Case Report

Severe Clinical Impact of Multiple Wasp Stings: A Case Report of Acute Kidney Injury

Hana Fauziyah[1], Bayu Rusfandi Nasution[1], Alwi Thamrin Nasution[1]

[1] Division of Nephrology and Hypertension, Rasyida Kidney Hospital, Medan, Indonesia

ARTICLE INFO

Article history:
Received: June 7, 2024
Accepted: July 26, 2024
Published Online: August 24, 2024

Corresponding Author:
Hana Fauziyah, Division of Nephrology and Hypertension, Rasyida Kidney Hospital Medan, off.hanafauziyah@yahoo.com

ABSTRACT

Wasp stings are prevalent in Indonesia and have occasionally resulted in fatalities. Wasp stings can potentially induce a small localized allergic response, systemic reactions, or even life-threatening illnesses. Receiving several stings from wasps can cause systemic inflammation, resulting in acute kidney injury. We present a case of a 51-year-old female who experienced severe renal impairment as a result of repeated wasp stings. Following the stings, the patient promptly obtained medical attention. However, on the second day after the incident, the patient's renal function declined and experienced anuria. The ultrasonography indicates the presence of nephritis. The patient presented with 103 sting wounds, which resulted in local reactions and were accompanied by systemic symptoms. The patient was administered high-dose steroids and underwent five intermittent hemodialysis sessions, which effectively restored their kidney function. Evidence of enhanced renal function was demonstrated through the restoration of normal urine production, elevated glomerular filtration rate, and significant clinical improvements in the patient. This case illustrates the severe impact on the kidney of a generalized wasp sting and the effect of promptly receiving medical treatment following an enormous wasp sting on the patient's prognosis. Initiating dialysis promptly is crucial for rapidly eliminating toxins and thus preserving renal function.

Keywords: acute kidney injury, hemodialysis, wasp sting.

Introduction

Insect bites are often caused by Hymenopterans, which belong to three major families: Apidae (bees), Vespidae (wasps), and Formicidae (ants).[1] Indonesia is home to a wide variety of wasps. Wasps exhibit a high level of aggression when protecting their nests.[2] Contrary to bees, wasps can retract their stingers from their victim's skin and then fly away. Wasps can sting multiple times without limitation.[1]

The incidence of Hymenopteran stings is distributed in several regions of Indonesia. Between 2017 and July 2022, Indonesia has recorded 125 incidences of wasp stings, resulting in 12 deaths. The management of the Handling Program for Diseases Caused by Bites/Stings of Poisonous Animals and Poisonous Plants is still inadequate. The Ministry of Health and National Standard Operating Procedures provide instructions for the management of cases involving bites or stings from venomous animals and plants. The limited supply of antivenom is a contributing factor to the ongoing challenge of managing these patients.[3]

Cite this as:
Fauziyah H, Nasution BR, Nasution AT. Severe Clinical Impact of Multiple Wasp Stings: A Case Report of Acute Kidney Injury. InaKidney. 2024;1(2):45-49. doi: 10.32867/inakidney.v1i2.137

Case Illustration

A 51-year-old female patient experienced edema anasarca during the previous 48 hours. The woman was transported to the local hospital two hours after getting stung. She had conservative therapy and wound cleansing before being transferred to a general hospital. At the second hospital, the patient first received conservative treatment. However, after careful observation, it was determined that the patient needed hemodialysis. As a result, the patient was then referred to Rasyida Kidney Hospital. During the examination, we discovered a total of 103 sting wounds on the patient's body. Specifically, there were 36 wounds on the left leg, 11 on the right leg, 22 on the right hand, 9 on the left hand, 12 on the chest, 5 on the face, and 8 on the back. These wounds varied in size, ranging from 0.5x0.5 cm to 1x1 cm. Several wounds developed into ulcers, while minor wounds started to heal. The patient exhibited symptoms including dyspnea, facial edema, emesis, cephalalgia, reduced urinary output, and edema anasarca. The patient had no prior medical conditions or preexisting renal problems. All vital indicators were within the normal range except for an elevated respiratory rate.

Figure 1. Clinical changes in the patient. A. Both legs on the first day. B. Both legs upon discharge. C. Both hands on the first day. D. Both hands upon discharge.

The laboratory results indicate the following values including hemoglobin: 12.0 g/dL, leukocyte count: 21,400/mm^3, platelet count: 150,000/µL, urea: 155 mg/dL, creatinine: 5.0 mg/dL, estimated Glomerular Filtration Rate (eGFR): 13 mL/min, albumin: 2.0 g/dL, glucose ad random: 115 mg/dL, Sodium: 139 mmol/L, Potassium: 5.26 mmol/L, and Chloride: 111 mmol/L. The arterial blood gas analysis reveals the following values: pH: 7.24, pCO_2: 33.1 mmHg, pO_2: 97.0 mmHg, HCO_3: 14.0 mmol/L, total CO_2: 15.0 mmol/L, base excess: -13.3 mmol/L, and oxygen saturation: 96%. The urinalysis results indicate a pH of 6.5, a significant amount of protein (+++), and the presence of erythrocytes (+). The renal ultrasonography revealed indications of nephritis.

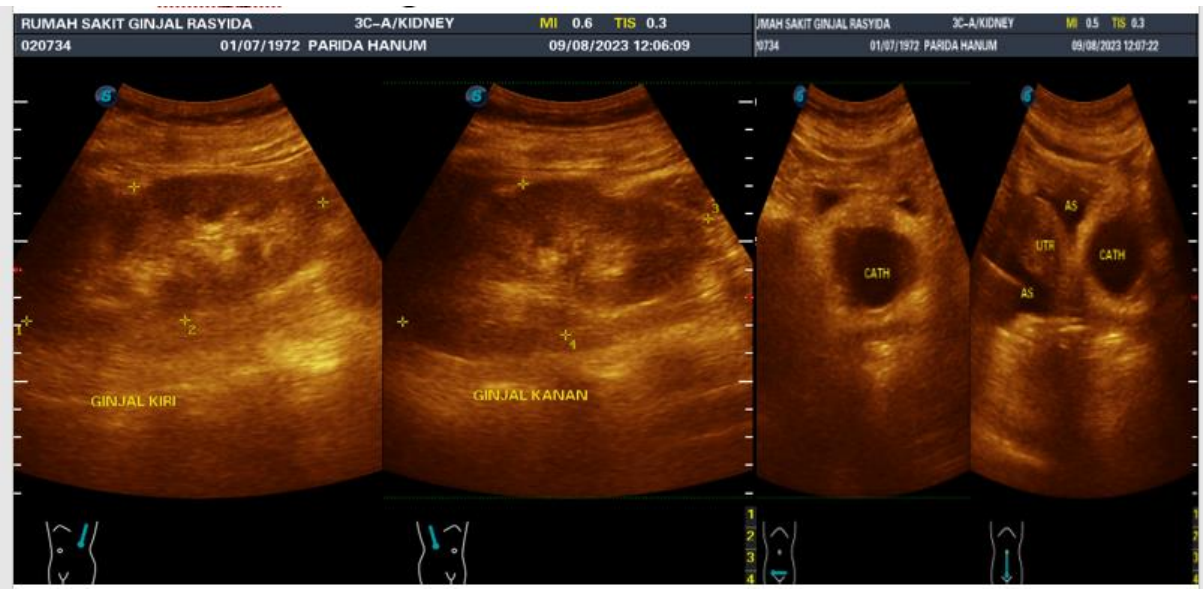

Figure 2. Ultrasonography examination results: showing signs of nephritis.

The patient was administered a large dosage of methylprednisolone intravenously and followed by oral dosages during her outpatient treatment. On the twelfth day of treatment, the patient experienced acute upper gastrointestinal bleeding, even though she had been receiving

proton pump inhibitor therapy since the first day she was admitted. During the following three days, the patient was treated with PPI therapy until the symptoms of upper gastrointestinal bleeding resolved. In addition, the patient presented with oral candidiasis infection, which was characterized by dysphagia and the presence of oral thrush. The edema anasarca was gone entirely on the final day of the treatment. The patient was discharged from the hospital after confirming the absence of digestive problems and an improvement in appetite.

Discussion

The venom of Hymenoptera contains several bioactive chemicals, including toxins, enzymes, activators, growth factors, and inhibitors.[4, 5] A typical local reaction is characterized by pain and swelling that persists for more than 24-48 hours and resolves within 5-10 days.[6] Kinin is the primary cause of pain, where vasoactive amines are responsible for edema, and tissue damage is mediated by enzymes such as phospholipase and hyaluronidase. A localized reaction occurred for this patient, characterized by swelling in the 103 locations of the sting wound.

An excessive quantity of venom can lead to systemic toxin reactions due to multiple stings, ranging from fifty to hundreds or even thousands of stings. The extensive venom stimulates an inflammatory reaction that involves the release of pro-inflammatory cytokines IL-1β, TNF-α, and IL-6, resulting in generalized inflammation and damaging tissues. As a result, chemical mediators such as histamine, leukotrienes, prostaglandins, and thrombocyte activators are released, interfere with the coagulation system, and cause hemoconcentration. Within 24 hours, it may develop into hemolysis, hemoglobinuria, rhabdomyolysis, elevated liver transaminase enzymes, interstitial nephritis, renal insufficiency, and electrolyte imbalances may develop due to rhabdomyolysis.[1] Administering high-dose steroid therapy as the first line of treatment is advantageous in preventing the progression of interstitial nephritis, which can develop in patients with acute kidney injury following a wasp sting.[7, 8]

The management of acute kidney injury resulting from insect stings is similar to the management of acute kidney injury in individuals with pre-existing kidney problems.[9, 10] Hemodialysis is effective in eliminating small-sized substances from the bloodstream. In case of poisoning caused by toxic substances, dialysis may be performed to eliminate toxic substances from the body rapidly. The requirement for dialysis is not determined by the severity of renal impairment in this type of condition. The Acute Dialysis Quality Initiative (ADQI) created the RIFLE method to diagnose and categorize different types of acute kidney problems.[11] In this patient, a reduction in eGFR to 15 (mL/min/1.73m^2) was observed on the second day as well as the production of urine is less than 0.1 mL per kilogram of body weight per hour.

The appropriate timing to start Renal Replacement Therapy (RRT) in patients with acute kidney injury cannot be ascertained. The initiation of RRT is primarily determined by the clinical manifestation of excessive fluid accumulation and the biochemical indication of an imbalance in solute levels (such as hyperkalemia and severe acidosis).[11] Several studies have shown that initiating dialysis early when there are signs of renal function decline can effectively improve kidney function and patient prognosis and potentially save numerous lives.[7,9] Most patients who experience acute kidney injury due to wasp stings require temporary RRT until their clinical condition improves and their kidney excretory function is restored to its normal state.[12] Metabolic acidosis in patients with acute kidney injury would normally be resolved by administering bicarbonate and rarely requires urgent dialysis unless there is simultaneous volume overload or uremia. When deciding to stop RRT in patients with acute kidney injury, it is important to consider the goal of improving kidney function. The decision whether or not to stop RRT is determined by urine production.[11] The patient decided on RRT, specifically hemodialysis, soon after discovering a significant decrease in kidney function accompanied by

relevant clinical problems. During the patient's stay, hemodialysis was performed in 5 sessions. The interval between hemodialysis sessions was not uniform but instead adjusted according to the patient's clinical status. The patient experienced a reduction in edema anasarca, leading to a decrease of 6 kg in body weight during treatment. While in the hospital, the patient was administered sodium bicarbonate intravenously and then orally to treat metabolic acidosis.

Diuretics are frequently used in the management of patients with AKI to control fluid imbalance. Furthermore, oliguric acute kidney injury is associated with a more adverse outcome compared to non-oliguric acute kidney injury. Consequently, physicians frequently use diuretics to convert oliguric acute kidney injury to non-oliguric acute kidney injury. Diuretics are used to control fluid imbalance and facilitate the administration of nutrition and drugs. Moreover, diuretics have renoprotective effects that can prevent the development of acute kidney injury and accelerate the process of recovery.[11] The patient's condition, marked by the presence of edema anasarca, pulmonary edema, and anuria since admission, suggests the need for intravenous furosemide treatment to promote diuresis. The patient had anuria, with urine production less than 0.1 mL per kilogram per hour for 7 days. Throughout the first 10 days of treatment, the patient's urine output over 24 hours consistently remained below 400 mL. Following four hemodialysis treatments, the patient's kidney function started to improve on the 11th day of therapy. This recovery continued until the patient was discharged with a consistent increase in urine volume and eGFR. After the medical care, the patient's urine increased to a total volume of 3100 mL. Diuretics were administered continuously throughout until the patient was discharged from the hospital. The edema anasarca consistently reduced, with an average weight loss of 0.3 kg per day during the first 7 days and 0.5 kg per day during the subsequent 8 days.

Conclusion

This case illustrates the essential effect of promptly receiving medical treatment following an enormous wasp sting on the patient's prognosis. Initiating dialysis promptly is crucial for rapidly eliminating toxins and thus preserving renal function. Furthermore, the administration of high-dose steroids as an initial treatment has been scientifically proven to be effective. The management of cases involving numerous wasp stings can be effectively managed due to the improvements in healthcare services.

Declarations

Competing interests

The authors declare no conflict of interest.

Funding source

This study did not receive any external funding.

Acknowledgments

None.

References

1. Freeman TM, Tracy JM. Stinging Insect Allergy: A Clinician's Guide. 2017:17-84. doi: 10.1007/978-3-319-46192-2
2. Hanawa M, Kojima J-i. Distribution pattern of swarm-founding eusocial wasps in the Indonesian Archipelago in comparison of that of parrots, one of sedentary bird groups. BIO Web Conf. 2020;19. doi: 10.1051/bioconf/20201900009
3. Kementerian Kesehatan RI. Rencana Aksi Kegiatan 2020-2024 (Revisi) 2018. Available from: https://e-renggar.kemkes.go.id/file_performance/1-465827-06-4tahunan-710.pdf.
4. Guido-Patiño JC, Plisson F. Profiling hymenopteran venom toxins: Protein families, structural landscape, biological activities, and pharmacological benefits. Toxicon X. 2022;14. doi: 10.1016/j.toxcx.2022.100119
5. Rich RR. Clinical Immunology Principles And Practice. 4th edition ed. China: Elsevier Saunders; 2013

6. Allergy and Clinical Immunology. Oxford: Wiley-Blackwell; 2015.
7. Ambarsari CG, Sindih RM, Saraswati M, Trihono PP. Delayed Admission and Management of Pediatric Acute Kidney Injury and Multiple Organ Dysfunction Syndrome in Children with Multiple Wasp Stings: A Case Series. Case Rep Nephrol Dial. 2019;9(3):137-48. doi: 10.1159/000504043
8. Hidayati EL, Rosyady M, Puspitasari HA, Saraswati M, Grace A, Ambarsari CG. Plasma exchange and hemodialysis for severe manifestations of multiple wasp stings in a child. J Renal Inj Prev. 2020;9(3):e27. doi: 10.34172/jrip.2020.27
9. Junior GBdS, Junior AGV, Rocha AMT, Vasconcelos VRd, Neto JdB, Fujishima JS, et al. Acute kidney injury complicating bee stings - a review. Rev Inst Med Trop Sao Paulo. 2017;59:e25. doi: 10.1590/S1678-9946201759025
10. Perhimpunan Nefrologi Indonesia. Konsensus Dialisis. Jakarta: Pernefri; 2003.
11. Walther CP, Podoll AS, Finkel KW. Summary of clinical practice guidelines for acute kidney injury. Hosp Pract (1995). 2014;42(1):7-14. doi: 10.3810/hp.2014.02.1086
12. Arshad AR, Rashid A. Acute Kidney Injury Complicating Wasp Stings: A Report of Two Cases and Literature Review. Cureus. 2023;15(4):e37343. doi: 10.7759/cureus.37343