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Case Report

# A Rare Case of Multiple Wasp Stings Causing Bilateral Ischemic Stroke

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## ABSTRACT

**Background and Importance:** Only 19 cases of wasp stings causing proven ischemic stroke have been reported. Authors reported a rare case of multiple wasp stings causing bilateral ischemic stroke.

**Case Presentation:** The authors report a 49-year-old man presenting with multiple (more than 50) wasp stings all over his body. The patient developed loss of consciousness (LOC) and right hemiparesis of Medical Research Council (MRC) grade 1 power. Magnetic resonance imaging (MRI) of the brain revealed a large area of infarction in the left front-temporal-parietal region involving basal ganglia, corona radiata, centrum semiovale, and the right parietal cortex. Computed tomography (CT) scan the next day showed a significant increase in brain edema with a midline shift to the right side. The patient underwent a left front-temporalparietal decompressive craniectomy and duraplasty. His condition gradually improved and underwent cranioplasty five months later.

**Conclusion:** Multiple wasp stings can cause life-threatening cerebral infarcts. Wasp stings causing large ischemic infarcts require decompressive craniectomy to save the patient. Early radiological evaluation of suspicious cases and prompt medical and surgical intervention are the key to successful treatment of cerebral infarction due to wasp sting.

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## Highlights

- Wasps, bees, and hornets belong to the order of insects called Hymenoptera.
- Wasp stings usually cause local inflammatory reactions and, less commonly, severe systemic allergic reactions.
- We present a rare case of bilateral ischemic stroke due to wasp stings.
- The mechanism of the neurotoxic effect of wasp stings remains unclear.
- Antihistamines, steroids, and epinephrine are used to control allergic responses.
- Large cerebral infarcts cause hemiparesis, increased brain edema, and deteriorating consciousness.
- Early radiological evaluation of a suspicious infarct, along with prompt medical and surgical intervention, is key to treatment success.
- Patients may require decompressive craniectomy to decrease brain edema and prevent brain herniation.

## Plain Language Summary

Wasp stings are common and typically cause local skin reactions. The local reactions are self-limiting and settle within a few hours. Herein, we present a rare case of stroke due to wasp stings. Patients develop limb weakness and decreased consciousness due to stroke. Health care personnel's awareness of rare complications of wasp stings is crucial to timely identifying and treating such patients. A large stroke can cause increased brain edema and require emergency surgery to save the patient.

## 1. Background and *Importance*

Honeybees and wasps are hymenopterans. Only 19 cases of wasp stings causing proven ischemic stroke have been reported.

Local reactions due to wasps and bee stings are self-limiting and settle within a few hours. Multiple stings can lead to vomiting, diarrhea, dyspnea, generalized edema, hypotension, syncope, acute renal failure, and death. Rarely, they cause vasculitis, serum sickness, neuritis, or encephalitis. Wani et al. reported a case of multiple wasp stings causing right hemiparesis. Magnetic resonance imaging (MRI) revealed multiple bilateral infarcts. Patient was discharged in a vegetative state on oral steroids and antibiotics [1]. Cerebral infarction in wasp stings could be due to vasculitis, hypoperfusion, retrograde stimulation of the superior cervical ganglion, coagulopathy, or vasospasm. However, the exact pathophysiology is unknown [2].

The authors reported a rare case of bilateral ischemic stroke due to multiple wasp stings that led to increased brain edema and required decompressive craniectomy to reduce intracranial pressure.

## 2. Case Presentation

A 49-year-old man presented with multiple (>50) wasp stings (Figure 1) all over the body at 8.30 AM. The patient developed a loss of consciousness (LOC) due to an anaphylactic reaction. Bite marks were considered for the face, trunk, and limbs. The patient was treated with antihistaminic and steroid medications. The patient regained consciousness without any neurological deficits and returned home. At 8 PM, he was brought back due to LOC and right hemiparesis.

MRI of the brain taken at 10.15 PM revealed a large area of diffusion restriction in the left front-temporal-parietal region involving basal ganglia, corona radiata, centrum semiovale, and in the right parietal cortex (Figure 2). He had a Glasgow coma scale (GCS) score of E1V1M5 (E-Eye, V-Verbal, M-Motor), bilateral equal reacting pupil, and right hemiparesis with Medical Research Council (MRC) grade 1 power. His pulse rate was 88/minute, his blood pressure (BP) 180/100 mm Hg, and he was afebrile. The patient was intubated and ventilated with a low GCS score. MR angiogram taken at 1.20 AM the next day revealed luminal narrowing of the distal segment of bilateral common carotid arteries

**Figure 1.** Some of the multiple wasps removed from the patient's body

(CCA) and bilateral cervical internal cerebral artery (ICA) (Figure 3), along with attenuated cortical branches of bilateral middle cerebral arteries (MCAs).

Cardiological evaluation using echocardiography revealed no abnormalities. Table 1 presents blood parameters. The patient was a non-smoker and had no comorbidities. No history of wasps or bee stings was observed. The patient was treated with antiplatelet agents, antibiotics, steroids, antiepileptics, anti-edema measures, and ventilation. Computed tomography (CT) scan taken at 11.40 AM showed significant increase in brain oedema with midline shift to right side (Figure 4).

The patient underwent a left fronto-temporoparietal decompressive craniectomy. The dura was opened, and duraplasty was performed using the pericranium. Antihypertensives were started owing to increased BP. The patient underwent tracheostomy on postoperative day (POD) 4 and was weaned off the ventilator. His GCS score was E2VtM5, pupils were bilaterally reactive, and he had right hemiparesis. Multiple wasp stings and edema of the upper limbs were noted (Figure 5).

A Venous Doppler study did not reveal any deep vein thrombosis in the upper limbs. Arterial Doppler showed normal blood flow patterns in both the upper limb arteries. A CT scan obtained on POD 13 showed left-sided craniectomy decreased brain edema, and multiple infarcts (Figure 6).

The patient's condition gradually improved, and he started obeying commands on POD 14. The tracheostomy was closed, and the patient was discharged on POD 17. He underwent cranioplasty after 5 months, during which his GCS score was E4V4M6, right upper limb power was MRC grade 2, and right lower limb power improved to MRC grade 4. No weakness was observed in the left upper or lower limbs.

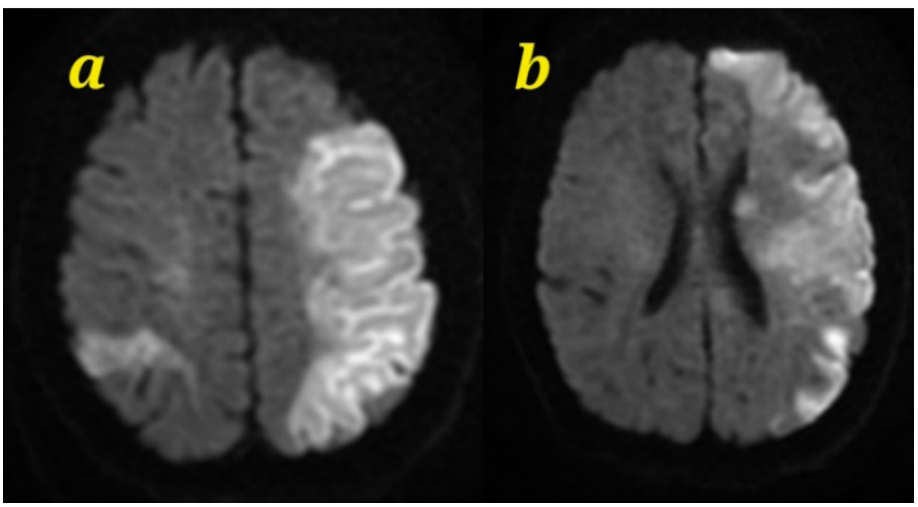


**Figure 2.** Diffusion weighted MRI images

a and b) Show a large area of diffusion restriction in the left fronto-temporo-parietal region involving the basal ganglia, corona radiata, centrum semiovale, and right parietal cortex.

MRI: Magnetic resonance imaging.

**Figure 3.** MR angiogram of neck

Abbreviations: MRA: Magnetic resonance angiography; CCA: Common carotid artery; ICA: Internal cerebral artery.

Notes: MRA shows luminal narrowing of the distal segment of bilateral CCAs and bilateral cervical ICAs.

## 3. Discussion

Wasps, bees, and hornets belong to the order of insects called “Hymenoptera”. Millions of Hymenoptera stings occur annually. They usually cause local inflammatory reactions and, less commonly, severe systemic allergic reactions [3]. Local reactions include itching, swelling of lips, and urticaria [4]. Systemic reactions include hypotension or anaphylactic shock, generalized edema, respiratory failure, or even multiple organ failures. Neurological complications, including stroke, are rare [3].

**Figure 4.** CT scan of head

CT: Computed tomography.

Notes: A CT scan shows left fronto-temporo-parietal and right parietal infarcts with brain edema and midline shift to the right side.


**Figure 5.** Multiple wasp sting marks over the body

Notes: The figures show limb edema and multiple sting marks on day 5 (a), day 7 (b), day 11 (c), and day 14 (d) of the wasp sting bite.

Wasp sting can present with sudden onset hemiparesis, facial weakness, and dysarthria due to MCA territory infarct. Serum wasp immunoglobulin E may be raised in such cases [5]. Min et al. reported a patient with wasp stings on his head and right shoulder. He developed left-sided hemiplegia, clumsy speech, and left facial droop due to acute progressive cerebral infarction. However, magnetic resonance angiography (MRA) showed normal blood vessels. Venom-induced vasospasm was suspected in this case [6]. Sundaramoorthy et al. reported a case of left MCA infarcts due to multiple wasp stings (about 40 to 50 wasps). He had 4-5 episodes of wasp stings in the past. However, no history of reactions from previous wasp stings was observed. Larger venom dose

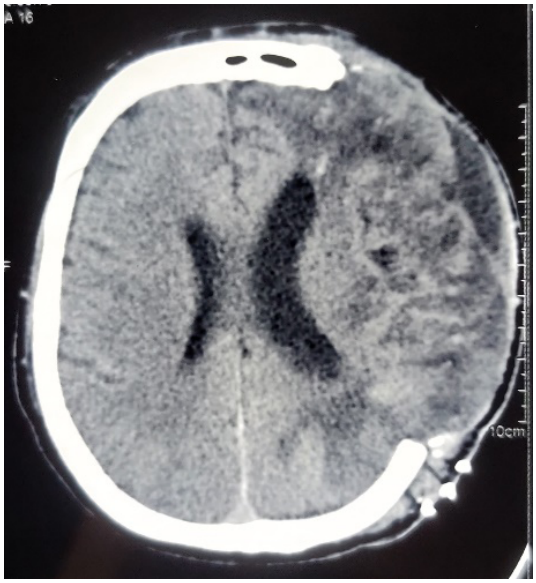

**Figure 6.** Postoperative CT scan

CT: Computed tomography; POD: Postoperative day.

Notes: The CT head taken on POD 13 showed left-sided craniectomy and decreased brain edema along with multiple infarcts.

**Table 1.** Laboratory findings of the patient with multiple wasp stings

| Investigations | Values |
|---|---|
| Haemoglobin (g/dL) | 16.8 |
| Total leukocyte count | 30300/uL |
| Differential leukocyte count (%) | Neutrophils: 89<br>Lymphocytes: 6<br>Eosinophils: 0<br>Monocytes: 0<br>Basophils: 0<br>Band cells: 4<br>Metamyelocytes: 1 |
| Platelet count | 243000/uL |
| Red blood cell count | 5.43/L |
| Haematocrit (%) | 50.2 |
| Blood urea (mg/dL) | 26 |
| Serum creatinine (mg/dL) | 0.8 |
| Uric acid (mg/dL) | 5.9 |
| Sodium (mmol/L) | 133 |
| Potassium (mmol/L) | 4.4 |
| PT | 15 |
| INR | 1.15 |
| CRP (mg/L) | 97.7 |
| ESR | 6 |
| TSH (IU/mL) | 3.62 micro |
| Lipid profile (mg/dL) | Cholesterol: 53<br>Triglyceride: 36<br>HDL: 12<br>LDL: 33 |
| Liver function test | Bilirubin total 2.3 mg/dL<br>Bilirubin direct 0.5 mg/dL<br>AST 99 U/L<br>ALT 62 U/L<br>ALP 96 U/L<br>Total protein 7.8 g/dL<br>Albumin 4.3 g/dL<br>Globulin 3.5 g/dL |

Abbreviations: PT: Prothrombin time; INR: International normalized ratio; CRP: C-reactive protein; ESR: Erythrocyte sedimentation rate; TSH: Thyroid stimulating hormone; HDL: High-density lipoprotein; LDL: Low-density lipoprotein; AST: Aspartate aminotransferase; ALT: Alanine transaminase; ALP: Alkaline phosphatase.

**Table 2.** Case reports of ischemic stroke after wasp sting

| Sl. No. | Authors, Year | Neurological Manifestations | Radiological Findings |
|---|---|---|---|
| 1 | Min et al. [6], 2022 | Left hemiplegia<br>Clumsy speech<br>Left UMN facial palsy | Cerebral infarction |
| 2 | Karri et al. [8], 2021 | Left hemiplegia<br>Death | Massive infarct in the right ACA and MCA regions. Right ICA thrombosis |
| 3 | Dalugama et al. [9], 2018 | Slurring of speech<br>Right UMN facial palsy<br>Right hemiparesis | Acute infarction in the left posterior frontal white matter |
| 4 | Moein et al. [3], 2017 | Dysarthria<br>Left upper limb weakness<br>Alien hand syndrome | Right frontoparietal infarct |
| 5 | Tao et al. [2], 2017 | Right hemiparesis, motor aphasis | MCA territory ischemic stroke |
| 6 | Kulhari et al. [5], 2016 | Left hemiparesis, left facial weakness, and dysarthria | MCA territory ischemic stroke |
| 7 | Wani et al. [1], 2014 | Right hemiparesis<br>Vegetative state | Multiple ischemic lesions in both cerebral hemispheres, pons bilateral thalami, and left parieto-occipital regions |
| 8 | Sundaramoorthy et al.[4], 2011 | Right hemiparesis<br>Right UMN facial nerve palsy<br>Slurring of speech | Left MCA multiple infarcts |
| 9 | Vidhate et al. [10], 2011 | Left upper motor neuron-type facial nerve palsy.<br>MRC grade 1 power in all four limbs. | Infarcts in the left frontoparietal cortex, posterior limb of the left internal capsule, and right subcortical region<br>Bilateral cavernous sinus thrombosis |
| 10 | Taurin et al. [11], 2006 | Vomiting<br>Hiccups<br>Nystagmus<br>Vagal syncope | Left dorsal medulla infarct in the territory of the posteroinferior cerebellar artery |
| 11 | Chen et al. [12], 2004 | Left UMN facial palsy<br>Left hemiplegia<br>Paraplegia | Right MCA infarct |
| 12 | LikiLikittanasombut et al. [13], 2003 | Encephalomyeloradiculopathy<br>Quadriplegia | MRI showed multiple ill-defined scattered lesions involving the grey and white matter of the medulla, pons, midbrain, basal ganglia, thalami, centrum semiovales, cortical grey matter, and cervical cord. |
| 13 | Sachdev et al. [14], 2002 | Left hemiplegia<br>Right nuclear cranial nerve seven palsy<br>Dysarthria<br>Right sided Cerebellar signs | Right ventral pons infarct<br>Right cerebellar infarct |
| 14 | Crawley et al. [15], 1999 | Right homonymous quadrantinopia | Left occipital infarct |
| 15 | Gállego et al. [7], 1995 | Stuporous<br>Right hemiparesis<br>Coma<br>Death | Bilateral pallidostriatal radiolucencies |
| 16 | Riggs et al. [16], 1994 | Slurred speech<br>Left hemiparesis<br>Delayed development of obtundation and quadriplegia. | Focal ischemic lesions were initially observed in the right centrum semiovale and right temporal lobe.<br>After 10 days, diffuse bilateral ischemic white matter lesions and left parietal and insular cortical infarctions were observed. Occlusions of the right and left internal carotid arteries. |
| 17 | Riggs et al. [17], 1993 | Right hemiparesis<br>Aphasia | Ischemic infarction in the left MCA territory<br>Left ICA occlusion |
| 18 | Romano et al. [18], 1989 | Right hemiparesis, slurred speech | Left supraclinoid ICA occlusion<br>Infarction of left putamen and caudate nucleus |
| 19 | Starr et al. [19], 1977 | Right hemiparesis | Cerebral infarction |
| 20 | Day et al. [20], 1962 | Right hemiplegia<br>Decerebrate rigidity<br>Death | Autopsy: Left parietal infarct |

Abbreviations: UMN: Upper motor neuron; ICA: Internal carotid artery; MCA: Middle cerebral artery; MRC: Medical research council; MRI: Magnetic resonance imaging; ACA: Anterior cerebral artery.

of multiple wasp stings was considered as the cause in this case [4]. A patient developed right hemiparesis and acute encephalopathy with coma after a single wasp sting. The patient died 72 h after the wasp sting. An autopsy revealed bilateral pallidostriatal necrosis and diffuse neuronal damage in the frontal, temporal, and parietal cortices. This occurred due to the neurotoxic effect of the poison and hypersensitivity [7]. A 40-year-old male presented with left hemiplegia after 6 hours of massive wasp stings. MRI showed right internal carotid artery (ICA) thrombosis causing massive infarct in anterior cerebral artery (ACA) and MCA territory [8]. In the authors' case, larger venom dose of multiple wasp stings and luminal narrowing of carotid arteries, along with attenuated cortical branches of bilateral MCAs, are the causes of bilateral cerebral infarcts in their case. Table 2 describes the previously published cases of ischemic stroke after wasp sting."

The mechanism underlying the neurotoxic effects of wasp stings remains unclear. Some authors believed that the mechanism of stroke was cerebral vasoconstriction caused by the vasoactive peptides [5]. Others suggested that venom had induced vasospasm and stimulated the superior cervical sympathetic ganglion, leading to cerebral infarction [6]. Sundaramoorthy et al. considered that severe reactions, such as cerebral infarcts, occur due to the larger volume of venom of multiple wasp stings [4]. However, Gállego et al. noted that a single wasp sting can cause neurotoxic effects and hypersensitivity, leading to encephalopathy and death [7].

Management starts with the stabilization of the airway, breathing, and circulation. Antihistamines, steroids, and epinephrine have been used to control allergic responses. No guidelines are available for the management of ischemic stroke after wasp stings due to the limited number of cases. Intravenous tissue plasminogen activator showed good outcomes in one report. To prevent cerebral vasoconstriction, the intravascular volume and hemodynamic status should be closely monitored. Aggressive BP augmentation and fluid resuscitation is crucial in these patients [5].

## 4. Conclusion

Multiple wasp stings can cause bilateral cerebral infarctions. Even if the initial symptoms are insignificant, wasp stings require close monitoring. Public and healthcare personnel awareness of wasp-sting complications is crucial. Multiple wasp stings causing a large ischemic insult to the brain can cause increased brain edema and require decompressive craniectomy to save the patient. Early radiological evaluation of suspicious cases and prompt medical and surgical intervention are key to the successful treatment of cerebral infarction due to wasp sting.

## Ethical Considerations

### Compliance with ethical guidelines

Informed consent was obtained from the patient.

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### Authors' contributions

Conceptualization or design of the work: Binoy Damodar Thavara and Rajeev Mandaka Parambil; Data collection: Binoy Damodar Thavara, Prem Kumar Sasi, and Atul Kale Keshavrao; Data analysis and interpretation: Binoy Damodar Thavara, Byjo Valiyaveetil Jose, and Ebby Sebastian; Drafting the article: Binoy Damodar Thavara, Rajeev Mandaka Parambil, and Byjo Valiyaveetil Jose; Critical revision of the article: Rajeev Mandaka Parambil, Binoy Damodar Thavara, and Shanavas Cholakkal; Study supervision: Rajeev Mandaka Parambil; Review of results and approval of the final version of the manuscript: All authors.

### Conflict of interest

The authors declared no conflict of interest.

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