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CASE REPORT

Total pancreatic necrosis after organophosphate intoxication

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Abstract **Cases of acute pancreatitis induced by organophosphate intoxication are encountered occasionally in clinics, but very few of them develop into severe pancreas necrosis and irreversible pancreatic function impairment. Here, we report a 47-year-old female organophosphate poisoning case after ingestion of massive insecticides; she was considered to have total necrosis and function failure of the pancreas via serum amylase test, glucose level test, and CT imaging. The patient exhibited no relief under the regular medicine treatment, which included sandostatin, antibiotics, intravenous atropine, and pralidoxime methiodide. She received percutaneous catheterization and drainage of pancreatic zone to expel hazardous necrotic waste, also by which the pathogenic evidence was obtained and the antibiotics were adjusted subsequently. The patient recovered gradually, was discharged after 2 weeks, and was prescribed with oral pancreatin capsules before meals and hypodermic insulin at meals and bedtime to compensate the impaired pancreatic function.**

Keywords organophosphate intoxication; severe acute pancreatitis; pancreas necrosis; percutaneous catheterization; sandostatin; insulin

Introduction

Cases of organophosphate intoxication (OI) are encountered commonly in clinics for the massive use of organophosphate insecticides to promote agricultural yields. It manifests various poisoning symptoms, such as abdominal pain, diarrhea, vomiting, sweating, hypersalivation, amyostasia, muscle spasm, even myasthenia, and paralysis, which are all attributed to the strong cholinesterase inhibition effect of the organophosphate [1]. Acute pancreatitis induced by OI has been reported sporadically, but very few of them belong to severe necrotizing types [2–4] (Table 1). Here, we report a 47-year-old female who developed the necrosis of the whole pancreas after OI, requiring the expulsion of the necrotic pancreas tissue by catheterized drainage.

Presentation of case

A 47-year-old female with severe abdominal pain, vomiting, and drooping eyelids was admitted to the hospital after ingestion of approximately 350 mL of organophosphate insecticides (O,O-dimethyl-O-2,2-dichlorovinylphosphate). The patient was unconscious and oliguria on admission, with the following vital signs: T, 40 °C; HR, 155/min; R, 29/min; BP, 148/70 mmHg; and SpO_2, 88%. Other positive findings during the physical examinations included symmetric but light-insensitive pupils with 2 mm diameters, bilateral pulmonary moist rales, board-like rigidity of the abdomen with over-active bowel sound, increased muscle tension, and spotted lower limbs. Her cholinesterase (ChE) level was 1.8 kU/L on arrival and reached a minimum of 1.0 kU/L after 2 days, which reinforced the diagnosis of OI (Fig. 1). Results of some key laboratory tests upon admission are listed in Table 2. Apart from the low ChE level, the remarkably elevated pancreatic enzyme and blood glucose level drew attention (Fig. 1, Table 2). CT scanning showed an inhomogeneous swollen pancreas with coarse border and notable peripancreatic effusions (Fig. 2). Therefore, the diagnosis of secondary severe acute pancreatitis (SAP) was established. The treatment was initiated with mechanical ventilation, gastric lavage, and catharsis. The status of oliguria and high level of blood creatinine symbolized acute renal function failure, which necessitated continuous renal replacement therapy. Intravenous pumping of atropine and pralidoxime methiodide (PAM) was adopted

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Table 1 Documented cases of severe acute pancreatitis induced by organophosphate poisoning

Authors	Age/sex	Necrosis	Treatment	Hospital stay	Outcome
Panieri *et al*. [3] 1997	39/M	Severe	Medicine, surgery (abscess evacuation and hemostasis)	48 days	Deceased
Panieri *et al*. [3] 1997	26/M	Severe	Medicine, surgery (necrosectomy)	75 days	Cured, pancreatic insufficiency
Hamaguchi *et al*. [6] 2006	69/F	Mild	Medicine	42 days	Cured, formation of pseudocyst
Roeyen*et al*. [4] 2008	Young/M	Medium	Medicine, distal pancreatectomy	–	Cured, pancreatic insufficiency
Yoshida *et al*. [1] 2015	62/F	No	Medicine, hemodiafiltration	32 days	Cured

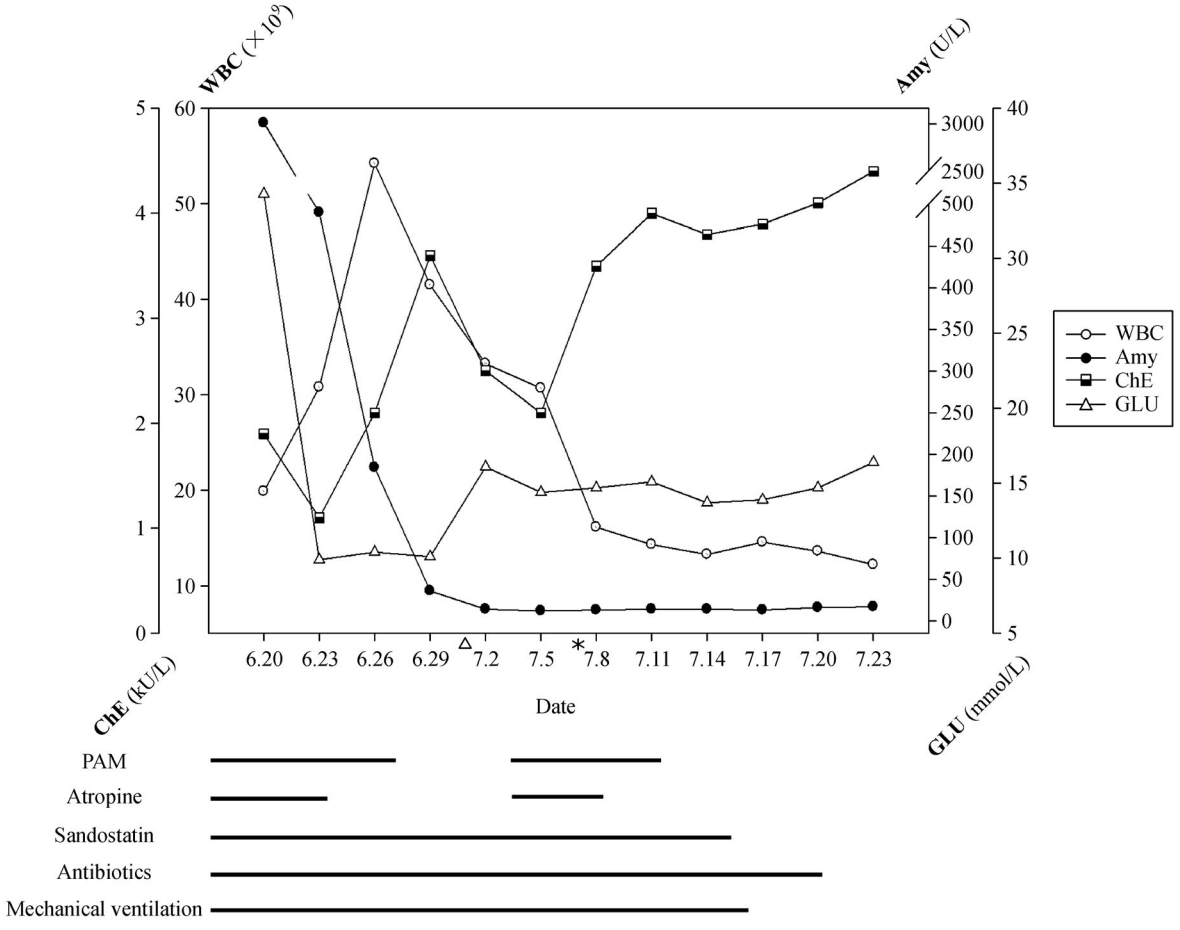

Fig. 1 Plot of blood WBC, amylase, cholinesterase, glucose, and major medications by time. Δ, Cease of intravenous atropine and PAM, and the launch of enteral nutrition (June 30th – July 1st); *, CT-guided percutaneous catheterization and drainage of pancreatic zone (July 7th).

immediately for decontamination and cholinesterase reactivation. For the treatment of SAP, the patient was continuously infused with sandostatin and omeprazole, while being supported with total parenteral nutrition.

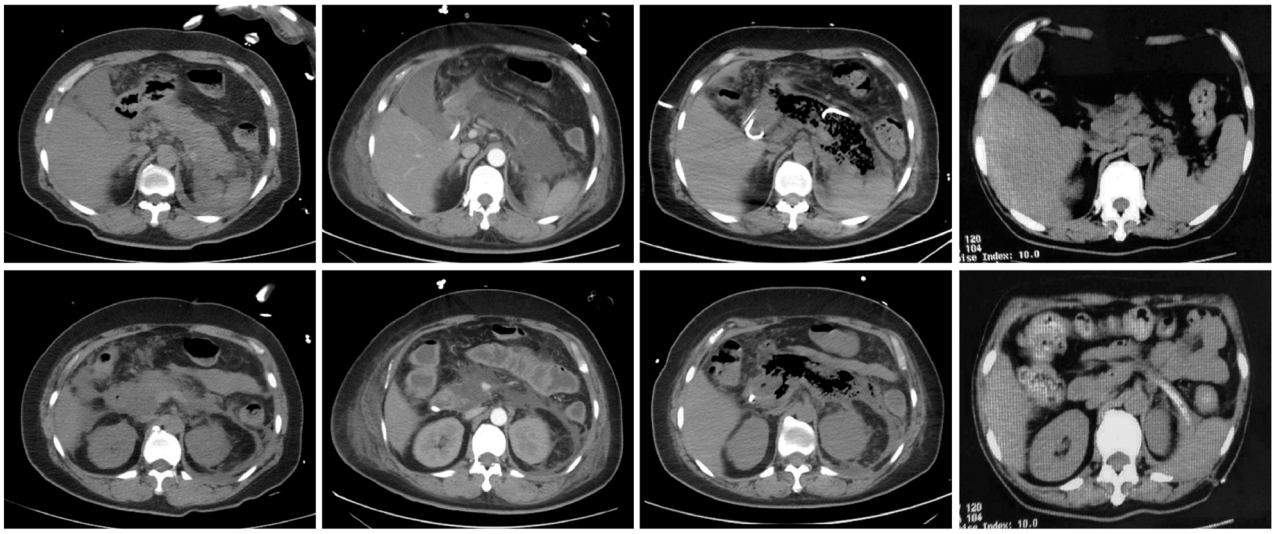

Fig. 2 Abdominal CT images of the patients.

Table 2 Laboratory tests results on admission

Blood routine		Coagulation	
WBC	19.86 × 10^9/L	PT	17.0 s
Neutrophil, %	84.3%	APTT	37.5 s
Hb	138 g/L	Fbg	3.38 g/L
Hct	43.9%	d-dimer	14.92 mg/L
PLT	286 × 10^9/L	TT	26.1 s
Biochemistry		**Arterial blood gas**	
ALT	39 U/L	pH	7.32
DB/TB	4.2/15.2 μmol/L	PaO_2	78.1 mmHg
Cr	500 μmol/L	$PaCO_2$	38.9 mmHg
Urea	29.01 mmol/L	SaO_2	88.9%
GLU	34.3 mmol/L	SvO_2	74.2%
cTnI	2.050 μg/L	cLac	3.8 mmol/L
Amy	2069 U/L	K^+	5.1 mmol/L
Lip	15996 U/L	Na^+	128 mmol/L
ChE	1.8 kU/L	BE	−5.2 mmol/L

Antibiotics therapy was empirical at first, with tienam and vancomycin, and then changed to sulperazone and tigecycline according to the drug-sensitive test of *Acinetobacter baumannii* found in sputum culture. However, the patient still had intermittent fever, with high and fluctuated leukocyte count.

With treatment, the patient's ChE and pancreatic enzyme level recovered to the normal range gradually. After the cease of intravenous atropine and PAM, and the initiation of enteral nutrition, her ChE level dropped again to 2.0 kU/L in three days (Fig. 1). Therefore, the intravenous PAM and atropine were restored. To clarify such rebound poisoning, the patient received another CT scanning, which showed a significantly enlarged gallbladder (10.3 cm × 5.9 cm) with coarse wall, as well as a large area filled with fluid and gas in the pancreatic zone (Fig. 2). Meanwhile, her pancreatic enzyme dropped rapidly below the normal range, whereas the blood glucose level remained high and fluctuated, which necessitated continuous intravenous pumping of insulin. Then the patient received CT-guided percutaneous catheterizations of the gallbladder and the pancreatic zone, by which massive gas, fluid, and necrotic tissues were discharged. The culture of pancreatic drainage showed the presence of *Enterobacter aerogenes* and *Candida albicans*, which are sensitive to cefepime and fluconazole, respectively. Therefore, the antibiotics were adjusted accordingly. The patient recovered gradually in two weeks. Her body temperature

and leukocyte count recovered to near-normal, and her ChE level remained stable after enteral nutrition. However, due to massive pancreas necrosis, her amylase and lipase continued to be subnormal, whereas her glucose level remained high. The patient was discharged 37 days after admission, with trachea cannula and abdominal drainage catheter removed. As requested, she took pancreatin enteric-coated capsules (two capsules before each meal) and hypodermic insulin (10, 16, and 16 U before three meals, 16 U before bed) as pancreas replacement therapy. She presented to be well up to the present time (one year after discharge).

Discussion

Unlike the case we presented above, OI-induced pancreatitis is reported to be a mild, benign, and self-limiting condition [1,5]. Its clinical manifestations are often obscured by other prominent AChE inhibition effects, including hypersalivation, nausea and vomiting, diarrhea, muscle fasciculation, bradycardia, and hypotension. Some patients may be combined with conscious disturbance and respiratory failure, which require mechanical ventilation, and further conceal the manifestations of pancreatitis [3,6]. Therefore, we strongly recommend abdominal CT scanning and serum amylase test for each OI patient to clarify the existence of pancreatitis and avoid potential serious consequence.

The mechanism of OI-induced pancreatitis is considered to be the AChE-inhibition-induced cholinergic overstimulation, which leads to increased intraductal pressure and excess pancreatic enzyme secretion [1,3]. However, we speculate that the co-existence of infection serves a critical role in transforming ordinary pancreatitis into severe necrotizing pancreatitis. As shown in our case, the infectious agents are most likely enterogenous, including *Escherichia coli*, *Enterobacter aerogenes*, and *Enterococcus faecalis*. These pathogens dislocate due to increased intra-enteral pressure and impaired gut barrier function after intoxication, causing liquefaction, and aerification of pancreas tissue.

Pancreatin inhibition and empirical antibiotics must be adopted immediately to OI patients suspected of pancreatitis. If inflammation exacerbates and pancreas necrosis emerges, percutaneous catheterization and drainage are crucial for the elimination of hazardous necrotic waste and acquisition of pathogenic evidence, according to which the antibiotics should be adjusted. Notably, the serum amylase and lipase may drop irreversibly below normal if pancreas necroses extensively, which signifies irreversibly impaired pancreas function. In this situation, insulin replacement therapy is imperative for blood glucose stabilization and should be maintained long after hospital discharge. The use of oral pancreatin is for the same compensatory purpose.

In addition, we observed poisoning rebound after the launch of enteral nutrition in the above case. We attribute this phenomenon to the poison-rich bile released by cholecyst in reaction to enteral nutrition. Hence, intravenous atropine and PAM should be maintained and then withdrawn gradually after enteral nutrition is reinstated. Percutaneous transhepatic bile drainage is beneficial in the case of over-enlarged cholecyst.

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Compliance with ethics guidelines

Rui Hou, Hongmin Zhang, Huan Chen, Yuankai Zhou, Yun Long, and Dawei Liu declare no potential conflicts of interest with respect to the research, authorship, and/or publication of this article. Informed consent was obtained from both the patient and her husband for which identifying information is included in this article. Other ethical board approval is not applicable in this case report.

References

1. Yoshida S, Okada H, Nakano S, Shirai K, Yuhara T, Kojima H, Doi T, Kato H, Suzuki K, Morishita K, Murakami E, Ushikoshi H, Toyoda I, Ogura S. Much caution does no harm! Organophosphate poisoning often causes pancreatitis. J Intensive Care 2015; 3(1): 21–25
2. Goud M, Nayal B, Deepa K, Devi OS, Devaki RN, Anitha M. A case of acute pancreatitis with occupational exposure to organophosphorus compound. Toxicol Int 2012; 19(2): 223–224
3. Panieri E, Krige JE, Bornman PC, Linton DM. Severe necrotizing pancreatitis caused by organophosphate poisoning. J Clin Gastroenterol 1997; 25(2): 463–465
4. Roeyen G, Chapelle T, Jorens P, de Beeck BO, Ysebaert D. Necrotizing pancreatitis due to poisoning with organophosphate pesticides. Acta Gastroenterol Belg 2008; 71(1): 27–29
5. Venugopal L, Dharma Rao V, Srinivas Rao M, Mallikarjuna Y. Toxic pancreatitis with an intra-abdominal abscess which was caused by organophosphate poisoning (OP). J Clin Diagn Res 2013; 7(2): 366–368
6. Hamaguchi M, Namera A, Tsuda N, Uejima T, Maruyama K, Kanai T, Sakata I. Severe acute pancreatitis caused by organophosphate poisoning. Chudoku Kenkyu 2006; 19(4): 395–399