Case report

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Posterior cerebral artery embolism following Naja sputatrix snakebite: Unusual case of snakebite envenomation

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Abstract

***Background*: Snakebite envenoming can potentially cause a life-threatening condition, including embolic stroke, because of the hemotoxic effect. Hemotoxicity of snakebite venom can affect blood clotting factors, make blood clots, be carried in brain circulation, and cause neurological deficits.**

***Case presentation*: A 34-year-old man from Bima, West Nusa Tenggara, Indonesia, was bitten by a Naja sputatrix snake. This patient exhibited signs and symptoms of cerebral infarction after he had a snakebite. Cerebral computed tomography angiography resulted in thromboembolic cerebral infarction in the right temporoparietal occipital according to the right posterior cerebral artery (PCA) territory. An anticoagulant was given to reduce the blood coagulation cascade and inhibit thrombin formation.**

***Conclusion*: An embolic stroke because of a snakebite is a rare case. Severe neurological deficit and rapid treatment determine the prognosis.**

Key words: Snakebite, stroke, hemotoxin, embolism.

Introduction

Annually, snakebite envenoming affects millions of people worldwide and causes a significant amount of death. (1) As a tropical country, Indonesia has a high incidence of snakebites. In Lombok and Sumbawa Island, the species responsible for most bites is Naja sputatrix. Naja sputatrix is a category I Indonesian venomous snake. (2)

The venom of N. sputatrix contains hemotoxin, neurotoxin, and cytotoxic protein. (3) Snakebite venom can cause cerebrovascular disorders, mostly hemorrhagic stroke and rarely ischemic stroke. (4) Snake venom exerts anticoagulant and procoagulant effects that can cause blood to clot more easily, cause vessel occlusion in the brain circulation, and cause an embolic stroke. (5)

Case history

A 34-year-old man was reported to have been bitten by a brown-colored snake on the right lower part of his foot when he was working in a cornfield in Bima, West Nusa Tenggara, Indonesia. The snake was later identified as a Naja sputatrix. After he was bitten by a snake, the patient immediately became unconscious, with blood coming out from his ears and nose, foam coming out from his mouth, and his lips looking bluish. The snakebite wound secreted a lot of dark-colored blood, and swelling was observed around the wound.

The patient performed first aid by tying the leg, was taken to a local shaman for 3-4 hours, and gave no medicine. After that, the patient was taken to the

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public health center. While in the public health center, the patient had a seizure that lasted about 1-2 minutes. Due to a power outage in the area, the public health center didn't give any treatment, and the patient was immediately referred to Bima General Hospital. The patient transfer took time for approximately one hour.

In the Emergency Room (ER) at Bima General Hospital, the patient had a second seizure. The patient was given 3-4 bottles of anti-snake venom (ASV) daily. The patient was treated in the Intensive Care Unit (ICU) for ten days. After 13 days in Bima General Hospital without improvement, the patient was referred to West Nusa Tenggara Province General Hospital (**Figure 1**). The chief complaint was decreased consciousness with a Glasgow coma scale (GCS) of 9/15 with normal vital signs. On neurological examination, we observed a left hemiparesis. The patient and family had no history of diabetes mellitus, hypertension, and heart disease.

We performed a chest X-ray (**Figure 2**). Head computed tomography (CT) scan without contrast showed a large cerebral infarction (**Figure 3**). To further assess the site of embolism, we did cerebral CT-angiography (CTA), and the result showed a chronic thromboembolic cerebral infarction in the right temporoparietal occipital according to the right posterior cerebral artery (PCA) territory (**Figure 4A**) and normal brain vessel (**Figure 4B**). The blood laboratory examination showed anemia, leukocytosis, thrombocytosis, and elevated D-dimer levels (**Table 1**). The hemostasis function and electrolytes were within normal limits.

Based on those results, this patient was diagnosed with thromboembolic cerebral infarction due to the snakebite. In West Nusa Tenggara Province General Hospital, the patient received care in the stroke unit and was treated with mannitol, anticoagulant, antiplatelet, antibiotic, and statin. After the treatment, the patient's condition improved and stabilized after seven days. The D-dimer, leucocyte, and thrombocyte were within normal limits, though the patient was still experiencing hemiparesis. After two weeks, the patient was discharged and instructed to be monitored regularly.

Discussion

Based on our findings, this was the first case report of thromboembolic stroke after a snakebite in Lombok, West Nusa Tenggara. Cerebral infarction or embolism after snakebite is a rare condition. In Sri Lanka, ischemic stroke after snakebite venoming is reported in 9 out of 500 victims. (6) The mechanism of cerebral infarction in snakebite envenoming was reported to be multifactorial. The venom exhibits anticoagulant and procoagulant effects that can cause small or even large vessel occlusion or micro thrombosis resulting in cerebral infarction. (7) The hemorrhaging may cause vascular spasms, endothelial damage, increased vascular permeability, and leads to toxic vasculitis and cause thrombosis. (6) Hyperviscosity and hypercoagulation may also contribute to vessel occlusion and direct cardiotoxic effects, which could lead to dysrhythmias and cause cardiac thromboembolism. (8)

Recognition of the type of snake that bites the patient can significantly assist healthcare professionals in providing proper treatment such as ASV. In Indonesia, the local ASV is a tri-specific antivenom against three snake species of Indonesian origin: the Javan spitting cobra (Naja sputatrix), the Malayan pit viper (Calloselasma rhodostoma), and the banded krait (Bungarus fasciatus). (2)

An elevated D-dimer level indicated a venom-induced consumption coagulopathy (VICC). VICC is the most prevalent systemic effect of snakebite envenoming by Australian snakes. The increasingly routine D-dimer testing for diagnosing thromboembolic disease allows even earlier diagnosis of VICC. An earlier diagnosis of VICC would allow an earlier antivenom administration and therefore reduce the risk of more severe neurotoxicity and myotoxicity. (9)

We did a CTA to evaluate the cerebral vessels. CTA is used in hyperacute stroke for assessing the infarct volume, location, occlusion or stenosis of blood vessels, and collateral integrity in the anterior and posterior circulations. (10) Due to the absence of additional risk factors, we believed that the patient's cerebral embolism was caused by coagulopathy due to the procoagulant proteases in snake venom, cardiotoxin-induced dysrhythmia, and then caused an embolism to the cerebral through the internal carotid artery.

Conclusion

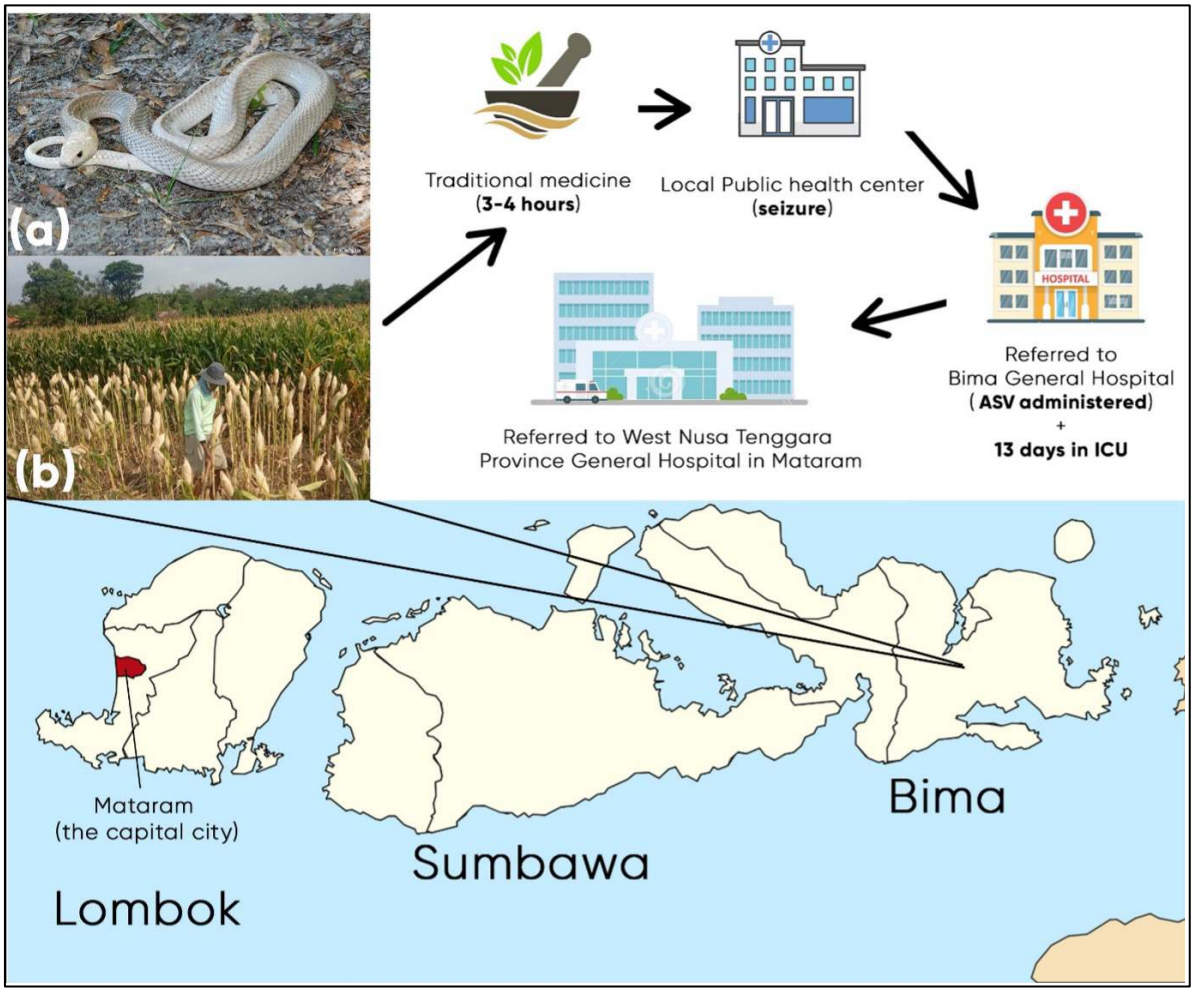
Posterior cerebral artery embolism following a Naja *sputatrix* snakebite is uncommon. The ASV is critical in the early management of snakebites to prevent fatalities or death.

Table 1. Laboratory analysis

Laboratory serum analysis	Day(s) after snakebite			Reference range
	1*	14§	21§	
Glucose (mg/dl)	108	151	130	<160
Creatinin (mg/dl)	1.2	0.8	0.9	0.9-1.3
Urea (mg/dl)	12	47	10	10-50
SGOT (U/l)	49	60	43	0-40
SGPT (U/l)	25	62	55	0-41
Natrium (mEq/l)	134	132	136	135-146
Kalium (mEq/l)	4.8	4.7	4.3	3.4-5.4
Chloride (mEq/l)	101	105	100	95-108
PT (second)	12.5	12	13.5	11.5-14.1
aPTT (second)	29.3	28	28.4	28.0-38.0
Hemoglobin (g/dl)	11.9	11.7	11.9	14.0-18.0
Leukocyte (/ul)	19,250	27,520	9,200	4,000-10,000
Erythrocyte (million/ul)	4.95	4.88	5.06	3.50-5.50
Thrombocyte (/ul)	140,000	358,000	211,000	150,000-400,000
D-dimer (mg/l)	-	1.7	0.9	<0.5
CRP (mg/l)	-	<5	<5	<6
HBsAg	Negative	Negative	-	Negative
Anti HCV	-	Negative	-	Negative

Legend: SGOT=serum glutamic oxaloacetic transaminase; SGPT=serum glutamic pyruvic transaminase; PT=prothrombin time; aPTT=activated partial thromboplastin time; CRP=C-reactive protein; HbsAg=Hepatitis B surface antigen; HCV=Hepatitis C virus.
*At Bima General Hospital; §At West Nusa Tenggara Province General Hospital.

Figure 1. Envenoming history of the patient



Legend: ASV=anti-snake venom; ICU=intensive care unit.
(a) Naja sputarix snake, the most abundant snake at Lombok and Sumbawa; (b) The patient worked on picking corn in his garden. The geographical location of snakebite at Bima, ±500 km from Mataram, the capital city of West Nusa Tenggara Province.

Figure 2. Normal chest X-ray of the patient

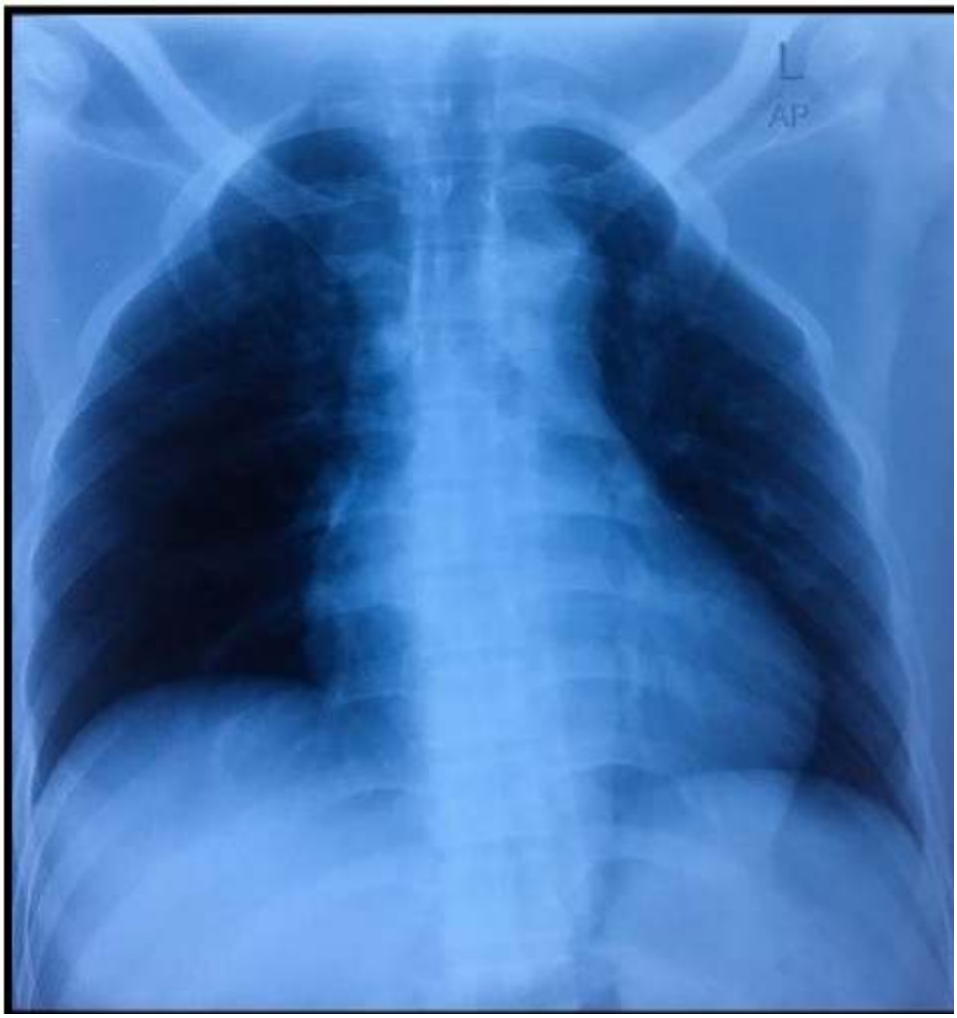
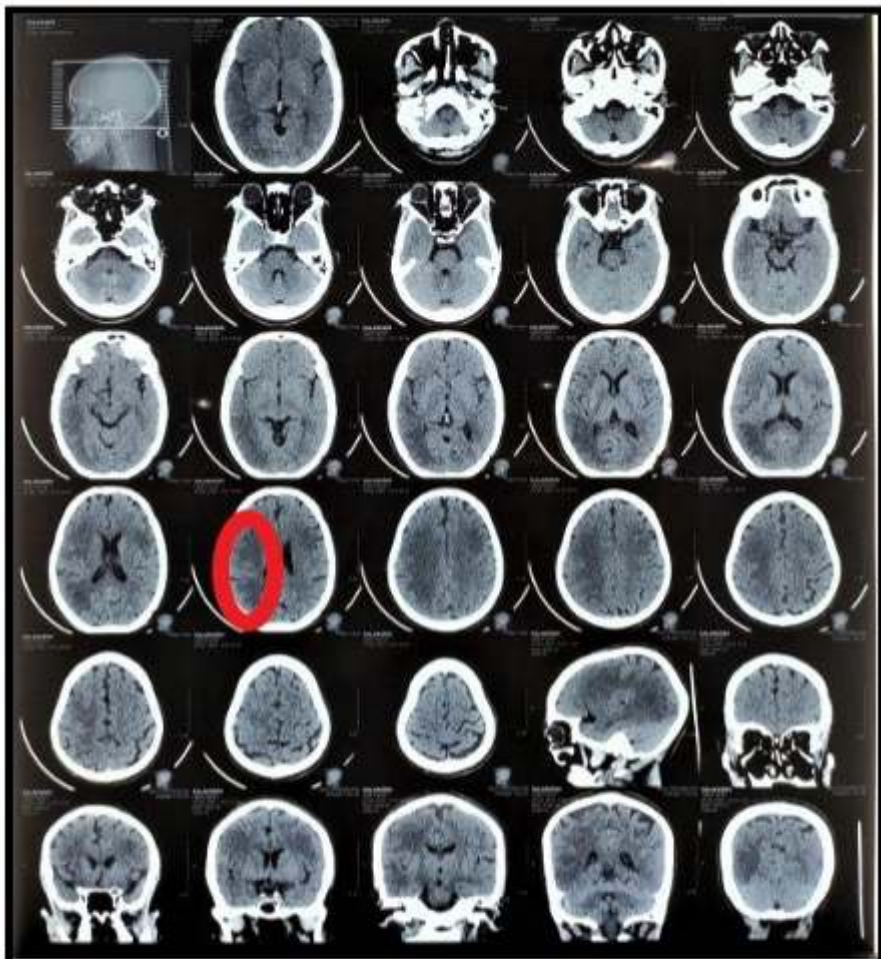
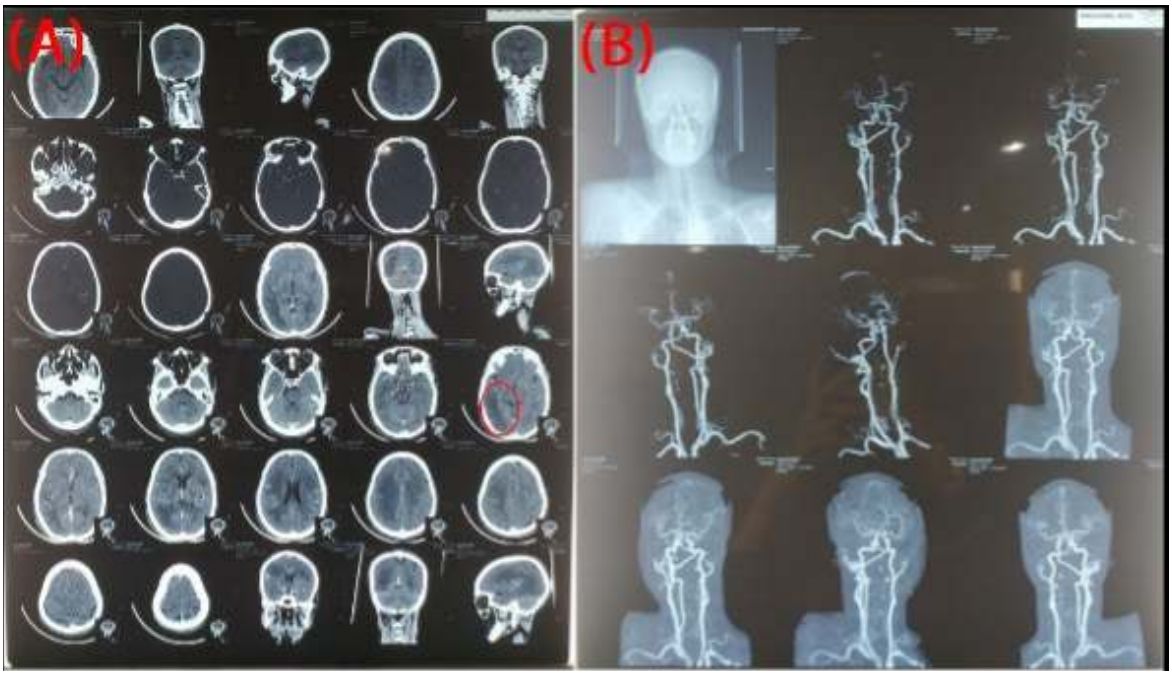


Figure 3. Head CT scan without contrast



Legend: The round red line indicates a large cerebral infarction at the right temporoparietooccipital.

Figure 4. Brain CT angiography of the patient



Legend: (A) Right temporoparietooccipital infarction; (B) Brain angiography indicating normal brain vessel.

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