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Case Report

Acute Kidney Injury Following Multiple Wasp Stings: A Case Report with Complete Renal Recovery after Hemodialysis

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Abstract:

Acute kidney injury (AKI) is a rare but serious complication of multiple wasp stings due to systemic envenomation. We report the case of a 55 year old male from rural Bangladesh who developed severe AKI following approximately 100 - 120 wasp stings (Vespa affinis). The patient initially presented with localized pain and swelling, followed by progressive oliguria and generalized edema. Laboratory evaluation revealed markedly elevated serum creatinine (19.2 mg/dL), hyponatremia, and metabolic derangement. In view of severe azotemia and persistent oliguria, hemodialysis was initiated. The patient underwent seven sessions of hemodialysis, resulting in gradual clinical and biochemical improvement. Serial laboratory findings demonstrated a progressive decline in serum creatinine, reaching near-normal levels (1.4 mg/dL) by day 114. This case highlights that AKI following wasp envenomation, although potentially life-threatening, is reversible with early recognition, timely referral, and appropriate renal supportive therapy.

Keywords: Acute kidney injury; wasp stings; hemodialysis; envenomation; renal recovery

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INTRODUCTION

Acute kidney injury (AKI) is a potentially life-threatening clinical condition characterized by an abrupt decline in renal function, resulting in the accumulation of metabolic waste products and disturbances in fluid, electrolyte, and acid–base balance[1]. Although commonly associated with sepsis, nephrotoxic drugs, and ischemic injury, toxin-mediated AKI due to envenomation represents an important yet underrecognized etiology, particularly in tropical and rural settings[2].

Hymenopteran stings, including those from wasps, bees, and hornets, are common worldwide and are usually associated with mild local reactions[3]. However, multiple stings can lead to severe systemic toxicity due to the cumulative effect of venom components[4]. Wasp venom contains a complex mixture of biologically active substances such as phospholipases, hyaluronidase, melittin, and vasoactive amines, which contribute to cellular injury, inflammation, and systemic toxicity[5, 6]. In cases of massive envenomation, these toxins may precipitate multi-organ dysfunction, including acute kidney injury[7].

The pathophysiology of AKI following wasp stings is multifactorial. Proposed mechanisms include direct nephrotoxicity, intravascular hemolysis, rhabdomyolysis, and immune-mediated injury leading to acute tubular necrosis[8-10]. Hemoglobinuria and myoglobinuria, resulting from hemolysis and muscle breakdown, respectively, play a critical role in pigment-induced nephropathy, which is a well-recognized cause of renal impairment in such cases[11]. Additionally, hypotension and shock may further exacerbate renal ischemia, compounding the severity of kidney injury[12].

Clinical manifestations of wasp sting envenomation range from mild allergic reactions to severe systemic complications, including hepatic dysfunction, coagulopathy, cardiac abnormalities, and renal failure[13]. Early identification of high-risk patients is essential, as delayed presentation and lack of timely intervention are associated with poor outcomes[14]. In many developing countries, including Bangladesh, limited access to healthcare facilities and delayed referral contribute significantly to increased morbidity and mortality in such cases[15].

Management of AKI secondary to wasp stings is primarily supportive and includes adequate hydration, correction of electrolyte imbalance, and monitoring of renal function[16]. In severe cases, renal replacement therapy in the form of hemodialysis may be required[17]. Prompt initiation of dialysis has been shown to improve outcomes, particularly in patients with oliguric or anuric renal failure[18]. Despite the severity of presentation, complete renal recovery is possible with timely and appropriate management, although such outcomes are not consistently reported in the literature[19].

Given the relative rarity of dialysis-dependent AKI with full renal recovery following wasp envenomation, documenting such cases is important for enhancing clinical awareness and guiding management strategies. This case report describes a patient who developed severe AKI following multiple wasp stings and subsequently achieved complete renal recovery after hemodialysis, highlighting the importance of early recognition, timely intervention, and availability of renal support services.

CASE PRESENTATION

A 55-year-old male from a rural area of Tangail, Bangladesh, with a known history of hypertension, sustained multiple wasp stings (approximately 100 - 120, identified as *Vespa affinis*) while performing household work. The stings involved the scalp, face, neck, trunk, and extremities. Immediately following the attack, he experienced severe pain and agitation but no features of anaphylaxis.

He was admitted to a local government hospital approximately 1.5 hours after the incident. On initial examination, he was restless, with a blood pressure of 170/100 mm Hg, pulse rate of 82 beats/min, and temperature of 98.6°F. He received supportive treatment, including antihistamines, corticosteroids, analgesics, and intravenous fluids.

On the second day following envenomation, the patient developed vomiting and progressively reduced urine output, accompanied by generalized edema involving the face, limbs, and trunk. There was no documented hypotension.

Serial laboratory parameters demonstrating the progression and recovery of renal function are summarized in Table I. By the eighth day, laboratory evaluation revealed severe renal impairment, with a serum creatinine of 18.1 mg/dL. Ultrasonography of the abdomen demonstrated bilaterally enlarged kidneys with poor corticomedullary differentiation, consistent with acute renal parenchymal disease.

On the ninth day, he was admitted to a tertiary care center. Laboratory investigations at that time showed worsening renal function, with serum creatinine of 19.2 mg/dL, hyponatremia (serum sodium 127 mmol/L), borderline hyperkalemia (serum potassium 5.1 mmol/L), and metabolic derangement (T-CO_2 23 mmol/L). Inflammatory markers were elevated (hs-CRP 16.5 mg/L). Urinalysis revealed proteinuria (3+), glycosuria (2+), and reduced urine output (50–100 mL/day), consistent with oliguria.

In view of severe azotemia and persistent oliguria, hemodialysis was initiated promptly. The patient underwent a total of seven sessions of hemodialysis. Following initiation of dialysis, urine output gradually improved, reaching up to 4000 mL/day after several sessions.

Serial laboratory monitoring demonstrated a progressive decline in serum creatinine, from 19.2 mg/dL during peak illness to 8.73 mg/dL during early recovery, followed by further reduction to 6.5 mg/dL in the pre-dialysis recovery phase and 3.2 mg/dL after completion of dialysis. Electrolyte abnormalities also gradually normalized during this period (Table I).

During the recovery phase, the patient's clinical condition improved, with resolution of edema and normalization of urine output. By the 114th day, serum creatinine had returned to near-normal levels (1.4 mg/dL), indicating complete renal recovery.

The patient was subsequently followed up on an outpatient basis. Although later ultrasonography showed mild structural renal changes, he remained clinically stable with preserved renal function (Figure 1).

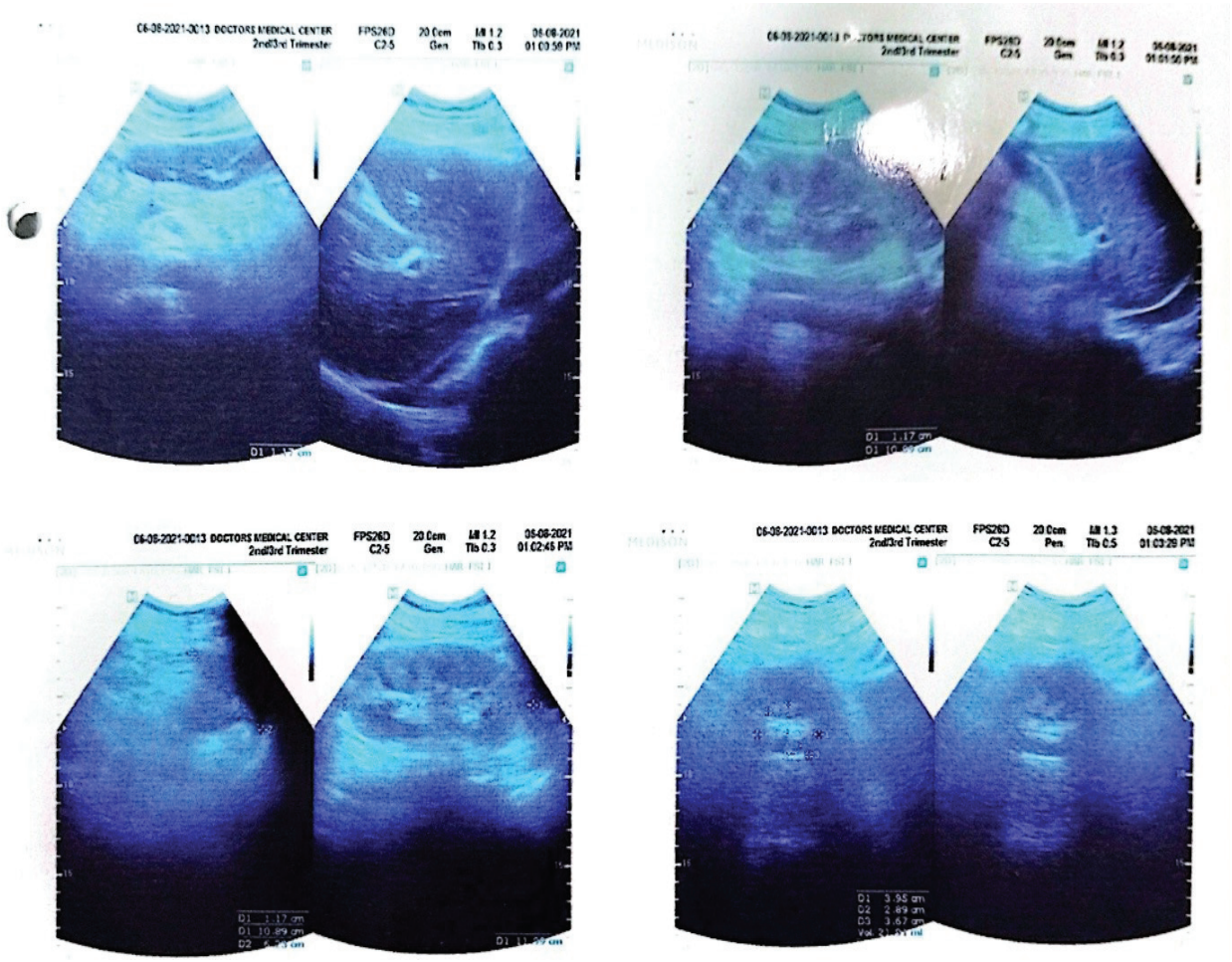

Figure 1: Ultrasonographic findings showing bilaterally enlarged kidneys with reduced corticomedullary differentiation

Table I. Serial Laboratory Parameters Demonstrating Progression and Recovery of Acute Kidney Injury

Parameter	Reference Range	Peak Illness (Day 8–9)	Early Recovery (Day 14)	Pre-Dialysis Phase (Day 22–35)	Post-Dialysis Improvement (Day 37–48)	Follow-up (Day 114)
Creatinine (mg/dL)	0.6–1.2	19.2	8.73	8.15–6.5	5.23–3.2	1.4
Blood Urea (mg/dL)	10–40	92	—	—	—	—
Hb (g/dL)	12–16	10.9	10.0	10.8–9.2	8.0	10.3
Na (mmol/L)	135–145	121–127	135	134–138	136–137	142
K (mmol/L)	3.5–5.0	4.2–5.1	3.6	3.6–4.3	3.9–5.0	4.1
Cl (mmol/L)	98–106	91	95	91–93	94–103	107
T-CO2 (mmol/L)	22–29	23	29	26–28	23–26	26
hs-CRP (mg/L)	<5	16.5	—	11.3	9.0	—
ESR (mm/hr)	<20	—	10	23–73	126	51
Bilirubin (mg/dL)	0.2–1.2	0.9	—	—	—	—
Leukocyte ($\times 10^9$/L)	4–11	20.15	21.24	21.24	15.2	5.44
Platelet ($\times 10^9$/L)	150–450	221	238	238	180	259

Note: Values are grouped into clinically relevant phases to demonstrate disease progression and response to hemodialysis. "—" indicates not recorded.

DISCUSSION

Acute kidney injury (AKI) following multiple wasp stings is an uncommon but well-recognized complication of systemic envenomation[1]. Although most wasp stings cause only localized reactions, multiple stings can result in severe systemic toxicity due to the cumulative effect of venom components[2, 3].

Wasp venom contains biologically active substances, including phospholipases, melittin, and hyaluronidase, that can cause direct cellular injury and trigger inflammatory cascades[4,5]. The development of AKI in such cases is multifactorial, involving direct nephrotoxicity, intravascular hemolysis, and rhabdomyolysis[6-8]. These processes lead to pigment-induced nephropathy and acute tubular necrosis, which are the principal mechanisms of renal injury[9].

In addition, factors such as hypovolemia, hypotension, and delayed medical intervention may further aggravate renal ischemia and worsen clinical outcomes[10]. Previous studies have demonstrated that the severity of AKI correlates with the number of stings and the time interval before receiving appropriate treatment[11, 12].

In the present case, the patient developed severe AKI with a peak serum creatinine of 19.2 mg/dL and persistent oliguria, necessitating hemodialysis. The electrolyte abnormalities observed, including hyponatremia and borderline hyperkalemia, are consistent with findings reported in earlier studies[13].

Hemodialysis remains the mainstay of management in severe cases of toxin-induced AKI[14]. Early initiation of renal replacement therapy is associated with improved outcomes, particularly in patients with oliguria and severe azotemia[15]. In this case, the timely initiation of hemodialysis led to progressive clinical improvement and recovery of renal function.

The gradual decline in serum creatinine levels and normalization of urine output observed in this patient are consistent with reversible acute tubular injury[16]. Although some studies have reported progression to chronic kidney disease following severe envenomation, complete renal recovery is also well documented when appropriate treatment is provided[17, 18].

This case is notable for the severity of renal impairment and the subsequent complete recovery following dialysis support. It underscores the importance of early recognition of systemic envenomation, prompt referral to specialized care, and timely initiation of renal replacement therapy[19].

CONCLUSIONS

Mass envenomation from wasp stings can result in severe systemic toxicity, including acute kidney injury through mechanisms such as rhabdomyolysis, haemolysis, and direct nephrotoxicity. This case highlights the importance of early recognition of clinical deterioration, prompt supportive management, and timely initiation of renal replacement therapy where indicated. Clinicians in resource-limited settings should maintain a high index of suspicion for delayed complications even after initial stabilization. Early intervention and close monitoring can significantly improve outcomes in such potentially life-threatening presentations.

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