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## Acute Interstitial Nephritis Following Multiple Asian Giant Hornet Stings

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Data Collection B  
Statistical Analysis C  
Data Interpretation D  
Manuscript Preparation E  
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**Conflict of interest:** None declared

**Patient:** Male, 42  
**Final Diagnosis:** Acute interstitial nephritis  
**Symptoms:** Difficulty breathing • headache • numbness • oliguria  
**Medication:** Methylprednisolone  
**Clinical Procedure:** Plasma exchange  
**Specialty:** Nephrology

**Objective:** Rare disease

**Background:** The Asian giant hornet is the largest wasp species in the world. Its stings can cause acute interstitial nephritis and acute renal failure. From July to October, 2013, Asian giant hornet attacks have killed 42 people and injured 1675 people with their powerful venomous stings in Hanzhong, Ankang, and Shangluo, three cities in the southern part of Shaanxi Province, China.

**Case Report:** We report here a case of a 42-year-old man with acute interstitial nephritis following multiple Asian giant hornet stings. On admission, the patient had difficulty breathing, headache, and numbness in both limbs (arm and leg). He was treated in the Emergency Department and Department of Nephrology with plasma exchange and dialysis within 24 hours after being stung. A kidney biopsy revealed acute interstitial nephritis with interstitial infiltrations of eosinophils and lymphocytes. After intensive treatment, his liver function recovered within 10 days. Along with oral methylprednisolone, his renal function recovered 1 month later.

**Conclusions:** This case shows that acute interstitial nephritis happens several days after being stung. Since the number of deaths in southern Shaanxi province is much higher than other places, our report draws the attention of fellow clinicians to the acute interstitial nephritis following multiple Asian giant hornet stings.

**MeSH Keywords:** Acute Kidney Injury • Methylprednisolone • Wasp Venoms

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## Background

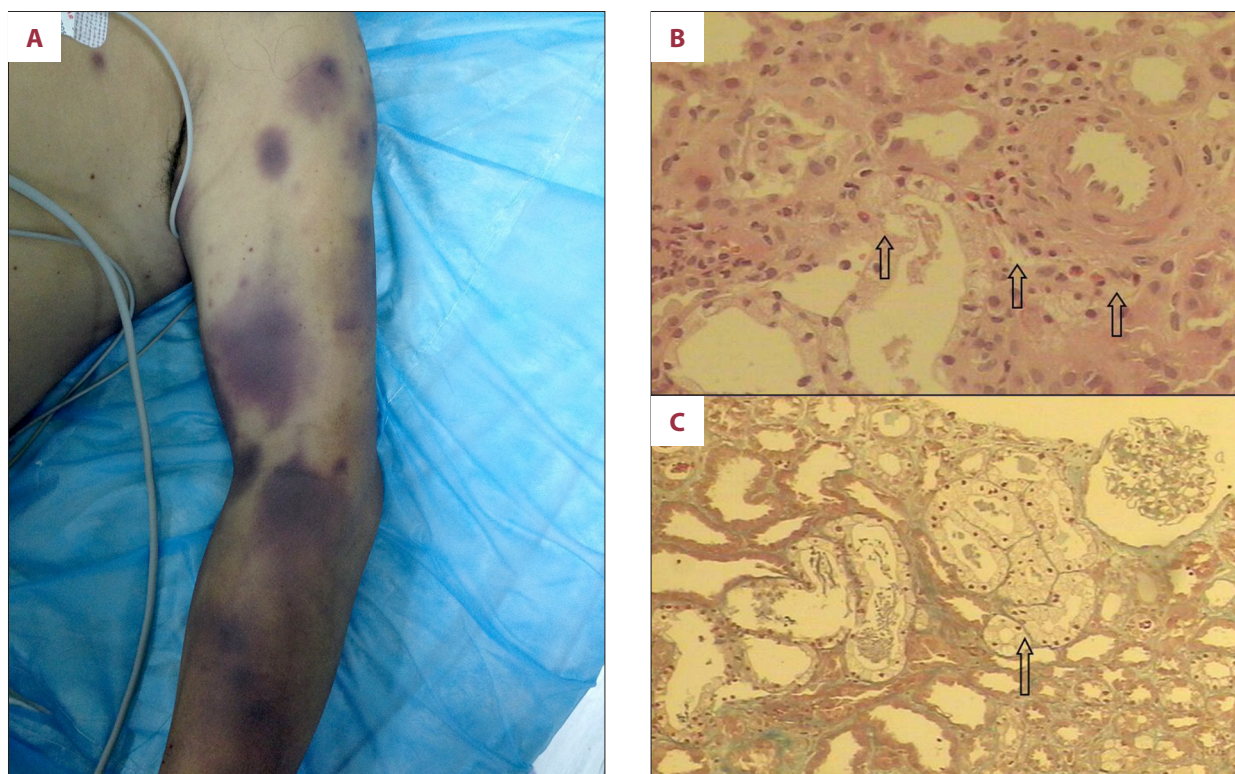
From July to October, the Asian giant hornets (*Vespa mandarinia*) have killed 42 people and injured 1,675 people with their powerful venomous stings in Hanzhong, Ankang, and Shangluo, 3 cities in the southern part of Shaanxi province, according to the CNN report. The Asian giant hornet is the world's largest wasp and some queens reach more than 50 mm in length. They are found throughout Eastern Asia. In recent years, some cases of Asian giant hornet stings have been reported in Japan. They can cause severe clinical symptoms such as acute interstitial nephritis, acute renal failure, and multi-organ injuries [1,2]. Here, we report a case of acute interstitial nephritis following multiple Asian giant hornet stings from Hanzhong City, China.

## Case Report

A 42-year-old man arrived at the Emergency Department about 5 hours after he was attacked by swarms of Asian giant hornets. On admission, he had difficulty breathing, headache, and numbness in both limbs (arm and leg). On physical examination, he was found to have approximately 66 sting marks in exposed areas of the face, head, neck, upper limb, and upper

thorax (Figure 1A). His blood pressure was 136/90 mmHg, and heart rate was 46/min. An initial blood laboratory test revealed the following indexes: white blood cells ( $32.94 \times 10^9/L$ ), hemoglobin (141 g/L), and platelets ( $199 \times 10^9/L$ ). Urine examination revealed a specific gravity of 1.01 and absence of proteinuria and red blood cells. Chest X-ray was normal, and electrocardiography showed sinus bradycardia of 45/min. Urine output was 200 ml/24 h on the first day. Subsequent laboratory test results are shown in Table 1.

The patient was given methylprednisolone, plasma exchange, and continuous veno-venous hemofiltration (CVVH). On day 3, a laboratory investigation revealed such indexes: direct bilirubin (13.69  $\mu\text{mol/L}$ ), alanine transaminase (163.9 U/L), aspartate aminotransferase (1124.00 U/L), creatine kinase CK (5342.3 U/L), creatine kinase-MB (577.0 U/L), troponin I (1.092 ng/ml), and serum creatinine (185.00  $\mu\text{mol/L}$ ). Ten days later, creatine kinase-MB and troponin I became normal. However, the patient had progressively worsening oliguria (200 ml/24 h) and the serum creatinine increased to 534  $\mu\text{mol/L}$ . On day 17, he remained oliguric (250 ml/24 h) and serum creatinine increased to 1130.5  $\mu\text{mol/L}$ . His renal function further deteriorated, color Doppler sonographic signal of the size of the kidneys increased, and renal parenchyma was 2.5 cm thick. A kidney biopsy was



**Figure 1.** Clinical appearance of the multiple sting sites of the patient and light microscopy findings at autopsy. Arrows in each image indicate histopathological changes. (A) Clinical appearance of the multiple sting sites on the left upper limb of the patient at hospitalization. (B) Cytoplasmic vacuoles, flattened epithelium, and irregularly round nuclei in tubular epithelial cells (Masson  $\times 100$ ). (C) Large numbers of eosinophils, lymphocytes, and neutrophils in interstitial edema (H & E  $\times 200$ ).

**Table 1.** Laboratory results.

Investigation	Day 1	Day 10	Day 31	Normal range
Total bilirubin	59.1 umol/L	11 umol/L	9.2 umol/L	3.4~20.5 umol/L
Direct bilirubin	18.86 umol/L	3.53 umol/L	4.14 umol/L	0.0~4.3 umol/L
Alanine transaminase	79.4 U/L	33 U/L	27.1 U/L	3.00~40.00 U/L
Aspartate aminotransferase	800.10 U/L	12.5 U/L	14.5 U/L	0~40 U/L
Creatine kinase	2974.20 U/L	310.8 U/L	381.1 U/L	25~200 U/L
Creatine kinase-MB	211.0 U/L	17 U/L	11.0 U/L	7~25 U/L
Troponin I	1.705 ng/ml	0.052 ng/ml	0.027 ng/ml	<0.4 ng/ml
Serum creatinine	130.7 umol/L	534 umol/L	159.3 umol/L	44~133 umol/L

performed. Under a light microscope, 19 glomeruli could be identified and all these glomeruli appeared normal. Tubular epithelial cells were distended by abundant, large, cytoplasmic vacuoles, while the blood vessels were normal (Figure 1B). The interstitial inflammation was accompanied by interstitial edema and focal interstitial infiltration with eosinophils and lymphocytes (Figure 1C). These findings were consistent with interstitial nephritis. The patient was continually given methylprednisolone orally 32 mg/day. On day 31, his urine output gradually increased to more than 2.8 liter/day and serum creatinine decreased to 159.3 umol/L.

## Discussion

In 1972, Sitprija first reported that wasp stings could lead to acute renal failure and myonecrosis [3]. Life-threatening multi-organ injuries following wasp and Asian giant hornet stings have been reported from time to time, but it is very unusual that so many people were killed and injured by Asian giant hornet in a short period of time. The wasp stings can directly cause toxin-induced acute renal failure because its venom contains histamine, melittin, apamin, phospholipases A1, hyaluronidase, acid phosphatase, and degranulating peptide

mastoparan [4,5]. As one of these injured people, our patient had an anaphylaxis-like reaction, which seemed to be caused by a delayed hypersensitive reaction to the venom because his condition was improved by kidney-supportive measures along with oral methylprednisolone therapy and he clinically lacked wheal and respiratory symptoms. This is similar to a case reported by Ghosh from India [6]. Moreover, our patients had no clinical or laboratory evidence of hemolysis and rhabdomyolysis, which are the 2 major factors that cause acute renal failure and always induce by toxic reaction [7,8]. In fact, in the southern part of Shaanxi province, China, there are many unpublished cases of Asian giant hornet envenomations, which account for a heavy death toll annually. Due to the fact that death reports from Asian giant hornet envenomation are scarce in China, some injured patients may not be treated promptly.

## Conclusions

Our case is quite valuable and significantly indicates that Asian giant hornet stings may cause severe clinical symptoms. Early treatment is vital in protecting kidney functions and preventing morbidity and mortality. Timely and appropriate supportive management is necessary.

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