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The Effect of Chlorpromazine on Body Temperature; Three Intensive Care Unit Cases and a Single Outcome

Bulent Devrim Akcay[1], Omur Ilban[2]

ABSTRACT:

The effect of chlorpromazine on body temperature; three intensive care unit cases and a single outcome

Antipsychotic drugs have the potential to affect thermoregulation. Hypothermia is a side effect that can be seen when using antipsychotic drugs. In this case report, we examined the body temperature changing effects of chlorpromazine as an antipsychotic drug that is administered for sedation purposes in patients exhibiting agitated and excited behaviors in intensive care units.

Keywords: chlorpromazine, body temperature, intensive care unit

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[1]Ministry of Health, Gulhane Training and Research Hospital, Department of Psychiatry, Istanbul - Turkey
[2]Konya Selcuk University, Department of Anesthesiology and Reanimation, Konya - Turkey

Corresponding Author:
Bulent Devrim Akcay
Ministry of Health, Gulhane Training and Research Hospital, Department of Psychiatry, Istanbul - Turkey

E-mail address:
drbulentakcay@yahoo.com

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INTRODUCTION

Antipsychotic drugs have the potential to affect thermoregulation. Hypothermia is a side effect that can be seen when using antipsychotic drugs. Before the antipsychotic actions of antipsychotic drugs were discovered, their body temperature lowering effect had been already known (1). Some antipsychotic drugs such as chlorpromazine, haloperidol, and reserpine have been shown to cause moderate hypothermia in mice and rats (2,3). This side effect has been rarely described for humans and the number of case reports published on this subject is limited4. The mechanism of antipsychotic drugs affecting the thermoregulatory process in humans has not been fully understood. The hypothermic effects of antipsychotics are seen less than their hyperthermic effects (e.g., neuroleptic malignant syndrome). Despite their different mechanisms of action, both typical and atypical antipsychotics have been reported to cause hypothermia (4-6). Antipsychotic drugs are widely used for various indications in patients treated in intensive care units. Physicians working in intensive care units often prefer antipsychotic drugs to sedate patients who show agitations and excitations. With the idea to help physicians working in intensive care units select antipsychotic drugs, 3 patients who were treated in the Intensive Care Unit of Konya Selçuk University's Department of Anesthesiology and Reanimation , who were administered chlorpromazine for the indications of agitation and excitation and who had not had any prior history of psychiatric diagnosis or treatment were assessed retrospectively and discussed together with their laboratory findings also by referring to the literature.

Table 1: Body temperature monitoring of the patients

	During Procedure	1st hour	2nd hour	4th hour	6th hour	8th hour	10th hour	12th hour
PATIENT-1	38.9 °C	38 °C	37.4 °C	37 °C	36.7 °C	36.5 °C	36.7 °C	35.9 °C
PATIENT-2	39 °C	38.5 °C	38 °C	37.5 °C	37 °C	37 °C	36.8 °C	36.1 °C
PATIENT-3	39.2 °C	39 °C	38.5 °C	37.8 °C	37.5 °C	37.5 °C	37.4 °C	36 °C

CASE 1

A 62-year-old female patient who fractured her hip upon falling off the stairs of the building in which she lived. She was urgently operated at the orthopedics clinic; she started exhibiting restless and tense behaviors on the fourth day of her stay in the intensive care unit after the operation and continued her agitations and excitations. She wanted to refuse the procedures intended for her and her blood pressure went up due to psychosomatic agitation. Her blood pressure was regulated with increased doses of antihypertensive drugs. The patient tried to get out of her bed and showed aggressive behaviors. She calmed down approximately 30 minutes after receiving 25 mg of chlorpromazine through intravenous infusion for sedation purposes and fell asleep after an hour. Her tympanic membrane temperature was recorded as 38.9 °C as measured by a digital thermometer when she was administered 25 mg of chlorpromazine. Further measurements were performed at the 1st, 2nd, 4th, 6th, 8th, 10th and 12th hours following the intervention. Her body temperature was found to drop to 35.9 oC at the 12th hour. The body temperature monitoring of the 3 patients is shown in Table 1. After staying 5 days in the intensive care unit, the patient was taken to the inpatient clinic at postoperative day 6.

CASE 2

A 36-year-old male patient who was operated urgently after having been injured by an object with a sharp point in his abdominal region at his workplace. After the operation performed at the general surgery clinic, he exhibited agitated behaviors on his third day in the intensive care unit and started shouting and refused the treatment. He tried to get out of his bed and he was administered 25 mg of chlorpromazine by way of intravenous infusion to bring his agitated behavior pathologies under control and to achieve sedation. His tympanic membrane temperature was recorded as 39 °C as measured by a digital thermometer during the procedure. Further measurements were performed at the 1st, 2nd, 4th, 6th, 8th, 10th and 12th hours following the intervention. His body temperature was found to drop to 36.1 °C at the 12th hour (Table 1). After staying 4 days in the intensive care unit, the patient was taken to the inpatient clinic at postoperative day 5.

CASE 3

A 39-year-old female patient who was urgently operated due to segmental fractures in the acetabulum of her right hip, left humerus and right clavicula as a result of a traffic accident while in a vehicle. The patient was operated urgently in the orthopedics clinic and after the operation she was taken to the intensive care unit for further monitoring. She started exhibiting anxious behaviors such as tension, nervousness, restlessness and insomnia and showed aggression to the treatment team on her sixth day in intensive care. She was administered 25 mg of chlorpromazine by way of intravenous infusion to bring her agitation and excitation under control and to achieve sedation. Her tympanic membrane temperature was recorded as 39.2 °C as measured by a digital thermometer during the procedure. Further measurements were performed at the 1st, 2nd, 4th, 6th, 8th, 10th and 12th hours following the intervention. Her body temperature was found to drop to 36 °C at the 12th hour (Table 1). After staying 7 days in the intensive care unit, the patient was taken to the inpatient clinic at postoperative day 8.

DISCUSSION

Being a propyl amino derivative of phenothiazine, chlorpromazine is a neuroleptic with vagolytic, sedative, and antiemetic properties. It is used widely not only in the field of neuropsychiatry but also in the fields of anesthesia and surgery (7). The most common causes of hypothermia in intensive care units include advanced age, exposure to

cold, drugs such as phenothiazine and barbiturates, endocrine dysfunctions, central nervous system diseases, spinal cord incisions, severe organ failures, and sepsis (8). None of these frequently seen conditions occurred in any of our 3 patients. They were not given any antipyretic or antibiotic drugs within the last 24 hours, no abnormal results were found in their laboratory values before the chlorpromazine administration and there were no signs of infections. Being an undesirable and unpredictable serious side effect of antipsychotic drug use, hypothermia may lead to inpatient hospitalization in an intensive care unit or even to death. Case reports on chlorpromazine are rare and hypothermia is even less stressed taking its place in the scientific literature as an undesirable drug side effect. A large majority of the case reports presented in previous years involve patients with prior psychiatric diseases such as schizophrenia and a smaller number of them involve older patients who were started an antipsychotic therapy due to dementia or delirium (6). None of our patients had any prior psychiatric diseases. As an additional medical condition, only patient 1 was using antihypertensive therapy due to essential hypertension. No significant changes were found in the other vital signs of the patients (rate of respiration, arterial blood pressure, and pulse rate).

Human body needs various chemical reactions that occur at a certain heat level for survival. In order for these chemical reactions to occur and the mechanical body movements to continue, the body temperature must be at a certain level (9). The center for thermoregulation is the hypothalamus in mammals. Many autonomous, somatic and endocrine mechanisms are responsible for heat regulation through central and/ or peripheral means (10). The complications of hypothermia are quite serious. Blood pressure and pulse amplitude drop, myocardial contractility and irritability increase, and conduction disturbances, atrial fibrillation and ventricular extrasystoles occur. Below 28 ºC, death may occur due to asystole or ventricular fibrillation (11). No cardiac complications were encountered in any of our 3 patients. Due to the previously known hypertension in our first patient, her blood pressure was regulated by increasing the doses of her antihypertensive drugs.

During general anesthesia, the anesthetic agents inhibit central thermoregulation by affecting the hypothalamic functions. For this reason, the body cannot compensate hypothermia (12). The major perioperative thermal anomaly is undesired hypothermia. This unwanted effect occurs due to cold, exposure to environmental factors, and impairment of the thermoregulatory mechanism (13) and disappears with the elimination of entire general anesthetic agent from the body in the first 24 hours (14). All 3 of our patients were operated under general anesthesia. The postoperative chlorpromazine procedure was administered at day 4 in patient 1, at day 3 in patient 2, and at day 6 in patient 3. Since the effect of general anesthesia had already disappeared in the patients on the days when chlorpromazine was administered, the low body temperature occurring was not associated with the general anesthesia.

Body temperature varies in different parts of the body. The nasopharyngeal and tympanic membrane temperature values give the hypothalamic temperature of the brain (15). Since the body temperatures of our patients had been calibrated and measured by a digital tympanic membrane thermometer, a temperature value close to the thermoregulatory center temperature was obtained.

Based on the reports related to the use of antipsychotic drugs, no pharmacological subgroup was found associated with increased risk of hypothermia. The hypothermia that occurs with the use of antipsychotic drugs was also not found associated with a specific age group. The ages reported range between 0 and 90 years. The mean age of our patients was 45.6. In most cases, hypothermia is detected shortly after starting an antipsychotic drug or increasing its dose. Similarly, the body temperatures of our patients dropped noticeably within the first 12 hours after administering them a single dose in the form of intravenous infusion. The measurements were performed using a digital tympanic thermometer. The ambient temperature was 22-24 ºC and the relative humidity 40% in the intensive care unit during the measurements.

In conclusion, the single result that came about in all these 3 cases involving administration of chlorpromazine in an intensive care unit was the fact that chlorpromazine also lowers the body temperature in patients with no psychiatric disorders. Our results are important in that they show the clinical significance of hypothermia as a potential life-threatening complication after using antipsychotics and the importance of careful monitoring of body temperature after administrations of antipsychotics in patients treated in intensive care units. Although our results may serve as a guideline for the physicians working in

intensive care units in their future selection of antipsychotics, there is a need for larger scale cohort-type studies to reveal and analyze the effects of antipsychotics on thermoregulation.

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