

코브라과 뱀에 물린 환자에서 코브라 항독소를 사용하여 치료한 1례

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A Case of Cobra Antivenom Therapy in a Patient Bitten by Elapid Snake in South Korea

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Elapid snakes have neurotoxic venom which causes diverse neuromuscular manifestations, including fatal respiratory failure. In South Korea, since elapid snakebites are very rare, the cobra antivenom, which is effective against neurotoxicity, was only introduced recently. Most physicians in South Korea have little experience in the treatment of patients who have been bitten by elapid snakes. A 19-year-old man was brought to the emergency department with sudden diplopia, 1 hour after a snakebite on the left 2nd finger. The patient presented with drowsiness and complained of mild dizziness and binocular diplopia. After 1 hour, he had sudden onset of dyspnea and dysphagia and appeared to be agitated. He was immediately intubated and received mechanical ventilation as he was unable to breathe on his own. A total of 2.5 mg of neostigmine diluted with normal saline was slowly infused, and 1 vial of cobra antivenom was infused for an hour, 5 times every 2 hours, for a total of 5 vials. He slowly recovered self-breathing; on the 3rd day of hospitalization, he showed tolerable breathing and was extubated. He was discharged without any neurological deficits or other complications.

Key Words: Snake Bites, Elapid Snakes, Antivenom, Neostigmine, Respiratory Insufficiency

INTRODUCTION

There are 4 species of venomous snakes residing in South Korea: *Gloydius brevicaudus*, *G. ussuriensis*, *G. saxatilis* of the family Viperidae, and *Rhabdophis tigrinus* of the family Colubridae. Their venoms are not fatal, so few systemic symptoms and cases of neurotoxicity have been reported^{1,2}. Elapid snakes are widely distributed in areas with tropical and subtropical climates, but not in South Korea. The venom of most elapid snakes is neurotoxic, and respiratory muscle paralysis is the most important cause of mortality in patients who have been bitten. Patients presenting respiratory failure after elapid snakebite frequently require mechanical ventilation with the infusion of several antivenoms and anticholinesterase until neurologic deficit recovery³. Elapid snakebite is a case that has not been reported in South Korea, and the cobra antivenom, which is required for the treatment of neurotoxin, has also rarely been used. We describe a case of cobra antivenom therapy in a patient presenting respiratory insufficiency caused by neurotoxicity after an elapid snakebite.

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CASE DESCRIPTION

A 19-year-old man was brought to the emergency department with sudden diplopia after a snake bite on the Lt. on the left index finger 1 hour prior. The snake, a smooth-scaled death adder, was his pet and had been imported from Australia (Fig. 1). The patient was drowsy and complained of mild dizziness and diplopia at presentation. Initial vital signs were stable. He was previously healthy without any underlying disease. He had no definite ophthalmoplegia or visual field defect but had binocular diplopia. The pupils were equal in size with normal light reflexes. He had felt pain and mild swelling in the Lt. 2nd finger with the bite wound, but there was no color change. Most laboratory data showed normal ranges: prothrombin time, 13.3 sec (84.5%); activated partial thromboplastin time, 23.3 sec; serum creatine phosphokinase (CPK), 155 U/L; aspartate aminotransferase (AST), 44 U/L; and alanine aminotransferase (ALT) 24 U/L. Abnormal laboratory data included a white blood cell count of 22,900/ μ L and a segmented neutrophil count of 84.2%.

After 1 hour upon arrival, he suddenly developed dyspnea, dysphagia, and dysphonia and appeared to be agitated. We presumed that the cobra venom-induced respiratory muscle weakness worsened. He was immediately intubated and received mechanical ventilation. 0.08 μ g/kg/min of remifentanyl and 0.6 μ g/kg/min of precedex were continuously administered to the patient after intubation for pain control and sedation. He was drowsy under light sedation but had difficulty opening his eyes and could not breathe independently. Cobra antivenom was not in the hospital. There was only one hospital in South Korea that had cobra antivenom because it was an orphan drug. We thought it would take at least 4 hours to receive the cobra antivenom,



Fig. 1. A smooth-scaled death adder (photo taken by the patient).

so we administered another drug first. He slowly received intravenous (IV) neostigmine 2.5 mg diluted to 50 ml with normal saline 5 hours after being bitten by an elapid. Then, cobra antivenom was first given 2 hours after neostigmine was administered. One vial of cobra antivenom, diluted at 1:10, was administered over an hour, and after another hour, symptoms were observed by physicians. This process was repeated 5 times every 2 hours, and a total of 5 vials of cobra antivenom were infused.

The following day, after stopping remifentanyl and precedex for spontaneous breathing trials, he recovered spontaneous ventilation to some extent. On the day of admission, control-mode ventilation with a 0.3 oxygen fraction in inspired air (FiO₂) was used. On the second hospital day, continuous positive airway pressure and pressure support ventilation was used: 5 cm H₂O of pressure support, 5 cm H₂O of positive end-expiratory pressure, and 0.3 FiO₂. He could open his eyes on his own and became cooperative, and diplopia had completely recovered. On the third hospital day, he showed tolerable self-breathing on a spontaneous breath trial and was successfully extubated. He was discharged on day 6 of admission without any neurological deficits.

DISCUSSION

The patient, in this case, was treated with cobra antivenom, neostigmine, and mechanical ventilation. His symptoms noticeably differed from severe manifestations which often occurs after venomous snakebites in South Korea. The snakebites envenoming in South Korea had caused a variety of outcomes, from mild symptoms such as pain, swelling at the injury site to severe complication such as rhabdomyolysis, acute kidney injury, coagulopathy, disseminated intravascular coagulation, and death⁴⁾. Neuroparalytic manifestations after snakebites has rarely been reported in South Korea. The antivenom used so far in South Korea has been specialized for viper snakes residing in domestic and has no effect on neurotoxin. Cobra antivenom, which is effective against neurotoxins, was only recently introduced to South Korea. Dyspnea, dysphagia, and dysphonia were thought to be evidence of neurotoxicity. We treated him with cobra antivenom, and the therapy was sufficient to reverse neuroparalysis against further clinical deterioration.

Death adders are members of the family Elapidae, which includes cobras, mambas, and coral snakes, and the genus *Acanthophis*, and is considered one of the most medically significant Australian venomous snakes. Although the compo-

sitions of snake venoms in the same family have a wide range of variation in toxin types, from minimal to extensive, all venom gland transcriptomes in the family Elapidae display very little variation in their coding sequence for acetylcholinesterase and cobra venom factor⁵. Envenomation by cobras causes a variety of symptoms and systemic conditions, including pain, local tissue damage, neurotoxicity, cardiovascular abnormalities, renal dysfunction, coagulopathy, etc. Among them, neurotoxicity and local tissue damage are often the dominate the clinical effects from cobra snakebites⁶. Cobra neurotoxins act postsynaptically, binding to acetylcholine receptors at the post-synaptic membrane of the neuromuscular junction on motor end plates, resulting in the prevention of nerve transmission and leading to a nondepolarizing type of neuromuscular blockade that reversibly affects the muscles of the eyes, throat, and chest³. Patients with respiratory failure due to neurotoxic snakebites could have favorable outcomes if they have timely administration of antivenom and respiratory support⁷.

Patients with respiratory failure after an elapid snakebite inevitably need mechanical ventilation due to muscle paralysis and symptomatic care with drug such as antivenom, neostigmine, atropine, antibiotics, antihistamines, and steroids⁸. Neostigmine is an anticholinesterase that prevents the destruction of acetylcholine by the enzyme acetylcholinesterase and preserves acetylcholine at the neuromuscular junction. It could be effective for reversing symptoms in patients who have reversible neuromuscular blockade due to the neurotoxin of venomous snakes^{2,9}.

The case presented here is a rare condition in South Korea in which cobra antivenom therapy for neurotoxicity caused by elapid snakebites restored the patient to a normal condition without any neurologic deficits. It is also thought to be meaningful as the first case to report the use of cobra antivenom in South Korea. Prompt antivenom therapy, anticholinesterase administration, and mechanical ventilation may help patients with neurotoxic symptoms due to snakebites.

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