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Case Report

Life-threatening wasp sting envenomation with multi-organ failure

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Abstract

Wasp stings usually bring temporary discomfort and pain, but on occasion, they can cause serious infections and fatal allergic reactions. We report on a patient who experienced massive wasp stings and developed multiple organ failures, including acute kidney, hepatic failure, and circulatory collapse. He was treated with aggressive fluid resuscitation, an inotropic agent, an intravenous injection of steroids, broad-spectrum antibiotics, and haemodialysis. After intensive treatment, his liver function recovered one month later. Recovery of renal function was delayed, and the patient needed temporary regular haemodialysis. The patient's renal and liver parameters were within normal limits in the initial stage after 24 hours his renal and liver parameters were deranged. The patient was immediately started on NAC infusion and emergency dialysis was started. A timely approach by our department saved the life of the patient and after the 8th day patient fully recovered, and he get back to his normal sedentary life. The patient was advised to follow up every week after discharge.

Keywords*:* wasp sting, multiorgan failure, haemodialysis

Introduction

Wasp bites usually bring temporary discomfort and pain, but on occasion, they can cause serious infections and fatal allergic reactions. We report on a patient who experienced massive wasp stings and developed multiple organ failures, including acute kidney, hepatic failure, and circulatory collapse. He was treated with aggressive fluid resuscitation, an inotropic agent, and intravenous injection of steroids, broad-spectrum antibiotics, and haemodialysis. After intensive treatment, his liver function recovered one month later. Recovery of renal function was delayed, and the patient needed temporary regular haemodialysis. The pathology of kidney biopsy showed acute tubulointerstitial nephritis. This case shows that toxic reactions following massive wasp attacks may happen several days after the fact and result in severe, multiorgan system dysfunction.

Case Presentation

A 55-year-old male came to the hospital with complaints of being stung by a swarm of wasps(more than 50) in his farm field. Within minutes, he developed severe local erythema and edema**(Fig 1)** followed by dizziness, diaphoresis and sudden loss of consciousness. He was shifted to the Emergency department. The patient was conscious, oriented, and afebrile. Vitals were stable BP- 90/60mmhg, PR; 90bpm,and SPO2 96% at room air. The patient was treated conservatively with Inj Hydrocortisone, InjAvil, Inj Tetanus Toxoid and Epinephrine subcutaneously and Epinephrine infusion was given as anaphylactic treatment. IV crystalloids were given as a bolus. His level of consciousness fluctuated between being responsive to sudden loss of consciousness and interruption of speech. GCS during those episodes with loss of consciousness was E4M1V1. There were no signs of motor abnormalities. The patient was given InjClonazep1mg IV during the episodes of loss of consciousness thinking of status epilepticus. The patient suddenly developed tachypnea with desaturation Spo2 of 83in room air, a

chest radiograph showed bilateral diffuse lung infiltration. He was subsequently diagnosed with acute respiratory distress syndrome (ARDS). In view of ARDS patient was intubated. After 24 Hours, laboratory investigations showed- Urine Myoglobin-Negative, 2D Echo showed an ejection fraction of 60%. The urine routine showed the presence of granular casts (features suggestive of acute tubular necrosis). Investigations are shown in Table 1. CT brain and MRI brain were unremarkable. He received an N-acetylcysteine infusion for deranged liver functions. Given sepsis, the patient was started on IV Inj.Meropenem 1gm. Given acute renal failure due to rhabdomyolysis, the patient was taken for emergency dialysis.He was admitted to the intensive care unit and about three cycles of hemodialysis were done.His urine output was normal and renal parameters were within normal limits after dialysis.The patient's general condition improved patient GCS on the 4th day of admission was 15/15 and the total count came back to normal limits after starting broad-spectrum antibiotics. The patient was discharged on the 8th day and advised for follow-up after a weak. He was able to do his normal work after admission. On follow up the patient was advised for certain diagnostic labs like renal profile, total counts and liver profile, which turned out to be within normal limits.

Discussion

Patients with a history of numerous wasp stings may have an increased incidence of mortality. Wasps venom-induced organ injury is mainly explained by two mechanisms which include toxin-induced allergic response mainly IgE mediated type 1 hypersensitive reaction and direct effect of toxin causing organ injury, especially in a mass wasp sting. Rhabdomyolysis, haemolysis, DIC, hepatitis, acute kidney injury, myocardial infarction, and pancreatitis are mainly caused by direct toxin-induced injury to the organs.[1]Wasp venom contains melittin, histamine, hyaluronidase, apamin, phospholipase A_2, and acid phosphatase. In addition to acute renal failure, hepatocyte damage, intravascular haemolysis, rhabdomyolysis, thrombocytopenia, coagulopathy, and cardiovascular and neurological abnormalities are severe complications that are also caused by wasp venom. It has also been reported that high concentrations of wasp venom can be detected 50 hours after wasp stings, indicating that it would still result in continuous damage to the body,[2]

Furthermore, inflammatory reactions activated by wasp venom are also difficult to deal with. In the past, conventional therapy including anti-inflammatory agents, fluid therapy, nutritional support, and other essential organ-supporting therapies was applied to cure patients who had been stung by wasps. When necessary, haemodialysis or peritoneal dialysis was carried out to manage hyperkalaemia, electrolyte disturbances, and excessive water load. However, all these measures are not able to antagonize all the toxic effects of wasp venom and remove the circulating mediators of inflammation caused by the venom itself. It is essential as soon as possible to restore homeostasis and protect vital organ function in patients who are suffering from wasp stings.

In recent years, it has been reported that CVVH, which is one modality of continuous blood purification, might be useful in dealing with critically ill patients. Many observations indicate that CVVH exerts beneficial effects on the clinical course of critically ill patients that are independent of its impact on electrolytes and fluids. In addition, our past findings also suggest that CVVH is effective in removing many plasma cytokines in patients with sepsis. Patients showed a better prognosis with the removal of excessive cytokines by CVVH treatment than by conventional therapy.

Three distinctive mechanisms are involved in CVVH treatment: diffusion, convection, and adsorption. Among these, diffusion mainly aims at the micro molecular substances, such as blood urea nitrogen, creatinine, and so on. Convection and adsorption remove molecules of medium sizes, such as cytokines. Convection is the principal component of CVVH treatment. CVVH can quickly clear cytokines whose molecular weight is too big for them to be removed by regular haemodialysis or peritoneal dialysis, and thus restore homeostasis as soon as possible. Furthermore, plasma exchange is also effective in removing some specific toxic materials, antibodies, or circulating mediators because of their tight binding to albumin or other large molecular weight substance.[3]

In this case, the combination of plasma exchange with CVVH appeared to be one of the best ways to solve the difficulties we were facing. Some researchers have suggested that physicians should consider exchange, transfusion, or plasmapheresis in severe cases following wasp stings. The difference in dose of CVVH may contribute to the different results reported. In a large randomized, controlled study including 425 patients, an ultra filtration dose of 35 mL/kg per hour increased the survival rate from 41% to 57% compared with a dose of 20 mL/kg per hour. The dose of ultra filtration applied in this study was 70 mL/kg per hour, so a high ultra filtration dose may be the origin of the improved effects. MOF following

wasp stings is mainly caused by intravascular haemolysis, rhabdomyolysis, or a combination of both, as well as the direct toxic effect of the venom. The combination of plasma exchange with CVVH appears to be an effective method for the direct removal of wasp venom and inflammatory mediators from a patient's circulation. However, the beneficial effect of combining plasma exchange with CVVH on the survival rate of these patients remains to be proved further.[4-5]The manifestations other than renal failure include myocardial necrosis and infarction, centrilobular necrosis of the liver, and thrombocytopenia as a result of direct platelet toxicity. Our patient had a rapidly worsening renal failure with markedly elevated serum levels of CPK and urinary myoglobin suggesting rhabdomyolysis. The elevated LDH levels point toward a haemolytic process. In view of the prolonged APTT disseminated intra vascular coagulation was considered, hence renal biopsy was not done, as the patient manifested all the stages of acute tubular necrosis.[6]

This case highlights that even though the patient is asymptomatic or has lesser symptoms due to wasp sting, he should not be discharged. Instead, observation of at least 24 hours is recommended as symptoms may worsen during this phase, and may even progress to multi-organ failure.

Conclusion

The wasp becomes aggressive when disturbed, so in warm humid weather, one has to be cautious when outdoors. They are attracted to bright colours, sweets, alcohol, and perfumes so all this should be avoided when venturing into forested areas. Trying to kill one of them will be dangerous as the pheromones released will attract the whole swarm. So, one has to stay calm if accidentally close to a colony and move away slowly as wasps do not attack beyond their area. Every physician must be aware of the complications of a wasp sting and should not discharge the patients as early observation of the patient at least for 72hours, particularly if the patient is stung by more than 10 wasps, to prevent further system failure.

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Figure 1: Multiple wasp stings on the body

Table 1: Follow-up investigations

Biochemical investigations	On admission	After 12 hours	After 24 hours	After 36 hours	After 48 hours	3rd day morning
Full blood count						
White cell count (4,000-11,000/mm^3)	13.17	27.79	44.45	37.34	30.3	33.2
Neutrophils (50-70%)	88	95	93.9	92.7	93	93.2
Lymphocytes (20-40%)	9.2	3.8	4.4	4.4	3.9	5
Haemoglobin (12-16 g/dl)	14.9	14	14.2	14.3	8.3	7.7
MCV (80-100 fL)	89	81	80.3	77.8	83	80
Red cell count (400,000-550,00 mm^3)	4.53	4.16	4.26	4.16	2.69	3.3
Platelets (150,000-450,000mm^3)	420	288	189	67	20	20
HCT (36-44%)	37.7	33	34.2	32.8	21.8	22.1
Inflammatory markers						
ESR (1st hour)	—	—	—	45	—	—
CRP (0-3.0 mg/L)	—	210	267	—	280	—
Renal functions tests						
Blood urea (2.5-6.4 mmol/L)	3.8	—	—	8.9	8.2	9.7
Serum creatinine (53-88 mmol/L)	50	278	287	178	198	248
Serum electrolytes						
Serum sodium (135-145 mmol/L)	138	135	139	158	—	156
Serum potassium (3.5-5.0 mmol/L)	3.9	3.7	5.5	5.2	5.1	4.8
Serum calcium (2.1-2.5 mmol/L)	—	2.28	—	—	2.24	—
Serum phosphorus (2.6-4.5 mg/dL)	—	—	—	4.5	4.6	—
Liver profile						
Serum AST (0-45 U/L)	—	678	455	—	2748	2842
Serum ALT (0-35 U/L)	24	45	367	557	614	3937
Serum bilirubin (0-17.1 mmol/L)	—	19.1	22.9	27	24	31
Serum protein (64-83g/L)	—	15	19	—	19	—
Clotting profile						
PT/INR (<1.4)	1.3	1.34	1.4	2.3	—	2.6
APTT (<35)	—	42.8	47	84.1	—	44
Serum CPK (U/L)	—	15000	22649	—	—	—
Urine full report						
Protein (+)	+	++	+++	—	—	+++
Pus cells/HPF	10-15	03-05	12-15	—	—	15-20
Red cells/HPF	15-20	40-50	35-40	—	—	25-30
Active sediment (+)	—	—	+			—

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