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Case Report

Successful use of the two-tube approach for the treatment of phenobarbital poisoning without hemodialysis



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ABSTRACT

Half-life of the antipsychotic vegetamin is very long, partially due to the presence of phenobarbital, and mortality due to phenobarbital poisoning is high. Here, we present the case of a 22-year-old female admitted to the emergency department with disturbed consciousness due to vegetamin overdose. Her blood phenobarbital level was elevated to 123 µg/ml. Phenobarbital undergoes enterohepatic circulation, and its retention in the intestine causes its blood levels to remain sustained. The utility of hemodialysis for drug poisoning has been previously reported; however, its efficiency is not yet established and its efficacy is low for drugs with long half-lives such as phenobarbital. Therefore, we performed a two-tube approach to adsorb phenobarbital in the intestines with activated charcoal delivered via a gastric tube and to remove the phenobarbital-adsorbed activated charcoal using whole bowel irrigation via an ileus tube 2 h later. The patient successfully eliminated the charcoal via stool, the blood phenobarbital level decreased drastically without hemodialysis, and the clinical course improved. We propose that this two-tube approach is suitable for treatment of poisoning with drugs that undergo enterohepatic circulation and have long half-lives.

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Phenobarbital, a barbituric antiepileptic drug and central nervous system depressant [1], reportedly has a very long half-life of approximately five days [2]. Thus, phenobarbital poisoning can lead to prolonged loss of consciousness that is potentially fatal. In such cases, hemodialysis is reportedly beneficial occasionally; however, no definitive treatment has yet been established for phenobarbital poisoning. Because phenobarbital undergoes enterohepatic circulation, its retention in the intestines will lead to a rebound increase in its serum concentration after an initial reduction with hemodialysis, rendering treatment challenging. In this case report, we present the case of a patient with phenobarbital poisoning who was treated successfully without hemodialysis. The report illustrates that adsorption of phenobarbital on activated charcoal in the intestine is a suitable approach to treat phenobarbital poisoning.

A 22-year-old female was admitted to our emergency department with disturbed consciousness following vegetamin overdose, which is an antipsychotic agent including phenobarbital, chlorpromazine, and promethazine. The patient was suspected to have ingested 3.5 g phenobarbital orally with suicidal intent. At presentation, her Glasgow Coma Scale score was three, and she was hemodynamically

stable. She was intubated and transferred to the intensive care unit. Her blood phenobarbital level was 123 µg/ml. First, we initiated conventional treatment with gastric tube insertion to deliver activated charcoal; however, 24 h after this procedure, her blood phenobarbital level elevated to 140 µg/ml, and she had not defecated. Therefore, based on the pharmacological characteristics of phenobarbital, including its long half-life and the fact that it undergoes enterohepatic circulation, we aimed to adsorb phenobarbital on activated charcoal, and thereby eliminate it out of the body. A gastric tube was placed in the stomach, and an ileus tube was placed in her ileum (Fig. 1). Activated charcoal was infused from the gastric tube, and whole bowel irrigation was performed via the ileus tube 2 h later. The procedure was repeated once daily for four days, and a large amount of charcoal was eliminated via stool. The blood phenobarbital levels drastically reduced without rebound increase (Fig. 2). The patient was extubated on the fifth day after admission and discharged on the tenth day.

The current case highlights two complementary clinical approaches that should be considered in phenobarbital overdose. The conventional treatment using activated charcoal was effective in eliminating phenobarbital after its poisoning without hemodialysis, whereas whole bowel irrigation via the ileus tube successfully promoted the elimination of the phenobarbital-adsorbed activated charcoal.

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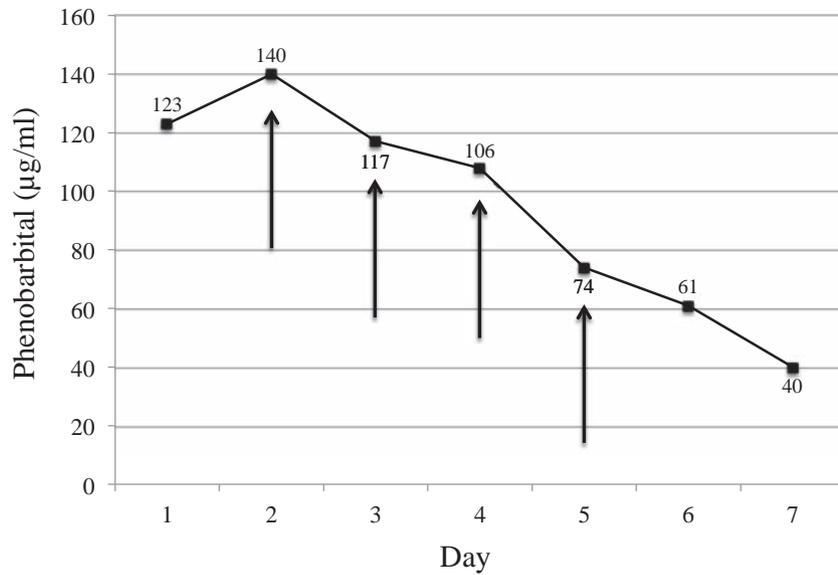


Fig. 1. The graph shows phenobarbital level. Our method performed at points indicated by arrows.

Currently, activated charcoal is the only effective agent to treat phenobarbital poisoning without hemodialysis. Hemodialysis is commonly used for poisoning; however, it is not very effective. Hoyland et al reported a case of successful treatment of phenobarbital poisoning with hemodialysis in a patient with a blood phenobarbital level of 140 µg/ml; hemodialysis was used because activated charcoal alone was not fully effective [3]. However the decrease in the blood phenobarbital level without hemodialysis in the current case (from 140 to 61 µg/ml in five days) was faster than that in the case reported by Hoyland et al, which used hemodialysis and achieved a reduction from 140 to 55 µg/ml in six days. Therefore, we considered that the effect of hemodialysis is low.

Additionally, whole bowel irrigation via an ileus tube was effective in removing the phenobarbital-adsorbed activated charcoal in the current case. The long half-life of phenobarbital and the fact that it undergoes enterohepatic circulation hinder efficient reduction in its

blood levels despite adsorption using activated charcoal unless the adsorbed drug is excreted outside the body. Therefore, whole bowel irrigation via the ileus tube was used to eliminate activated charcoal. Given that the tip of the ileus tube was in the jejunum beyond the Treitz ligament, there was no gastric backflow of the drug despite the large volume used for bowel irrigation. This approach was successful; the patient had large-volume charcoal-mixed stools without paralytic ileus and a steady reduction in the blood phenobarbital level was also observed.

The approach presented here utilizing two complementary methods is suitable for treatment of poisoning with compounds having long half-lives and those undergoing enterohepatic circulation, such as phenobarbital, colchicine, and zonisamide. Considering the pharmacological action of such drugs, our approach is more efficient than hemodialysis. Even after these drugs are removed by hemodialysis, their blood levels exhibit a rebound increase due to enterohepatic circulation, leading to only a mild reduction in their blood levels. In the approach presented herein, activated charcoal in the intestines adsorbs the drug, which is then eliminated from the body, similar to dialysis in the intestines. Moreover, this approach is cost-effective and less invasive compared to the placement of a catheter for dialysis in the vena cava.

We presented the case of a patient with phenobarbital poisoning who was successfully treated with the insertion of a gastric tube to deliver activated charcoal and the insertion of an ileus tube for whole bowel irrigation 2 h later to remove the phenobarbital-adsorbed activated charcoal. We believe that this approach is effective for the treatment of poisoning with drugs that have a long half-life and undergo enterohepatic circulation.

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Declaration of Competing Interest

None.

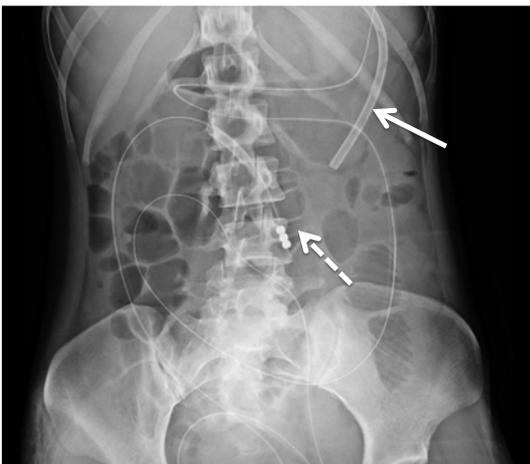


Fig. 2. X-ray showed the two-tubes approach, the gastric tube by arrow and the ileus tube by dotted arrow.

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