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Case Report

A Case of Application of Bedside Continuous Renal Replacement Therapy on Treatment of MODS Caused by Fish Bile Poisoning

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Abstract

One case of 54 years old female patient was admitted to hospital due to vomiting and diarrhea for 3 days and abnormal renal function for 1 day. The patient appeared repeatedly vomiting and watery stools 6 hours after eating 2 grain of raw carp fish bile and gradually appeared oliguresis, whole body skin yellow dye and fever symptoms. The condition of patient had no improvement after visiting the emergency department of local county hospital. She was checked in department of nephropathy in our hospital for further diagnosis and treatment. Because the patient's condition was serious and the function of liver and kidney was damaged, diagnosed as severe multiple organ dysfunction syndrome (MODS), she was transferred to ICU rescue to protect the liver, maintain water and electrolyte balance, control blood sugar, improve the circulation and give other drug treatments and actively carry out bedside continuous renal replacement therapy. Then the body temperature and hemogram of the patients became normal, liver and kidney function improved obviously, urinary production became normal, skin yellow dye faded and vital signs became stable. The successful treatment of this patient indicated that bedside continuous renal replacement therapy can not only have a good support for the kidneys but also reduce the waterfall effect of inflammatory of patients with severe MODS, which has great therapeutic effect on the multi organ dysfunction caused by fish bile poisoning.

Keywords: Fish bile poisoning; MODS; Continuous renal replacement therapy

Introduction

Fish bile poisoning refers to acute poisoning caused by eating raw fish bile. Because the raw fish gall contains

bile salt and cyanide and other ingredients which can inhibit cytochrome oxidase, then mitochondrial function is inhibited. They can also cause damage to the cell membrane, ultimately lead to multiple organ

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dysfunction. Recently, 1 cases of patient with multiple organ dysfunction syndrome (acute liver and kidney injury) due to eating raw carp bile were treated in our department. The patient was successfully treated with bedside continuous renal replacement therapy. Now reported as follows:

Case Report

The patient was female and was 54 years old. She was treated in the Department of nephropathy due to vomiting, diarrhea for 3 days and abnormal renal function for 1 day. The patient eat raw fish bile at 14:00, and vomited for 3 times and was with watery stool for 5 times at 20:00. There were fatigue, cold, no fever, dizziness, headache, dyspnea, chest tightness, heart palpitations and other symptoms, but no joint pain. Oliguresis was included, but gross hematuria was not obvious and without frequent micturition, urgency, dysuria and other symptoms. The last 2 days feel fever and fatigue, with the highest temperature 38°C. At the local clinic for cooling and symptomatic treatment, the temperature decreased. Then she found herself dizzy, so visited Lixin County Hospital. Renal function was checked and serum creatinine was found to be 494 $\mu\text{mol/L}$, urea to be 23.61 mmol/L. Then the patients came to the Department of nephropathy in our hospital for further treatment. The patient had a history of diabetes for more than 10 years. Body temperature at admission: 37.2°C. Heart rate: 78 beats per minute. Breathing: 22 times/min. Blood pressure: 140/80 mmHg. Mind was clear and the patient was seat on the wheelchair into the ward. She was cooperative when conduct physical examination and could answer to the point. Whole body skin and sclera were stained with yellow dye, the double pupils were with the equal size and circle, the diameter was 3 mm and was sensitive to light reflex. The lungs breathing were clear, without obvious dry and wet rales. Rhythm was neat, and each valve without pathological murmur. Abdomen was soft, and epigastrium had tenderness but no rebound pain. The liver did not touch the rib, the double kidney area had no percussion pain and both lower extremities had mild edema. Diagnosed as: 1. Fish bile poisoning complicated with multiple organ dysfunction: Acute liver and kidney injury. 2. Type 2 diabetes mellitus.

Routine blood test and liver and kidney function were reviewed after admission. The results showed: white blood cell (WBC) count : $9.24 \times 10^9/\text{L}$, neutrophil (NEUT) count : $7.76 \times 10^9/\text{L}$, lymphocyte (LY) count : $1.41 \times 10^9/\text{L}$, red blood cell RBC) count : $4.01 \times 10^{12}/\text{L}$, platelet (PLT) count : $128 \times 10^9/\text{L}$, alanine aminotransferase (ALT): 1264 $\mu\text{mol/L}$, aminosuccinic acid transferase (AST): 379 $\mu\text{mol/L}$, total bilirubin (TBIL): 44.9 $\mu\text{mol/L}$, albumin (ALB) : 30.9 g/L , creatinine (Scr) : 499 $\mu\text{mol/L}$, urea nitrogen (BUN) : 25.07 mmol/L. Because the patient was in critical condition, and the 24 hours urine volume was only 590 ml, she was then transferred to ICU of our hospital for treatment. Double cavity dialysis catheter with right femoral vein was conducted after entering into the department. Bedside renal replacement therapy was conducted twice at the second, the third, the fourth day and the seventh, the eighth, the ninth day respectively. Pattern: continuous venous dialysis with liver protection, water and electrolyte balance maintaining, blood sugar controlling, circulation improvement and other drug treatment. Liver and kidney function were reviewed at tenth days of hospital admission. The results showed: alanine aminotransferase (ALT) : 115 $\mu\text{mol/L}$, aminosuccinic acid transferase (AST) : 28 $\mu\text{mol/L}$, total bilirubin (TBIL) : 9.4 $\mu\text{mol/L}$, albumin (ALB) : 34.6g/L , creatinine (Scr) : 344 $\mu\text{mol/L}$, urea nitrogen (BUN) : 8.84 mmol/L. 24 hours urine volume rose to 4420ml at 15 days after admission. The general condition of patients was acceptable, no discomfort and with stable condition. So the patient was transferred from ICU back to the Department of nephropathy to continuing treatment and with liver protection, water and electrolyte balance maintaining, blood sugar controlling, circulation improvement and other drug treatment. Liver function was reviewed at twentieth day of admission. The results showed: alanine aminotransferase (ALT): 53 $\mu\text{mol/L}$, aminosuccinic acid transferase (AST): 28 $\mu\text{mol/L}$, total bilirubin (TBIL): 12.3 $\mu\text{mol/L}$, albumin (ALB): 47.7 g/L. The kidney function was reviewed at twentieth day of admission. The results showed: creatinine (Scr): 181 $\mu\text{mol/L}$, urea nitrogen (BUN): 8 mmol/L. The patient was discharged from hospital on the twenty-fourth day. Changes and trend of laboratory indexes in patients during hospitalization could be seen in Table 1 and 2.

Table 1: Results of blood routine examinations during hospital.

	Day 1	Day 2	Day 4	Day 6	Day 7	Day 14
WBC (10 ⁹ /L)	9.24	9.69	14.04	11.72	10.65	8.64
NEUT (10 ⁹ /L)	7.76	9.1	11.05	9.28	8.58	6.47
LY (10 ⁹ /L)	1.41	0.32	1.14	1.03	0.84	1.01
RBC (10 ¹² /L)	4.01	4.06	3.61	3.27	3.3	3.35
HB (g/L)	112	115	104	93	94	96
HCT (L/L)	0.322	0.318	0.299	0.258	0.265	0.276
PLT (10 ⁹ /L)	128	170	174	213	256	419

Table 2: Results of liver and kidney function examinations during hospital.

	Day 1	Day 2	Day 4	Day 6	Day 10	Day 14	Day 20	Day 24
ALT(μmol/L)	1264	1319	690	317	115	67	53	NA
AST(μmol/L)	379	240	73	39	28	25	33	NA
TBIL(μmol/L)	44.9	27.9	19	12.2	9.4	11.9	12.3	NA
DBIL(μmol/L)	NA	19.5	11.7	6.6	4.6	0.7	5.5	NA
IBIL(μmol/L)	NA	8.4	7.3	5.6	4.8	11.2	6.8	NA
ALB(g/L)	30.9	31.6	33	30.5	34.6	33.9	47.7	43.8
Scr(μmol/L)	499	320	154	479	344	442	217	181
BUN(mmol/L)	25.07	16.72	4.43	11.35	8.84	15.14	9.11	8
CRP(mg/L)	16.2	25.3	23.6	35.2	22.4	21.2	21.5	NA

Discussion

With respect to toxins, such as puffer fish, it contains tetrodotoxin, a neurotoxin [1], which may cause the human to appear the breath and the circulation failure eventually cause the patient to die [2]. Unlike the puffer fish, carp fish bile also contain toxic ingredients. The main components of the bile are cholic acid, hydrocyanic acid, 5α-carp cholesterol sulfate and histamine. Hydrocyanic acid is a kind of inorganic cyanide, it can lead to changes in cell metabolism through the inhibition of oxidative phosphorylation, from aerobic to anaerobic oxidative damage, so it is an efficient inhibitor of mitochondrial respiration. Exposure to cyanide can lead to significant toxic reactions, including cardiac dysfunction, neuronal necrosis, metabolic disorders and death [3]. 5α-carp cholesterol sulfate has been shown

to be the main toxic component of bile of common carp [4], which is a kind of kidney and liver toxic substances. Liver biopsy after carp toxin administrated in mice showed liver necrosis and neutrophil infiltration. But it showed no significant changes in the control mice. The pathological changes of liver pathology after poisoning were consistent with that of acute toxic hepatitis. The research of fish bile poisoning model of rats indicated that renal tubular epithelial cells were injured by taking 1230 mg/kg to 5122 mg/kg fish bile in rats and can cause significant increase in the level of TNF- α in the body [5]. The massive release of TNF- α has been shown to be one of the initiating factors of multiple organ dysfunction caused by systemic inflammatory response syndrome [6]. With the activation of systemic inflammatory cells in fish bile poisoning, it can cause the cascade release of the body's inflammatory mediators,

which can lead to inflammatory response syndrome and multiple organ dysfunction. In this case, severe multiple organ dysfunction occurred after fish bile poisoning. There was a significant increase in the level of aminotransferase and bilirubin, and the liver function injury showed systemic jaundice. At the same time, there was a significant increase in serum creatinine and urea nitrogen, and the renal dysfunction showed oliguresis. There is a version among the people that eating raw fish bile can improve the eyesight. Therefore, in many cases of eating raw fish bile poisoning can lead to increasing of BUN, Scr, ALT and AST, which can lead to acute liver and renal function damage, and even MODS [7]. There were also some reports of fish bile poisoning in abroad and different degrees of liver and kidney damage and the corresponding clinical symptoms were found in all the cases [8]. The reports of fish bile poisoning were not only consist in adults, but also in children that occurred liver and kidney damage after eating raw fish bile [9,10]. After the extraction, rats were injected intravenously with the fish bile by Chen et al. [11] The glomerular filtration rate of rats was decreased and it was found that the extract of bile also caused the rapid decrease of systemic arterial blood pressure and cardiac output. Further in vitro experiments demonstrated that bile salts triggered a hemolytic reaction. In early years, Luo JA [12] studied on the use of salvia miltiorrhiza, cattail, rhubarb and other preparations on observation of early injury of kidney in rats induced by fish bile. It was found that these drugs can decrease the level of the serum creatinine, reduce the renal proximal tubular epithelial cell necrosis, and increase the creatinine clearance rate, which had a certain therapeutic effect on acute kidney injury caused by fish bile poisoning. For the treatment of fish bile poisoning, in addition to the appropriate protection of the liver, diuretic, maintaining electrolyte balance and other drug treatment, blood purification technology also has a good therapeutic effect. There were reports of successful treatment of fish bile poisoning after hemodialysis [13-15]. Almost all of these reports were used intermittent dialysis therapy, which could only has some effects of supportive treatment to the kidney. In this case, MODS were in kidney combined liver. Bedside continuous renal replacement therapy was used in the treatment of this patient. The model was: continuous venous hemodialysis filtration. Unlike the previous blood purification technology, this

technology is different from the previous simple dialysis. It can be carried out in the bedside for 3-7 days, without the transfer of critically ill patients to the dialysis room. And there was little effect on the hemodynamics of the critically ill patients. It can not only complete the renal replacement, but also through the filtration mode to clear the body of patients due to poisoning caused by excessive inflammatory reaction, resulted in reducing the body's inflammatory response. So as to avoid serious damage to other organs and has played a good therapeutic effect. Through the successful treatment of this case, it is recommended that the clinical fish bile poisoning patients can be transferred to ICU in early stage for continuous renal replacement therapy, as far as possible to prevent the occurrence of MODS.

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