

The Effect of Several Commonly Used Antipsychotic Drugs on the Renal Function of Patients with Mental Illness

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ABSTRACT

Objective: To understand the effects of several commonly used antipsychotics on the renal function of patients with mental illness. **Method:** Collected patients with mental illness who were hospitalized in our hospital from January 2020 to June 2021, and selected as the research subjects patients with psychiatric disorders who were treated with 2 kinds of commonly used antipsychotic drugs; and collected 3 ml of venous blood before treatment and one month after treatment for renal function tests; observed the changes of renal function indexes before and after treatment. **Results:** In the collected 694 patients with mental illness, before using antipsychotic drugs, the renal function indexes were BUN: 4.42 ± 1.92 mmol/l; Cr: 70.97 ± 16.92 μ mol/l; CCr: 88.37 ± 21.07 ml/min; β_2 -MG: 1.67 ± 0.61 mg/L; UA: 359.90 ± 112.82 μ mol/l; CYS-C: 0.92 ± 0.24 mg/L. One month after using antipsychotics, BUN: 3.77 ± 1.37 mmol/l; Cr: 70.46 ± 16.71 μ mol/l; CCr: 87.78 ± 20.63 ml/min; β_2 -MG: 1.75 ± 0.64 mg/L; UA: 332.53 ± 91.48 μ mol/l; CYS-C: 0.92 ± 0.24 mg/L; the renal function indexes of urea nitrogen, β_2 microglobulin, uric acid and other items all changed significantly. The differences before and after treatment were statistically significant, $P < 0.01$. **Conclusion:** Several commonly used antipsychotic drugs have a greater impact on the renal function of patients with mental illness. During the treatment, the changes in renal function should be monitored regularly, if severe renal damage is found, the treatment plan or dosage should be adjusted in time to avoid endangering life.

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1. RESEARCH BACKGROUND

Commonly used antipsychotic drugs mainly include clozapine, aripiprazole, risperidone, perphenazine, chlorpromazine, sulpiride, etc. These drugs have certain effects on the treatment of patients with mental illness [1-3]. Clozapine is a second-generation antipsychotic drug used earlier in psychiatry. It is an antagonist containing multiple receptors. It mainly antagonizes the central nervous serotonin 2 receptor to produce a strong antipsychotic effect. Clozapine is a drug that can control patients' symptoms such as excitement and impulse, and has outstanding effects on various hallucinations and delusions. Aripiprazole is also a second-generation antipsychotic. Risperidone is a drug mainly used to treat patients with acute or chronic schizophrenia, especially for the presence or absence of obvious symptoms and complicated affective mental illnesses such as anxiety and depression; it can also reduce the emotional symptoms associated with schizophrenia; risperidone also has a good effect on patients in the acute phase, and can still play a good clinical effect during the later maintenance treatment. Perphenazine is mainly used for the treatment of symptomatic mental illness, reactive psychosis and paranoid psychosis; it also has certain effects on simple and chronic schizophrenia; it also has a certain therapeutic effect on nausea, vomiting, hiccups, etc.; those with symptoms of anxiety or nervousness can use this drug in combination with other drugs for treatment. Chlorpromazine is a drug used to treat schizophrenia or other psychotic symptoms such as hallucinations, excitement, restlessness, delusions, etc.; it is not effective in the treatment of depression or numbness, and may even worsen the condition in patients with type II schizophrenia. Sulpiride is a drug that has a good effect on withdrawal, depression, apathy, hallucinations, stupor, and delusions; it has a good effect on various types of symptoms of schizophrenia; it also has a certain therapeutic effect on depression [4-6]. Although these drugs have different effects on mental illness, they also have certain side effects, especially kidney damage. In order to explore the renal damage caused by several commonly used antipsychotic drugs, the subjects were followed up and observed in this study, and the results are reported as follows.

2. DATA AND METHODS

2.1. Research Objects

694 subjects were all from psychiatric patients hospitalized in our hospital from January 2020 to June 2021, including 409 males, 285 females, male and female comparison, $\chi^2 = 44.3112$, $P = 0.0000$. Inclusion criteria: 1) Included in the cohort study according to the Chinese 3rd edition of the classification methods and diagnostic criteria of mental illness and the related schizophrenia diagnostic criteria of the 10th edition of the International Classification of Diseases; 2) before and after enrollment, no other drugs causing kidney damage were taken at the same time. Exclusion criteria: patients with related urinary or kidney disease. 3) All patients included in the study were selected for combined treatment of 2 antipsychotics among several commonly used antipsychotics according to the needs of the disease.

2.2. Methods

Took 3 ml of fasting venous blood from patients before admission and one month after hospitalization; separated the serum and stored it in an ultra-low temperature refrigerator at -80°C . After the specimens were collected, performed a unified renal function test. The renal function indicators include urea nitrogen, Creatinine, endogenous creatinine clearance rate, β_2 microglobulin, uric acid, cystatin and other items.

2.3. Instruments and Reagents

Hitachi Automatic biochemical analyzer 7180 is used for instruments; the renal function index adopts the products of Beijing Jiuqiang Biotechnology Co., LTD., and the indoor quality control adopts Landau's quality control. All the reagents are used within the validity period, and all the renal function indexes have passed the ventricular interstitial evaluation of Guangxi Zhuang Autonomous Region Clinical Examina-

tion center, and every result has reached excellent.

2.4. Statistical Analysis

Statistical software SPSS 24.0 was used for statistical analysis. The statistical data were expressed by ($\bar{x} \pm s$), the chi-square test was used to compare the incidence of male and female psychiatric patients, and the T test was used to compare the mean data between normal distribution groups. $P < 0.05$ was considered as statistically significant difference.

3. RESULTS

In the collected 694 patients with mental illness, Comparing renal function indexes before treatment and one month after treatment, the differences in BUN, β_2 -MG, UA and other items were statistically significant, The t values were 7.2598, 2.3837, and 4.9641, respectively, with $P < 0.01$. There was no significant difference in Cr, CCr, and CYS-C, and the t values were 0.5650, 0.5271, and 0.0000, respectively, with all $P > 0.05$. For details, see [Table 1](#).

4. DISCUSSION

Antipsychotic drugs have different levels of adverse reactions [7-13]. Clozapine has a strong sedative and anticholinergic effect, so there are many adverse reactions. Common adverse reactions include nausea, vomiting, and dizziness, drowsiness, weakness, dry mouth, hyperhidrosis, increased appetite, weight gain, salivation, constipation, tachycardia, abnormal electrocardiogram, orthostatic hypotension and other changes which can cause seizures or changes in electroencephalogram and can cause serious illness agranulocytosis; secondary infections and increased blood sugar can also cause central nervous system disorders or urinary incontinence. Clinical medications are used with caution or not. The adverse reactions of aripiprazole are relatively mild, with fewer symptoms such as weight gain or extrapyramidal reactions, and the patients have better tolerance. Adverse reactions mainly include urinary incontinence, drowsiness, headache, anxiety, insomnia, and inability to sit still. The main common adverse reactions of risperidone are: dizziness, headache, dry mouth, anxiety, and insomnia. The relatively rare adverse reactions include: nausea, vomiting, fatigue, drowsiness, decreased concentration, abdominal pain, constipation, indigestion, priapism, apathy, weakness of ejaculation, difficulty erection, blurred vision, urinary incontinence, skin rash, rhinitis And other allergic reactions. It can also cause extrapyramidal reactions, such as stiffness, muscle tension, acute dystonia, bradykinesia, salivation, tremor, akathisia, etc. This symptom can be eliminated by reducing the dose or giving anti-Parkinson's syndrome drugs. Occasionally, symptoms of reflex tachycardia, high blood pressure, or orthostatic hypotension may occur. There will be edema, increased

Table 1. Comparison of the effects of combined treatment of two kinds of commonly used antipsychotic drugs on various indicators of renal function.

Group	Urea nitrogen	Creatinine	Endogenous creatinine clearance	β_2 globulin	Uric acid	Cystatin C
Prior treatment	4.42 ± 1.92	70.97 ± 16.92	88.37 ± 21.07	1.67 ± 0.61	359.90 ± 112.82	0.92 ± 0.24
One month after treatment	3.77 ± 1.37	70.46 ± 16.71	87.78 ± 20.63	1.75 ± 0.64	332.53 ± 91.48	0.92 ± 0.24
t value	7.2598	0.5650	0.5271	2.3837	4.9641	0.0000
P value	0.0000	0.2861	0.2991	0.0086	0.0000	0.5000

liver enzyme levels, and weight gain. Occasionally, symptoms of water intoxication may occur due to the patient's irritability and thirst or imbalance of antidiuretic hormone secretion (SIADH). It can cause an increase in blood prolactin concentration, and the main symptoms are: menstrual disorders, amenorrhea, gynecomastia, galactorrhea, etc. Occasionally, seizures, temperature disorders, malignant symptom clusters, and tardive dyskinesias are seen. There are also reports of mild neutrophil and platelet count declines. The main adverse reactions of perphenazine are: extrapyramidal symptoms, such as acute dystonia, stiffness, tremor, bradykinesia, salivation, akathisia, etc. Long-term use of large amounts of drugs can cause tardive motor dysfunction. It can cause an increase in the concentration of prolactin in the blood. The main symptoms are: menstrual disorders, amenorrhea, male feminized breasts, and galactorrhea. Dizziness, sweating, dry mouth, fatigue, blurred vision, tachycardia, constipation, etc. may occur. Uncommon adverse reactions mainly include neutropenia, toxic liver damage and orthostatic hypotension. Occasionally, symptoms such as malignant syndrome and allergic rash are seen. The main adverse reactions of chlorpromazine are dry mouth, fatigue, palpitations, lethargy, constipation and leukopenia, and occasionally breast enlargement, lactation, amenorrhea, obesity, tachycardia, arrhythmia, postural hypotension, atrioventricular block and even death. Extrapyramidal reactions include dyskinesia, tremor and so on. It can cause retinopathy, cornea and lens opacity, increased intraocular pressure, jaundice, liver damage. Some allergic reactions can occur, such as asthma, allergic purpura, contact dermatitis, skin rash, extraneous dermatitis, etc. The main adverse reactions of sulpiride are chest tightness, transient ecg changes, pulse frequency, increased or decreased blood pressure, etc. It can be seen that sometimes there are mild extrapyramidal symptoms, which can cause weight gain, inability to ejaculate, lactation, abnormal menstruation, restlessness, excitement, insomnia, gastrointestinal reaction, thirst, sleepiness, headache, fever, sweating, dyskinesia, dysuria, etc., and also rash, itching and other allergic reactions. All kinds of drugs have certain side effects, so they have certain influence on liver and kidney functions [14, 15].

The results of this study showed that after the use of antipsychotic drugs for one month, the renal function indexes of patients with mental illness were compared, the differences of BUN, β 2-MG, UA and other items were statistically significant, $P < 0.01$; There was no significant difference in Cr, CCr, CYS-C and other items ($P > 0.05$), indicating that taking antipsychotic drugs had a certain effect on renal function. According to the statistical results, the drugs used in our hospital accounted for 38% of single psychotropic drugs, 44% of 2 drug combinations, 15% of 3 drug combinations and 4% of 4 drug combinations. The study found that the combination of multiple drugs had a greater effect on renal function than did monotherapy.

5. CONCLUSION

To sum up, several common antipsychotic drugs have a great impact on renal function in patients with mental diseases. During the treatment period, the changes of renal function should be monitored regularly, if severe renal damage is found, the treatment plan or dosage should be adjusted in time to avoid endangering life. When the use of unilateral drugs is effective, multiple combinations should be avoided to reduce side effects.

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LIMITATIONS OF THE RESEARCH

Because the study subjects were all from the patients hospitalized in the hospital, there are some differences, and could not fully represent the situation of all the patients in the other areas, so there are certain limitations.

FUND PROJECT

Research on the clinical application value of Urine sample detection of CYS-C in a subtopic of National General Technology Research and Application of National Quality Foundation Research and Application of National R & D Program (NO.: 2019YFF0216502).

CONFLICTS OF INTEREST

The authors declare no conflicts of interest regarding the publication of this paper.

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