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Ischemic Stroke Induced by Bee Sting in Agricultural Society – A Rare Complication of Bee Sting: A Case Report

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Abstract

Ischemic stroke is one of the highest causes of morbidity and mortality. One of the factors that triggers ischemic stroke which is quite rare is a bee sting. Pathomechanism of this condition remain unclear. This case report will describe a rare complication of bee sting and discuss it from a pathomechanism perspective. Case Report: A 40-year-old woman came to the emergency room at Dr. Koesnadi, Bondowoso with the main complaint of weakness in the right face. Referral patients from community health centers. The patient's complaint occurred 7,5 hours ago after being stung by a bee on the middle finger of his left hand. Physical examination showed facial angioedema, edema of digiti manus IV dextra, and others normal. On neurological examination, it was found Paresis Nervus XII and VII sinistra UMN type and hemiparesis sinistra. Laboratory examination showed increased neutrophils (90.4%) and eosinophilia (0.1%). A non-contrast CT scan examination showed a hypodense lesion in the right hemisphere. The patient was given antiplatelet, antihistamine, and neuroprotectant. One of the rare complications of bee stings is ishemic stroke. This occurs due to the toxin from bee stings which contain vasoactive, pro-inflammatory agents, thrombogenic peptides, thromboxane A2, and leukotrienes which trigger platelet aggregation and vasoconstriction. This condition can trigger thrombus formation and lead to ischemic stroke. Medical personnel, especially neurologists, must be aware of pathomechanism from the quite rare complications of ischemic stroke induced by bee stings, especially in agricultural society.

Keywords: Ischemic Stroke, Bee sting, agricultural society.

Introduction

Stroke is the second highest cause of death in the world. In 2019, stroke accounted for 11.6% of total deaths in the world. Strokes are divided into ischemic and hemorrhagic. Ischemic stroke is one of the most common types. It was noted that 62.4% of ischemic strokes occurred in the world in 2019 (Feigin, et. al., 2021).

Previous research showed that the incidence of ischemic stroke is projected to increase to 89.32 per 100,000 population and increase in women compared to men in 2030 (Pu, et. al., 2023). The etiology of ischemic stroke consists of thrombotic or embolic problems. This condition will cause a lack of blood supply to the brain. In thrombotic events, blood flow to the brain is obstructed in the blood vessels due to a thrombus in the blood vessels, atherosclerosis, inflammatory conditions, or arterial dissection (Pierik, et. al., 2020).

Bee stings are a rare etiology for ischemic stroke especially *Vespa affinis* that reported some cause of acute ischemic stroke. Bee stings trigger various mechanisms that cause tissue hypoperfusion. Some of the mechanisms are hypotension and decreased cerebral perfusion due to anaphylactic reactions, hypercoagulability and platelet aggregation due to activation of thromboxane A2 and phospholipase, as well as vasoconstriction due to retrograde stimulation of the superior cervical and carotid ganglion (Elavarasi, et. al., 2020). This case report presents an interesting case presentation about one of the rare complications from bee stings that trigger ischemic stroke in agricultural society.

Case Report

A 40-year-old woman came to the emergency room at Dr. Koesnadi Bondowoso hospital with the chief complaint of weakness in the right face. The patient is a referral from the primary health center (Puskesmas). The patient's complaint occurred 7.5 hours ago after being stung by a bee (*Vespa affinis*) or called by locals "Tawon Endas" (Figure 1) on the middle finger of his left hand at the patient's house. At primary health center, the patient received initial antihypertensive therapy and oral corticosteroids.

The patient had a history of uncontrolled hypertension and did not have a history of diabetes, dyslipidemia, cardiac disease or other neurological disease. The patient's vital signs show: BP: 190/120, pulse 99x/minute, respiratory rate 20x/minute, and temperature 37° C. The patient also complained of headache with a VAS scale 3 and vomited once at primary health center.

Physical examination of the patient showed: GCS 4-5-6, facial angioedema, dextra digital manus IV edema, tenderness (+) (Figure 2a), and others were normal. On neurological examination, paresis of nerves VII and XII sinistra UMN type, left hemiparesis were found (Lext extremity motor 3/5) (Figure 2b-c), and NIHSS Score showed 7.

Laboratory examination showed Hemoglobin 14.9 gr/dl, Leukocytes 8,660/uL, increased neutrophils (90.4%) and eosinophilia (0.1%). Non-contrast of Head CT scan examination shows a hypodense lesion in the right hemisphere (Figure 3).

The patient was given oral therapy with Aspirin 320 mg loading dose followed by 1x80 mg, Atorvastatin 40 mg, Folic acid 2x1, Citicholin 2x500 mg, and Diphenhydramine 3x50 mg intravenously. The patient showed improvement in his condition after 7 days of treatment as demonstrated by improvements in vital signs and improvement in the patient's clinical condition (Left extremity motor 4/5, paresis XII and VII left improved) (Figure 4).

Figure 1. *Vespa affinis* or called "Tawon Endas" by locals.

Figure 2. (a) Edema on digiti manus IV dextra, tenderness (+), **(b)** and **(c)** paresis on nervus XII and VII sinistra UMN type, hemiparesis sinistra, and angioedema

Discussion

Strokes related to bee stings are reported quite rarely. Several case reports show that strokes triggered by bee stings can appear in the post-acute phase within the first 4-10 hours. Most case reports state that this incident was triggered by several bee bites, while in this case only 1 bee bite was found and it occurred 7.5 hours after the bee sting at the patient's house (Guzel, et. al.,2016).

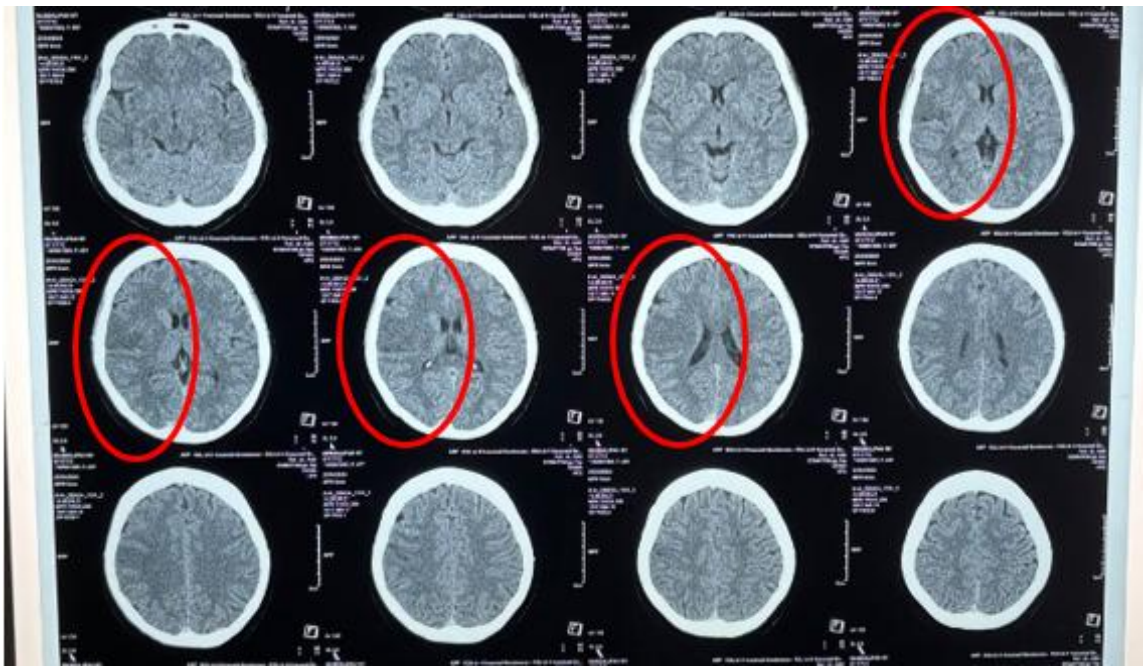

Figure 3. Hypodense lession on hemisfer dextra

Figure 4. Improvements on parese nervus VII sinistra UMN type

Bee classified as ordo hymenopteran. Bee especially *Vespa affinis* is a common venomous hymenopteran that live in most parts of the tropical island like Indonesia. Human encounter has been noted in plantation, cultivation, and forest areas. Bee has sting appratus. The stings apparatus used as defence mechanism when its disturbed. Hymenopterans has venom glands that able to produce multiple toxins. These toxins have various substances, including serotonin, histamine, tyramine, catecholamines, wasp kinins, and histamine-releasing peptides (Witharana, et. al., 2015).

The pathomechanism of stroke due to bee stings is still unclear. Several mechanisms that are hypothesized for stroke due to bee stings include decreased cerebral perfusion due to anaphylactic reactions, hypoxemia, hypercoagulation and platelet aggregation via the thromboxane A2 and phospholipase pathways, vasoconstriction due to retrograde stimulation of the superior cervical ganglion and carotid spasm, and so on (Balagopal, et. al., 2021). Another mechanism that possible to induce this condition is toxin-mediated thromboembolism even though there was no evidence of vasospasm, vertebrobasilar artery thrombosis, cardiac wall motion abnormality, or DIC

(Mahale, et. al., 2016).

Furthermore, bee's venom also contains several compounds that play a role in the inflammatory response such as thromboxane, leukotrienes, histamine, hyaluronidase, phospholipase 2 (PLA2) enzyme, and other inflammatory mediators. These components have been shown to cause cerebral infarction via a vasoconstriction mechanism. Then, the permeability of the cerebral endothelium can also be induced by this molecule, so that it can trigger a thrombogenic response to a systemic immune response (Balagopal, et. al., 2021; Mingomatai, et. al., 2012; Gupta, et. al., 2016; Gupta, 2020; Kabra, et. al., 2022). This condition is worsened because the patient had history of uncontrolled hypertension that causes endothelial damage, thickening of the arterial walls, and narrowing of the blood vessel lumen, thereby worsening cerebral blood flow. These conditions will contribute the process of cerebral hypoperfusion that leading infarction that occur in this patient (Ishitsuka, et. al., 2014).

In this case, the diagnosis of ischemic stroke induced by bee sting was made based on the acute onset (7,5 hours) of bee sting, results of physical examination like facial angioedema and edema on digiti manus IV dextra (site of bee sting), neurological examination, and a Head CT scan which showed the presence of a hypodense lesion in the right hemisphere and supported by laboratory values showing an increase in neutrophils (90.4%) and eosinophilia (0.1%) as a marker of an allergic reactions like bee stings. Further investigations like IgE serum specific of bee antigent will precise the diagnosis of acute ischemic stroke induced by bee sting.

Management of bee stings is based on the patient's clinical characteristics. The bee sting must be removed first so it can reduce the progress of the venom that entered body. Vasoconstrictor agents, antihistamines and corticosteroids are given to treat anaphylactic reactions. Most of patients who experience anaphylactic reactions from bee sting can be adequately treated with these drugs. It is very rare to find patients who experience further and severe systemic symptoms such as stroke, acute renal failure, cardiac dysfunction, rhabdomyolysis, and so on (Bhaskar & Singh, 2022).

In this case, the patient received treatment by administering antithrombotics, antihistamines and neuroprotectants. The patient did not receive thrombolysis because he came to the hospital after passing the golden hour for stroke (<4.5 hours). This patient didn't receive corticosteroids at hospital because it is don't provide immediate relief from the acute effects of a stroke. In ischemic stroke caused by a bee sting, the immediate priority is to restore blood flow and manage the damage caused by lack of oxygen. Corticosteroids, while helpful in reducing inflammation, don't address the immediate circulatory issues. Corticosteroids will helpul in case of large local inflammation or severe anaphylactic reactions. There was clinical improvement in the patient after the 7th day of treatment with improvement in facial paralysis and motor strength of the left extremity muscles showing 4/5 with NIHSS Score showed 4 which mean good clinical outcome.

In agricultural society, this problem is of particular concern because the risk of bee stings is still high, as well as the lack of facilities to ensure early diagnosis and appropriate treatment. This condition is a challenge for neurologists in agricultural society to make a diagnosis and provide appropriate treatment.

Conclusion

Stroke cases are life-threatening cases. Ischemic stroke triggered by bee stings is a rare case but requires special attention especially in agricultural society. Comprehensive evaluation and appropriate treatment are the keys to successful treatment in this case. Further examination such as serum specific bee IgE is needed to be able to establish a more precise diagnosis.

Conflict of interest

The authors declare no conflict of interest

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