Severe Methylphenidate Intoxication-Charcoal Hemoperfusion as an Aid in Treating the Patient

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Case Report

A 47-year-old woman was admitted to a local hospital 2 hours after the ingestion of 3000 mg methylphenidate, 360 mg duloxetine, 200 mg chlorprothixen, 400 mg quetiapin, 15 mg zopiclone, 60 mg mirtazapine and approximately 1 liter of strong alcohol (40% v/v). Her intention was suicidal. All the medication was her own prescription drugs except methylphenidate, which was prescribed to her 13-year-old son who was diagnosed with Attention Deficit and Hyperkinetic Disorder (ADHD). The patient was therefore transferred to the nearest large facility hospital and the severity of the condition demanded advanced ICU support. The patient developed circulatory shock (blood pressure 60/30 mmHg, pH 7.3, 3 (normal range 3, 5-4, 6). Gastrointestinal aspiration was performed and 50 grams of Activated Charcoal (AC) instilled. The patient was then discharged to a general ward for further psychiatric observation the following day.

Due to severe circulatory instability and troubling CGC level the patient was transferred to the ICU for further treatment. Biochemical date revealed increasing plasma lactate levels from 3, 3 to 4, 7 mmol/l (normal range 0, 5-2, 5 mmol/l) and sustained hypokalemia2, 7-3, 3 (normal range 3, 5-4, 6). Gastrointestinal aspiration was performed and 50 grams of Activated Charcoal (AC) instilled. The patient developed circulatory shock (blood pressure 60/30 mmHg, pulse 90) and was in need of vasopressors (Epinephrine 20-25 microg/kg/min and Dopamine 3-6 microg/kg/min). Intravenous lipid emulsion (Intralipid 20%, Fresenius Kabi, Uppsala, Sweden) was dosed as 100 ml/kg/min and Dopamine 3-6 microg/kg/min). Intravenous lipid emulsion, which was prescribed to her 13-year-old son who was diagnosed with Attention Deficit and Hyperkinetic Disorder (ADHD), was fully awake and circulatory stable (Figure 1). The patient was then discharged to a general ward for further psychiatric observation the following day.

The use of methylphenidate for various psychiatric conditions is rapidly increasing. In Denmark a more than six-fold increase in sold daily doses was observed from 2005 to 2010 (Figure 2) [4]. The Danish Medicines Agency presents data, which shows that the drug is mainly prescribed to youngsters, aged 10-14 with a second prescription top in adulthood in the range 30-39 years of age. Primary diagnosis for the users of methylphenidate is the ADHD patients [5].

Records at the Danish Poisons Information Center reveal a
A steep increase in inquiries regarding accidental and non-accidental consumption of large doses of methylphenidate, an increase that reflects the increase in sold daily doses [6]. The most common symptoms following methylphenidate overdose are agitation, tachycardia and lethargy. Severe toxicity from high dose intake includes cardiotoxicity, hyperthermia, mydriasis and neurologic effect ranging from agitation and confusion to CNS depression, seizures and coma [7].

The rationale of using CHP in preference of standard hemodialysis is further enhancement in the elimination of the absorbed toxic agents [8,9]. This in coherence with physiochemical properties of methylphenidate with a low protein binding 10-33% and a volume of distribution ranging from 1,8 to 2,65 l/kg depending on the isomer in question supports the use of CHP as the choice for extracorporeal removal technique used to increase the clearance of this xenobiotic [7].

Standard treatment with oral AC might be insufficient when large quantities of tablets are ingested. The laboratory test shows a small incline in methylphenidate concentration after CHP is commenced which can be explained by formation of a gastrointestinal pharmacobezoar leaking the active pharmaceutical agent to the blood. To our knowledge there are no previous cases or studies of full recovery from acute deep toxic coma to normal mental status after 4 hours of CHP, and no case reports on CHP use in methylphenidate intoxication.

The lack of effect from the intravenous lipid emulsion might have been caused by a combination of an insufficient dose for clinical effect and the only slightly lipophilic physicochemical properties of methylphenidate. The predicted log P value for methylphenidate is 1.47 but vary depending of methods of determination [10]. Though there are no standard methods available in the literature for intravenous lipid emulsion therapy, a higher dose than the patient received in the present case for cardiac resuscitation is suggested [11].

When treating methylphenidate overdose, practitioners should remain alert when the standard AC treatment is insufficient and think of the possibility of CHP assistance.

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