Rare disease

An unusual neurological consequence of massive wasp stings

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Summary

Although rare, central and peripheral neurological manifestations after single or multiple wasp stings have been reported. The authors describe a 45-year-old man who developed periods of sudden loss of consciousness with a Glasgow Coma Scale of 6 after being stung by fifty wasps. These periods were seen directly after being stung and were continuing months later. Different mechanisms and pathophysiological findings of neurological sequela reported after wasp stings are being reviewed.

BACKGROUND

Wasp (Hymenoptera) stings are common and can cause severe allergic reactions ranging from local reactions to anaphylactic shock or even death. However, neurological complications after single or multiple stings are uncommon. Serious damage to the central and peripheral nervous systems is described. Different mechanisms of neurological complications after wasp stings are suggested but poorly understood. We report a new unusual neurological complication after massive wasp sting.

CASE PRESENTATION

A 45-year-old man was admitted to the intensive care unit (ICU) after being stung by more than 50 *Vespula Germanica* species. He was mowing the lawn and unknowingly passed through the wasps hive. He was primarily stung on his arms and the left side of his neck. Within minutes he developed severe local erythema and oedema followed by dizziness, diaphoresis and a sudden loss of consciousness (LOC). Directly he was brought to the emergency department (ED). Upon arrival, he was awake and responsive. Vital signs were as follows: heart rate 110 beats/min, blood pressure 140/90 mm Hg, respiratory rate 16/min and pulse oximetry 96% on room air. He received intravenous antihistamines, corticosteroids intravenously and epinephrine subcutaneously as anaphylactic treatment with no direct effect on clinical manifestations. In the ED however, his level of consciousness fluctuated between responsive to sudden LOC and interruption of speech. Glasgow Coma Scale (GCS) during those episodes with LOC was E4M1V1. The patient stared blankly. Pupils were isocor with normal pupillary reflexes. There were no signs of motor abnormalities. Muscle tone was diminished with relaxation of the arms. Deep tendon reflexes of upper and lower extremities were normal. Vital signs remained within normal limits. Respiratory pattern stayed regular with a rate of 16/min. The periods with LOC lasted between 30 s upto 3 minutes after which he regained consciousness (GCS 14) spontaneously. However, he was confused and disoriented to time and place and could not remember what had happened. These absence like periods occurred every 2 to 3 h. The patient's history showed chronic obstructive pulmonary disease and obstructive sleep apnoea disorder, but

no history of neurological disorders or allergic reactions to any kind of insect bites.

INVESTIGATIONS

Laboratory investigation showed C reactive protein 4 mg/L, erythrocyte sedimentation rate 7 mm/h and white blood cell count 7/nl were within normal limits. Only a mildly elevated creatinekinase value of 448 U/l (normal value <400U/l) was seen, most probably due to the massive insect stings. Cerebral CT and MRI were performed and did not show structural abnormalities. EEG during decreased consciousness showed increased generalised β waves and decrease of α waves (figure 1), compared with EEG during full consciousness (figure 2). There were no epileptiform waves. Allergy and mastocytosis as a cause of clinical manifestations could be ruled out.

TREATMENT

The patient received oxygen and intravenous fluids and was treated with 1 mg clonazepam intravenously during the episodes of LOC empirically, thinking of a status epilepticus. Antihistamines and corticosteroids were continued. His vital signs were closely monitored in the ICU.

OUTCOME AND FOLLOW-UP

The patient was discharged from the ICU after 2 days, at that moment the interval between periods of LOC increased to every 8 to 12 h. A 24 h EEG on the neurology ward showed no clear abnormalities. The patient was discharged home 6 days later. He recalled his time in the hospital, except for the time he was having periods of LOC. He is still experiencing short weekly episodes of reduced state of consciousness and self-reported difficulties in short-term memory up to four months after the initial event.

DISCUSSION

Wasps belong to the order of Hymenoptera and also include ants, apids (bees and bumble bees), vespids (wasps, hornets and yellow jackets). Through their stinging apparatus at the tail end of their abdomen they can deliver venom into their victim. Usually the symptoms are mild and varies from local reactions to more generalised systemic reaction

Figure 1 EEG during decreased consciousness (purple bar) showing increased generalised β -waves and decrease of α activity, compared with EEG during full consciousness.

causing discomfort and morbidity. Even death attributed to hypersensitivity anaphylactic reaction is reported. Next to cutaneous reactions (pruritus, urticaria and angioedema), systemic symptoms such as gastro-intestinal discomfort with nausea, vomiting and diarrhoea, cardiopulmonary signs with bronchospasm, hypotension and arrhythmias and neurological symptoms like lightheadedness and dizziness are seen. Although rare, several serious neurological manifestations and cerebral lesions of hymenoptera stings have been reported. Encephalitis,¹ peripheral neuritis,² optic neuropathy,³ myasthenia gravis,⁴ cerebral infarction,⁵⁻⁸ acute inflammatory polyradiculopathy indistinguishable from Guillain-Barré⁹⁻¹⁰ acute disseminated encephalomyelitis¹¹ and encephalomyelorradiculoneuritis¹²⁻¹³ have all been reported. Mostly, patients with neurological complications significantly improved or completely recovered after corticosteroid treatment, however permanent neurological deficits were also reported.⁴⁻⁵⁻¹²

Different explanations for neurological complications have been considered. First is a hypoxic-ischaemic mechanism. Wasp venom contains vasoactive, inflammatory and thrombogenic peptides and amines, including histamine, leukotrienes and thromboxane. Infarction after wasp sting seems to be caused by vasoconstriction and platelet aggregation secondary to an injection of distinct allergens contained in wasp venom. Infarction could also be a consequence of circulatory failure and respiratory distress due to an anaphylactic response.⁶

Another explanation for cerebral ischaemia by wasps sting is their venom mimicking the essential features of the model for internal carotid occlusion in moyo moyo syndrome.⁵

The superior cervical ganglion controls sympathetic innervation of the distal internal carotid artery. Multiple unilateral wasp stings in neck and head region have been suggested to stimulate the superior cervical ganglion resulting in increased endothelial permeability in the distal-internal carotid artery. Concurrently, the associated wasp sting systemic immune response and activated platelets would promote thrombosis in the sensitised internal carotid artery.⁵

A second mechanism of neurological disease might be a direct toxic effect of mass envenomation from large venom load. Massive envenomation by Hymenoptera is reported

Figure 2 EEG during full consciousness.

to cause acute and delayed reactions such as encephalopathy, haemolysis, rhabdomyolysis and acute renal failure. Death as result of these complications or due to cardiac complications, especially in children, are also reported.¹⁴⁻¹⁵

Levick *et al*¹⁵ describe a 3.5-year-old boy with massive (>120) vespa germanica envenomation with predominant neurological symptoms and no major metabolic disturbance. Within 40 minutes of being stung, the child became moderately cerebral irritated. He was noted to be disorientated and to have a fluctuating conscious state, although he remained arousable in contrast to our patient. Typical features of allergy or anaphylaxis were not present and epinephrine was not given. There were no mentioning of tonic-clonic seizures. No EEG was made. The patient completely recovered after 2 days, no protracted memory impairment in this 3.5-year-old child was reported. The authors give no clear explanation, suggesting toxins as a cause for clinical manifestations.

Third main category of pathological mechanism described in patients with neurological manifestations after wasp stings is central and peripheral demyelination.⁹⁻¹³

Potential cross reactivity between venom constituent and central nervous system myelin is suggested in acute disseminated encephalomyelitis after yellow jacket stings.¹¹

Production of antibodies which cross-react with myelin basic protein could be initiated by antigens of the wasp. Instead, immune reactions can be induced by phospholipase A activity from venom with release of encephalogenic basic proteins or other antigens from myelin membranes.¹³

Reisman¹⁰ found antimyelin antibodies in an 8-year-old boy who developed ataxia, areflexia and ophthalmoplegia 72 h after four honeybee stings. Additionally, Means *et al*¹³ reported a case with relapsing and progressive bilateral weakness and numbness of arms and legs following vespa Pennsylvanica stings. Autopsy revealed areas of demyelination throughout central and peripheral nervous system with necrosis and inflammatory infiltration in the brain stem and spinal cord. Also massive pulmonary embolism was found as cause of death. In our patient a hypoxic-ischaemic mechanism seems unlikely as a haemodynamic failure or respiratory distress was not present at any time. Typical features of allergy or anaphylaxis were also not manifested. There were

no cases reported in literature which mimic the neurological manifestations seen in this patient. Because differential diagnosis included epileptic activity as result of toxic reaction on massive wasp envenomation, EEG during one of the periods with LOC was made as well as an 24 h EEG. EEG showed decreased α and no epileptical activity. Few case reports describe epileptic attacks associated with wasp stings, mostly tonic-clonic insults. Epileptic activity was attributed to severe anaphylactic reaction in all cases.^{6 16}

Clinical findings and investigations in our patient showed no signs of hypoxic-ischaemic damage or demyelination. Therefore a high suspicion of toxic effect due to massive wasp envenomation on the central nervous system in our patient was present. This is the first case describing these neurological features after massive wasp envenomation.

In conclusion, neurologic reactions after wasp stings are quite diverse, potentially life-threatening and occur minutes to days after the sting with long-term consequences. A high degree of clinical suspicion is required as these patients may have few significant presenting symptoms and develop further complications till days after being stung. Corticosteroids are the most mentioned treatment in patients with neurological manifestations and have often good results. However, treatment should be based on good clinical examination for different underlying pathophysiological mechanisms.

Learning points

- ▶ Neurological reactions after wasp stings although uncommon are quite diverse and potentially life threatening.
- ▶ They can occur minutes to days after the sting and have long-term consequences.
- ▶ Different underlying mechanisms include hypoxic-ischaemic damage due to anaphylaxis or mya-like syndrome, demyelination and the neurotoxic effect of wasp venom.
- ▶ Extensive diagnostics and observation to search for cerebral damage and organ system failure should be done after massive stings.

Competing interests None.

Patient consent Obtained.

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