

# STROKE AND SNAKEBITE

## Case report

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**ABSTRACT** - Snakebites are common and lead to potential complications like neuromyopathies and strokes, these last associated with disturbances of blood coagulation. We report on a 65 years old woman of cerebral intraparenchymal hemorrhage associated with snakebite by a *Bothrops jararaca* that occurred in the Reconcavo of Bahia, BA, Brazil. The patient was submitted to a surgical evacuation of the hematoma, with a good result. This report is accompanied by a revision about the association among snakebite and neurological complications, emphasizing strokes. Statistics reveal a high incidence of snakebite in the world, mainly in tropical countries and gets attention for his socioeconomic impact. The clinical and laboratorial characteristics to identify the victims that present a high risk of presenting strokes are discussed in order to identify early those patients, so that they may be treated in a more precocious and effective way.

**KEY WORDS:** snakebite, coagulopathy, stroke, *Bothrops*.

### Acidente vascular cerebral e ofidismo: relato de caso

**RESUMO** - Acidentes ofídicos são comuns e trazem como potenciais complicações neuromiopatii e doenças cerebrovasculares, estas últimas associadas a distúrbios da coagulação sanguínea. Relatamos sobre uma mulher de 65 anos com hemorragia cerebral intraparenquimatosa associado a acidente ofídico por *Bothrops jararaca*, ocorrido no Recôncavo Baiano, BA, Brasil. A paciente foi submetida à craniotomia para evacuação cirúrgica do hematoma, com bom desfecho final. Este relato é acompanhado de revisão sobre a associação entre ofidismo e complicações neurológicas, com enfoque as doenças cerebrovasculares. As estatísticas impressionam pela alta incidência de acidente ofídico no mundo, principalmente em países tropicais e chama atenção o seu impacto sócio-econômico. Discutimos os achados clínicos e laboratoriais que identificam quais vítimas apresentam maior risco de apresentar complicações cerebrovasculares a fim de se identificar precocemente esses pacientes, para que possam ser tratados de forma mais precoce e eficaz.

**PALAVRAS-CHAVE:** acidente ofídico, coagulopatia, acidente vascular cerebral, *Bothrops jararaca*.

Cerebrovascular diseases (CVD) are the main cause of death in Brazil<sup>1,2</sup> and here deserve special attention and different approach because of uncommon causes like sickle cell disease, Takayasu's arteritis, cysticercosis, infectious endocarditis, Chagas' disease, hemorrhagic fevers, gnathostomiasis, leptospirosis, cerebral malaria, puerperal venous thrombosis, tuberculosis and others<sup>3</sup>.

After approval of the Hospital Ethics Committee and signed informed consent obtained from a patient representative we report a case of another uncommon cause of CVD which is mostly seen in tropical countries: snakebite.

### CASE

A 65-year-old woman was admitted to the emergency unit of the Anti-Poison Center, Roberto Santos Central Hospital, with alteration of the language, speech change and right side hemiparesis. Twelve hours before admission she was attacked by a *Bothrops jararaca* in the rural area of the city of Mata de São João, BA, Brazil, on January 5<sup>th</sup>, 2004. She had had systemic arterial hypertension for many years with previous history of CVD with no sequels. The neurological examination after admission showed aphasia, left deviation of labial commissure and contra lateral motor deficit with Babinski signal. The patient evolved with rapid deterioration of consciousness (Glasgow Coma Score 8) and worsening of motor deficit. The trachea was intu-

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bated to maintain airway protection and a computed tomography (CT) of the head showed extensive hematoma in the left temporo-parietal lobe, with perilesional edema (Figure). The patient was transferred to the Intensive Care Unit (ICU). The consultant neurosurgeon decided for a direct evacuation of the hematoma.

Three days after the surgical treatment the patient had improved her conscience level (Glasgow Coma Score 10) and motor deficit, subsequently been disconnected from the mechanical ventilation. She was discharged from the ICU and made a full recovery.

## DISCUSSION

The incidence of snakebites in the world is high and estimations in about 500 cases for 100000 inhabitants, with more than 20000 deaths annually in Africa, Asia and Latin America. In the United States of America, more than 8000 cases are reported every year<sup>4</sup>. In Europe, the incidence of snakebites range from 15000 to 20000/year, resulting in about 50 deaths<sup>5</sup>.

In Brazil more than 20000 snakebites each year are notified to Ministry of Health. According to the database of the Brazilian General Office of Health Surveillance about 75% of the notified cases are attributed to the serpents of *Bothrops* gender, 7% *Crotalus*, 1,5% *Lachesis*, 3% no poisonous serpents and 0,5% *Micrurus*. The species of the serpents are not described in about 13% of notified cases.

The registry shows death rate of 1.85% for *Crotalus* snakes, 0, and 95% for *Lachesis*, 0.36% for *Micrurus* and 0.31% for *Bothrops*<sup>6</sup>. The Central Brazil is an area of high incidence of attacks, being the gender *Bothrops*, *Crotalus* and *Micrurus* responsible for 74%, 24% and 2% of the accidents, respectively<sup>7</sup>.

In the Brazilian Amazonian region, snakebites are described by serpents of the *Viperidae* family (including the genders *Bothrops*, *Crotalus* and *Lachesis*), *Elapidae* family (gender *Micrurus*) and *Colubridae* family (*Philodryas viridissimus*, *Clelia clelia* and *Erythrolampis aesculapii*). In a retrospective analysis of 734 patients, *Bothrops atrox* was responsible for 76% of the cases and *Lachesis muta* for 10%. Of all patients, 81.3% were male, 50.4% were farmers, 70.2% occurred in the rural area, 72.1% were in productive age (15 to 59 years old) and 57.3% of the patients only received medical treatment after six hours of the attack. This delay is mainly due to the great extension of the area and the inadequacy of public transportation. Most of the time, people have to travel by waterways to arrive at urban center<sup>8</sup>. In a series of 3139 cases of snakebites assisted at the Vital Brazil

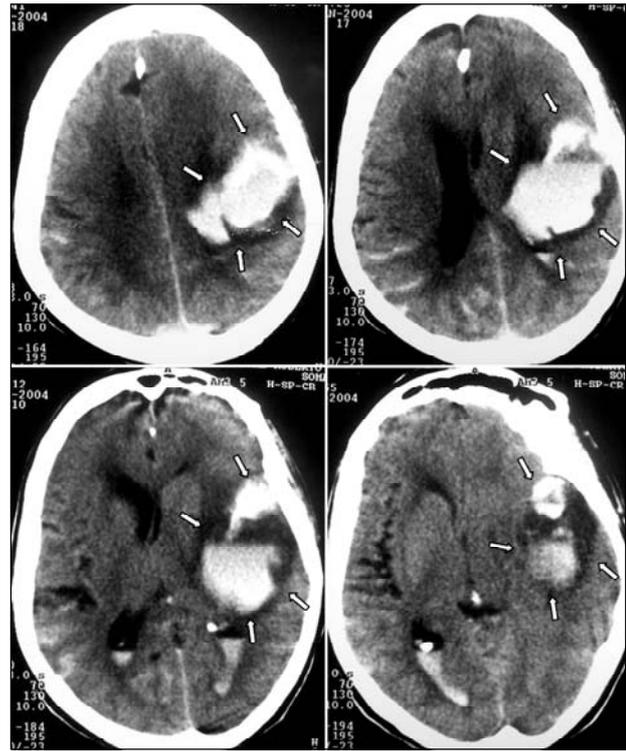


Figure. CT scans of the head on the first hospital day showing extensive hematoma in the left temporo-parietal lobe with ventricular flooding and perilesional edema.

Hospital of the Butantan Institute between 1981 and 1990, the specie of the serpent was identified in 1412 (45%) cases. *Bothrops jararaca* was responsible for 1376 cases (97.5%), *Bothrops jararacussu* 20 cases (1.4%), *Bothrops neuwiedi* 11 cases (0.8%), *Bothrops moojeni* 2 cases (0.2%), *Bothrops alternatus* 2 cases (0.2%) and *Bothrops pradoi* was responsible for 1 case (0.1%). The accidents predominantly occurred between October and April (83.8%), from 12 to 18 o'clock (42.2%), mostly males (75.7%), with the age ranging from 10 to 40 years old (59.0%). The lower limbs were attacked in 2342 cases (74.7%)<sup>9</sup>. The serpents of medical interest in Brazil belong to gender *Bothrops*, *Crotalus*, *Lachesis* and *Micrurus*. The social-economic impact of snakebites come from the fact that the population attacked is in productive age, prevailing males, with more common and are attributed to neurotoxin effect and coagulation disturbances of the venom.

Seneviratne et al. at the Department of Neurology of Ratnapura General Hospital in Polonnaruwa, Sri Lanka, enrolled 56 patients admitted with neurological manifestations after snakebite. The most common manifestations were related to the muscular plaque (e.g., double vision, dysphagia and dropping

eyelids). Ten patients developed respiratory failure requiring mechanical ventilation and one developed peripheral sensorial neuropathy two weeks after a krait bite. The only death in this series was due to stroke. The autopsy revealed a large intracerebral hemorrhage in the right parietal lobe<sup>10</sup>.

It is estimated that CVD occur in 2.6% of the victims of *Bothrops* snakebite and these are related to hemorrhagic events. Mosquera et al. studied 309 patients bitten by *Bothrops* spp in the Military Hospital of Guayaquil, Ecuador (252 men, 57 women, and 8 to 82 years old). Eight patients (2.6%) developed CVD, being seven hemorrhagic strokes and one ischemic stroke. Four patients had evidences of systemic hemorrhage and all of them were classified as having degree degree 3 of the SSS (Snakebite Severity Scale).

Except from one woman that had used oral contraception, no other patient had risk factors for stroke. Six of these patients developed stroke six hours after the accident<sup>4</sup>. In a Colombian study that selected 39 patient with snakebites by *Bothrops*, *Porthidium* and *Bothriechis*, hemorrhagic stroke was described in five patients (12.8%)<sup>11</sup>.

The poison of the *Viperidae* family serpents (*Crotalus*, *Lachesis* and *Bothrops*) has proteolytic enzymes and polypeptides toxins (e.g., cardiotoxins, bradykinin and histamine), which cause respiratory failure, arrhythmias (disruption of impulse transmission) and hypotension. It releases also some proteases, phospholipases, collagenases and thrombin-like enzymes, which interfere with normal blood clotting. The combination of these components generates anticoagulant and coagulant effects. The coagulant effect can be due to the presence of the arginine esterase hydrolase, one enzyme that has similar action of the thrombin on platelets aggregation. The fibrinolysis is activated and in association to proteases which destroy the wall of blood vessels, cause serious hemorrhage<sup>5</sup>. The bothropic venom is responsible for most accidents causing thrombocytopenia, prolongation of prothrombin and partial thromboplastin times, disseminated intravascular coagulation, and even damage of blood vessels<sup>4</sup>. The *Lachesis* venom is similar to the *Bothrops* although it has neurotoxic effect, with symptoms as nausea, vomits, abdominal pain, bradycardia and syncope. The *Crotalus* venom has effects on blood coagulation and potent neurotoxic effect, with visual alterations (double vision), dropping eyelids, dysphagia, odynophagia and even respiratory failure. Myalgia is also common. The renal failure with tubular necrosis is common in

these three types of accidents, because of rhabdomyolysis and myoglobinuria. The *Micru rus* snakebite has mainly a neurotoxic that resembles the symptoms associated to the *Crotalicus* poisoning.

One study has analyzed 38 patients with coagulopathy after snakebite, 14 (37%) developed thrombocytopenia, 22 (58%) showed hypofibrinogenemia, and 17 (45%) presented prolonged prothrombin time and activated partial thromboplastin times. These alterations continue for two weeks<sup>12</sup>. Coagulopathy and intracerebral hemorrhage was reported in an 85-year-old woman attacked by a serpent of *Elapidae* gender (*Notechis scutatus*)<sup>13</sup>. Boviatsis et al. published a case of a 65-year-old woman admitted to a local hospital in Athens, Greece with multiple hemorrhagic infarcts in the cerebral hemisphere<sup>5</sup>.

Ischemic phenomena are uncommon and they can be associated to specific types of serpents. Procoagulant activity of the venom, vascular damage and circulatory shock may account for the cerebral infarcts. Lee et al. described an infarct of brainstem resulting in one-and-half syndrome in a 54 year-old man following an attack by a Korean snake (*Agkistrodon blomhoffii brevicaudus*)<sup>14</sup>. Some other few cases of ischemic stroke were reported in the literature<sup>15-17</sup>.

Other reports described Guillain-Barre syndrome<sup>18</sup>, intestinal ischemia following accident with *Lachesis muta*<sup>19</sup> and lung hemorrhage caused by *Bothrops jararacussu*<sup>20,21</sup>.

Mortality due to snakebite is associated to renal failure, central nervous system hemorrhage and secondary infection.

Snakebites are common worldwide and can potentially lead to strokes. It is important to identify the potentials victims of neurological complications for a more precocious and effective treatment. The degree as the SSS, systemic bleeding and abnormalities in the coagulation system seem to be involved. We call attention for an uncommon etiology of stroke that occur in tropical countries and are particularly important for Brazilian physicians who work in rural areas, as well as the public health authorities.

## REFERENCES

1. Lessa I. O adulto brasileiro e as doenças da modernidade: epidemiologia das doenças crônicas não-transmissíveis. São Paulo: HUCITEC/ ABRASCO 1998:97-114.
2. Lessa I, Mendonça GAS, Teixeira MTB. Doenças crônicas não-transmissíveis no Brasil: dos fatores de risco ao impacto social. Bol Ofic Sanit Panam 1996;120:369-413.
3. Del Brutto OH. Enfermedad cerebrovascular em los trópicos. Rev Neurol 2001;33:750-762.
4. Mosquera A, Idrovo LA, Tafur A, del Brutto O. Stroke following *Bothrops* spp. snakebite. Neurology 2003;60:1577-1580.

5. Boviatsis EJ, Kouyialis AT, Papateodorou G, Gavra M, Korfiatis S, Sakas DE. Multiple hemorrhagic brain infarcts after viper envenomation. *Am J Trop Med Hyg* 2003;68:253-257.
6. Guia de Vigilância Epidemiológica - Secretaria de Vigilância em Saúde - SVS. Ministério da Saúde do Brasil. <http://dtr2001.saude.gov.br/svs/pub/GVE/PDF/GVE0501.pdf>.
7. Silva CJ, Jorge MT, Ribeiro LA. Epidemiology of snakebite in a central region of Brazil. *Toxicon* 2003;41:251-255.
8. Borges CC, Sadahiro M, Santos MC. Aspectos epidemiológicos e clínicos dos acidentes ofídicos ocorridos nos municípios do Estado do Amazonas. *Rev Soc Bras Med Trop* 1999;32:637-646.
9. Ribeiro LA, Jorge MT. Acidente por serpentes de gênero *Bothrops*: série de 3139 casos. *Rev Soc Bras Med Trop* 1997;30:475-480.
10. Seneviratne U, Dissanayake S. Neurological manifestations of snake bite in Sri Lanka. *J Postgrad Med* 2002;48:275-278.
11. Otero R, Gutiérrez J, Mesa MB, et al. Complications of *Bothrops*, *Porthidium*, and *Bothriechis* snakebites in Colombia: a clinical and epidemiological study of 39 cases attended in a university hospital. *Toxicon* 2002;40:1107-1114.
12. Boyer LV, Seifert SA, Clark RF, et al. Recurrent and persistent coagulopathy following pit viper envenomation. *Arch Intern Med* 1999;159:706-710.
13. Yap CH, Ihle BU. Coagulopathy after snake envenomation. *Neurology* 2003;61:1788.
14. Lee BC, Hwang SH, Bae JC, Kwon SB. Brainstem infarction following korean viper bite. *Neurology* 2001;56:1244-1245.
15. Numeric P, Moravie V, Didier M, et al. Multiple cerebral infarct following a snakebite by *Bothrops caribeaus*. *Am J Trop Med Hyg* 2002;67:287-288.
16. Cole M. Cerebral infarct after rattlesnake bite [Letters to the editor]. *Arch Neurol* 1996;53:957-958.
17. Panicker JN, Madhusudanan S. Cerebral infarction in a young male following viper envenomation. *J Assoc Physicians India* 2000;48:744-745.
18. Ribeiro LA, Albuquerque MJ, Pires de Campos VAF, et al. Óbitos por serpentes peçonhentas no Estado de São Paulo: avaliação de 43 casos, 1988/93. *Rev Ass Med Brasil* 1998;44:312-318.
19. Chuang TY, Lin SW, Chan RC. Guillain-Barré syndrome: an unusual complication after snake bite. *Arch Phys Med Rehabil* 1996;77:729-731.
20. Rosenthal R, Meier J, Koelz A, Müller C, Wegmann W, Vogelbach P. Intestinal ischemia after bushmaster (*Lachesis muta*) snakebite: a case report. *Toxicon* 2002;40:217-220.
21. Benvenuti LA, França FOS, Bárbaro KC, Nunes JR, Cardoso JLC. Pulmonary haemorrhage causing rapid death after *Bothrops jararacussu* snakebite: a case report. *Toxicon* 2003;42:331-334.