Case study

Acute Kidney Injury Due To Wild Mushroom Consumption: Hemodialysis And Ozone therapy Combination A Therapeutic Asset (About One Case)

Abstract

Aims: to assess the value of ozone therapy in the management of acute toxic kidney injury due to the ingestion of wild mushrooms.

Case Presentation: This was a prospective case study of a 30-year-old patient who was hospitalized in the nephrology department of the Departmental Teaching Hospital of Borgou (Benin), in November 2021, for acute toxic renal failure following severe intoxication by ingestion of wild mushrooms. His condition required hemodialysis sessions coupled with ozone therapy. Three sessions of hemodialysis coupled with ozone therapy were performed, followed by four sessions of isolated ozone therapy in two weeks. The recovery of renal function was favorable and faster. A rapid clinical improvement was noted as well as a regularization of the paraclinical parameters.

Discussion: Ozone therapy, as an adjuvant treatment, due to its anti-inflammatory, antioxidant and cell growth properties, favored a rapid recovery of the renal function and a clinical improvement of the patient victim of a severe intoxication by ingestion of wild mushrooms. This is the case of a multidisciplinary management of acute toxic renal failure by ingestion of wild mushroom, the management of which was done with hemodialysis associated with ozone therapy, the results being quite interesting.

Conclusion : Ozone therapy in adjuvant treatment could facilitate a rapid recovery of renal function.

Key words : acute kidney injury, wild mushrooms, ozone therapy, Benin

Introduction

The consumption of mushrooms is not rare. About 50 to 100 mushrooms species are toxic to humans [1]. Poisoning by ingestion of mushrooms is not too rare. Most situations are benign [1]. If these intoxications are often benign, severe intoxications are to be deplored [2]. The attacks can concern several organs and/or systems such as liver, kidneys, heart, nervous system, skin. The onset can be brutal or progressive [2,3]. Acute renal failure can occur with high mortality, especially in the presence of other complications, requiring extra renal purification sessions. Other treatments, such as ozone therapy, could be combined with dialysis to better treat patients. Among complementary medical approaches, ozone therapy is

known all over the world but it is not yet practiced correctly everywhere because of the incomplete knowledge by improvised ozone therapists [4]. We report a case of acute renal failure due to wild mushroom consumption in which hemodialysis and ozone therapy were combined for better management at the Departmental Teaching Hospital of Borgou (Benin).

Case Presentation

The patient was a 30-year-old male farmer living in a rural area more than 100 km away from a referral hospital. The onset of symptoms was three days before his admission, marked by abdominal pain, diarrhea and vomiting, followed by anuria, dyspnea, jaundice following ingestion of wild mushrooms, which prompted a consultation at the nearest hospital where investigations revealed renal failure, liver insufficiency, hepatic cytolysis syndrome and cholestasis. Thus, the patient was referred to the nephrology department of the Departmental Teaching Hospital of Borgou (Benin), for better management.

On admission to the department, the patient was found to be in altered general condition or stage 3 according to World Health Organization (WHO) [5] , severely dehydrated with dry mucous membranes, icteric, with a blood pressure of 105/68 mmHg, and a respiratory rate of 36 cycles per minute with an oxygen saturation of 82% in ambient air. The urine dipstick showed pH 5, specific gravity 1.030 and urobilinogen +. The paraclinical examination of the same day found somes abnormalities. We can retain an alteration of the renal function with increased serum urea and serum creatinine. Other findings were: hyponatremia, hypokalemia, cholestasis syndrome, hepatic cytolysis, moderate hyperuricemia and bicytopenia (anemia and thrombocytopenia). The results of paraclinical examinations on admission are summarized in Table 1.

Table 1: Results of paraclinical examinations (at admission) of the patient suffering from acute toxic renal injury following ingestion of wild mushroom and treated at the Departmental teaching Hospital of Borgou (Benin) in November 2021

	values	usual values
Glucose blood (g/L)	1.1	<1.2
Serum urea (g/L)	3.4	0.15-0.45
Serum Creatinine (mg/L)	118.0	6-14
Natremia (mEq/L)	130.0	135-148

Kalemia (mEq/L)	3.4	3.5-5.5
Chloremia (mEq/L)	90.7	98-107
Total bilirubinemia (mg/L)	16.1	6-14
Conjugated bilirubinemia (mg/L)	12.5	<3
Uricemia (mg/L)	74.1	30-70
Aspartate aminotransaminase (UI/L)	74.0	7-40
Alanine aminotransaminase (UI/L)	224.0	7-40
Hemoglobin level (g/dL)	9.9	13-18
Platelets (1000/L)	59	150-450

The patient was put on treatment, oxygen therapy at 6 liters per minute, hydration with normal saline 9‰ at a rate of 3 liters per day, sodium bicarbonate 14‰ 500 ml per day, Ringer Lactate 500 ml per day, transfusion of two bag of blood, betamethasone 4mg twice a day and vitamin therapy with vitamin C and B complex vitamin.

After 48 hours following admission, there was an alteration of consciousness with a Glasgow score of 11 and encephalopathy. The biological parameters show a multivisceral failure. There was hyperglycemia. worsening of renal function impairment with increased serum urea and serum creatinine. Severe hyponatremia with hypochloremia, severe hypocalcemia associated with severe hyperphosphatemia, hypermagnesemia and severe hyperuricemia were observed. Further impairment of liver function with severe cholestasis syndrome, severe hepatic cytolysis and hepatocellular insufficiency associated with bleeding risk and severe disturbance of the liver function were also observed. The results of the paraclinical examinations after 48 hours following admission are summarized in table 2.

Table 2: Results of paraclinical examinations (after 48 hours of admission) of the patient suffering from acute toxic renal injury following ingestion of wild mushroom and treated at the Departmental teaching Hospital of Borgou (Benin) in November 2021

	Values	Usual values
Glucose blood (g/L)	1.4	<1.2
Serum urea (g/L)	4.4	0.15-0.45

Serum Creatinine (mg/L)	125.7	6-14
Natremia (mEq/L)	115.0	135-148
Kaliemia (mEq/L)	5.5	3.5-5.5
Chloremia (mEq/L)	80.0	98-107
Calcemia (mg/L)	43.0	85-105
Phosphaemia (mg/L)	161.1	28-47
Magnaemia (mg/L)	31.0	16-25
total cholesterol (g/L)	1.38	1.1-2.0
HDL-cholesterol (g/L)	0.33	> 0.4
Triglyceridemia (g/L)	5.12	0.45-1.71
Total bilirubinemia (mg/L)	56.1	6-14
Conjugated bilirubinemia (mg/L)	43.7	<3
Uricemia (mg/L)	141.1	30-70
Aspartate aminotransaminase (UI/L)	121.0	7-40
Alanine aminotransaminase (UI/L)	432.0	7-40
Prothrombin level (%)	23.1	70-100
International Normalized Ratio (INR)	2.8	1

In view of these results, the patient was put under hemodialysis on three successive progressive doses with an adequate filling and also a session of oxygen-ozone therapy at the end of each dialysis session and two complementary sessions of major autohemotherapy *(*autologous blood transfusion*)* of ozone at the rate of one session per day. The major oxygen-ozone autohemotherapy consists in reinjecting into the blood stream blood taken from the patient (about 200 ml) in a sterile bag containing an anticoagulant and mixed with the oxygen-ozone added to the vacuum container.

At the end of the three sessions of hemodialysis coupled with oxygen-ozone therapy, a progressive improvement of the state of consciousness and a progressive disappearance of dyspnea, asthenia and regression of jaundice were noted. In general, there was a clear improvement of the multivisceral failures with improvement of the renal and hepatic functions and normalization of the hydro-electrolytic parameters. Also, a correction of anemia and thrombocytopenia was observed. The continuation of the treatment was done without the hemodialysis sessions but with the major autologous blood transfusion of ozone sessions at the rate of two sessions per week and over two weeks. The results of the paraclinical examinations are summarized in table 3.

Table 3: Results of paraclinical examinations (at the end of treatment) of the patient suffering from acute toxic renal injury following ingestion of wild mushroom and treated at the Departmental teaching Hospital of Borgou (Benin) in November 2021

	Values	Usual values
Glucose blood (g/L)	1.1	<1.2
Serum urea (g/L)	0.7	0.15-0.45
Serum Creatinine (mg/L)	25.6	6-14
Natremia (mEq/L)	137.0	135-148
Kaliemia (mEq/L)	4.6	3.5-5.5
Chloremia (mEq/L)	100.3	98-107
Calcemia (mg/L)	83.2	85-105
Phosphaemia (mg/L)	43.1	28-47
Magnaemia (mg/L)	17.0	16-25
Total bilirubinemia (mg/L)	12.2	6-14
Conjugated bilirubinemia (mg/L)	5.5	<3
Uricemia (mg/L)	41.7	30-70
Aspartate aminotransaminase (UI/L)	29.0	7-40
Alanine aminotransaminase (UI/L)	45.0	7-40
Hemoglobin level (g/dL)	12.0	13-18

Platelets (1000/L)	174.0	150-450

Discussion

Wild mushrooms are highly toxic and responsible for the majority of fatal poisonings. The toxicity of wild mushrooms depends on their toxin and also on the patient's body. Ingestion of wild mushrooms leads to irreparable destruction of the liver and other organs such as the kidneys [3]. Renal damage may be direct, constituting acute tubular necrosis or acute glomerulonephritis. Acute renal failure could be a consequence of severe gastroenteritis responsible for dehydration and/or associated with hydroelctrolytic losses. It is often an orellanian syndrome in which orelline is responsible for the intoxications. The seriousness of the intoxication comes from the fact that the symptoms which will appear are those of an acute renal insufficiency quickly progressive. Its clinical picture is made of nausea and vomiting, accompanied by abdominal pains and intense abdominal pain and intense aches, with anuria. [6].

This renal impairment would be more severe if associated with other multivisceral failures. Hepatic and gastroenteric disorders are often due to the phalloid, gyromitrian, anthraquinonian and resinoid syndromes and this according to the corresponding toxins [6]. Moreover, the toxicity is not reduced by cooking, freezing or drying [6]. No definitive antidote has yet been found, but some specific treatments appear to increase survival. Other methods to increase toxin removal have been tested: hemodialysis, hemoperfusion, plasmapheresis, and peritoneal dialysis have occasionally shown efficacy but, overall, do not appear to significantly improve outcomes [8-12].

The combination of ozone therapy with dialysis may reduce toxicity for several reasons that remain to be better documented. In this reported case, ozone therapy resulted in activation of the immune system, detoxification, and reduction of oxidative stress. The regeneration of renal and hepatic cells was more rapid. It is reported to activate the immune system, improve oxygen utilization, and stimulate the release of growth factors and other mediators that may reactivate the immune system [13,14]. In response to ozone concentration, the release of platelet-derived growth factor (PDGF)-AB, transforming growth factor (TGF) b-1 and IL-8 have been measured [14]. Ozone finally acts as a useful messenger through three processes : detoxification, dilution, and excretion [15]. Therefore, the normalization of the antioxidant-redox cycle and the detoxification system slowly promotes tissue regeneration [15]. As recently established ozone therapy is able to specifically treat oxidative stress-related

diseases. The improvement also depends on the age of the patients and the presence of comorbidities that may delay healing. This is not surprising because even for oxygen, as well as glucose and uric acid levels, a change in physiological concentrations is not good [16]. Based on the mechanisms of action, ozone therapy appears to be a safe, economical and effective treatment for patients with cardiovascular disorders, based on the biological responses [16]. Ozone therapy improves blood flow and oxygen delivery to ischemic tissues as well as general metabolism; it upregulates antioxidant enzymes, induces a slight activation of the immune system and enhances the release of growth factors and has an excellent disinfectant activity [17].

Conclusion

Wild mushroom ingestion has serious and fatal consequences. The management is multidisciplinary and sometimes requires extra renal purification sessions. But the association of ozone therapy makes symptomatic treatments more effective.

Consent for Publication

All authors declare that informed consent was obtained from patient for publication of this study.

Ethics Approval and Consent to Participate

“All authors hereby declare that all ozone therapy had been examined and approved by the board of ethics committee of Faculty of Medicine, University of Parakou in accordance with the ethical standards laid down in 1964 Declaration of Helsinki”

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