reported that, with discontinuation of steroid therapy, over 90% of patients with steroid-induced psychosis will have a resolution of symptoms within 6 weeks[1]. The risperidone administered to our patient has been shown to be useful in treating patients with steroid-induced psychosis and may possibly its resolution[9].

Although the mechanism of steroid-induced mental disturbances is largely unknown, corticosteroids, including dopamine[10], norepinephrine[11] and serotonin[12] have been shown in animals to affect some neurochemical systems. Also, it appears that corticosteroids may exert direct action on certain areas of the brain[13].

Because there is evidence that stress can play an important role in precipitating exacerbations of asthma[14], some patients with asthma exacerbations may have emotional stress. In this situation, the asthmatic patients might be at greater risk for steroid-induced psychotic reaction. However, systemic steroids are highly effective for patients with moderate-to-severe asthma exacerbations. The use of steroids should not be precluded by the risk of psychological adverse effects. Consideration of this aspect of steroid therapy may lead to more effective management of asthma.

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