BITE OF THE PRAIRIE RATTLESNAKE, SISTRURUS CATENATUS RAF.

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Snakebite anywhere in the United States is a comparatively infrequent accident. As Indiana is well populated and cultivated and located in the north, snakebite in this state is a very infrequent accident; and, owing to the small size of the most common venomous species, a fatality or other serious result is rare. Knowledge of proper treatment of snakebite is singularly lacking, so that it may not be inappropriate to call attention to it as practiced with excellent results in more southern states, especially Texas, where poisonous snakes are more abundant and larger in size.

There are only five species of poisonous snakes in Indiana (Hay 1892): the banded rattlesnake, *Crotalus horridus* (p. 536); the massasauga, or swamp rattlesnake, *Sistrurus catenatus* (p. 534); copperhead, *Agkistrodon contortrix* (p. 531); of very doubtful occurrence, the water moccasin, *Agkistrodon piscivorus* (p. 592); and the very small, rare coral snake, *Elaps fulvius* (p. 529). The last named snake is zoologically related to the Old World cobra more than to the others. It lives mostly underground, seldom bites, and is of negligible importance. The other four snakes constitute a well marked group known as the pit vipers because of the pit in front of the eye, all closely related, and each producing a more or less similar type of venom. They are members of the family Crotalidae. The most common of the four in Indiana is the massasauga, or swamp rattler, which is of common occurrence in the meadows in the northern part of the state.

Two cases of serious poisoning by the massasauga came to our attention in the summer of 1935, one in an adult in St. Joseph County, who was treated by us as a patient, and the other a child in Laporte County, who died, according to authentic newspaper accounts. Our own case is here briefly reported, and Dr. W. W. Ross has kindly furnished observations on the Laporte case.

The chief action of rattlesnake venom is on the blood, the blood vessels, and the circulation. The blood corpuscles become swollen and then undergo hemolysis, the vessel walls are injured, allowing blood to escape into surrounding tissues, and the blood pressure is diminished. There is also general necrosis of the tissues about the point of inoculation. The poison does not have marked neuro-toxic properties, as is the case of the cobra and allied snakes. There is a marked increase in the ratio of the corpuscles to plasma. In normal cases of snakebite the poison is carried centrally and slowly by the lymphatics (Essex and Markowitz, 1930).

As mentioned, the most common venomous snake in Indiana is the massasauga, or swamp rattler, *Sistrurus catenatus*, which is a frequent inhabitant of the meadows in the northern portion of the state. Fortunately, it is a small animal; and its bite, while it may be serious, is seldom fatal. It is not a reptile to seek shelter about buildings, which probably accounts for the fact that children are infrequently bitten. As a rule only adults are attacked. The larger the animal bitten, the less

severe the consequences, the poison being toxic approximately according to the body weight of the victim. The severity of the bite depends in large part on the snake's making a successful inoculation of the poison, as well as on the quantity injected, which as a rule varies in proportion to the size of the snake. The poison sac may be much depleted of poison, due to the snake's having just bitten a victim. It requires as much as a week for a venomous serpent to refill the poison sacs after complete emptying. In our own case the snake had evidently previously struck, since a large undigested meadow mouse (*Microtus pennsylvanicus*) was found in the stomach.

Every case of snakebite poisoning should be treated with serum, provided it is available (Crimmins, 1927, 1929, 1934). The figures published by Githens (1935) show the decided lessening in mortality since the use of serum. Probably more important than the use of antivenin, which at best contains only a few neutralizing doses of toxin, is free incision at the site of the bite with well applied suction (Jackson, 1927, 1929). This method has been used very successfully by Texas physicians in cases of bites of large rattlesnakes. The time-honored whisky is more synergistic to the venom than antidotal. Injections of potassium permanganate are practically useless, as the normal tissues rapidly absorb it, and its activity is lost.

Suction should be applied for a total of one hour and a half to two hours in five applications, for 20 hours after the patient has been bitten. If the bite is particularly severe, cuts should be made through the skin of the limb affected, above the bite, and suction should be applied to them.

It has been shown that incision and suction will save dogs after four minimum lethal doses (Jackson and Harrison, 1928) when the treatment has been delayed as long as one hour. The material removed, even after several hours, is still toxic when injected into appropriate animals. As one syringe of antivenin neutralizes but one minimum lethal dose, it is readily seen how effective incision and suction are, and also the necessity for using more than one syringe full of antivenin for serious bites.

There is now on the market available in most of the better drugstores a pocket outfit consisting of a piece of rubber tubing to apply above the bite as a tourniquet, a blade for making the incision, and a strong suction bulb, with complete directions for using. Anyone who expects to encounter the possibility of snakebite ought to carry such an outfit in his pocket. The tourniquet should be applied gently and released for 10 out of every 30 minutes. At best, the venom is only slowly absorbed. Instances are known in which gangrene has been caused by the use of a tourniquet, and the patient would have been better off if none had been applied.

In Githens' (1935) table only a few bites of the massasauga are recorded, with no fatalities. That the bite may be more serious than statistics show is indicated by our patient, as well as by the fact that during the past season a child died in Laporte County from a bite of undoubtedly this species of rattlesnake.

Case Reports

1. Mr. T. J., farmer, Polish, white, 72 years, living in St. Joseph County near the Laporte County line.

Was mowing hay July 2, 1935, about 8:00 a.m. Weeds clogged teeth of the mower. He stopped the machine and, in clearing out the weeds, felt a sting in his left little finger. Looking for the cause of it, he noticed a medium-sized snake which had been partly cut in two by the mower. He went to his home where someone tied a handkerchief tightly about his wrist.

He came to us for medical attention about one hour after the bite. Aside from a complete swelling of the entire hand, which was probably caused by the tightly tied handkerchief, the patient appeared in normal condition, and we were unable to find the fang marks on his little finger, probably owing to the fact that his hands were much calloused and the epidermis roughened in many places.

The ligature was removed and the patient put to bed in spite of the fact that he seemed normal and showed no systemic symptoms. In fact, we were skeptical of the patient's having been bitten by a venomous snake, and insisted that his relatives fetch it to us. On seeing it we promptly identified it as the massasauga, or swamp rattler, *Sistrurus catenatus*. Its length was 18 inches (450 mm.).

About two hours after being bitten, the patient began to show symptoms of poisoning. During the course of the day he vomited several times, felt weak and became dizzy on standing up. He soon experienced pain in the little finger and also in the left arm, and at times broke out into a perspiration. The little finger gradually became reddened and much swollen, while his entire hand also was swollen. Warm compresses of magnesium sulphate in water were applied to the hand during the day. Morphine and amytal were administered for relief of pain, anxiety, and restlessness.

At six o'clock he was transferred to St. Joseph Hospital, South Bend, and remained there for a period of six days.

Antivenin for North American Crotalidae was given to him, after much delay in getting it, about 12 hours after the original bite. This seemed to relieve the pain, but the swelling and discoloration of the finger increased. His arm began to swell and to become edematous. It became much discolored especially along the inner side, with large ecchymotic blotches.

During the first night he was given morphine for the relief of pain, and phenobarbital, 1½ grains. Warm dressings to his hand and arm were continued. During the next two days the patient was given three additional 10 cc. doses of North American Crotalidae antivenin. Warm compresses were still kept placed about the patient's hand and arm. On the third day the end of the little finger looked gangrenous, and was much swollen and livid. Much of his hand was also discolored, and also his arm almost to his shoulder. The axillary glands were tender. At this time his little finger was incised, and much bloody material oozed out.

From that time on, the patient made a rapid and uneventful recovery, except that his finger had to be dressed occasionally. About the tenth day the patient developed a characteristic serum rash.

The leucocyte count 9 hours after the bite was 11,300, polymorphonuclears 84%, and nuclear index depressed to 5. The red count was 4,440,000, hemoglobin 86%. The fragility test was essentially normal, though the cells actually appeared somewhat more stable than the normal control that was done at the same time. The icterus index was only 7.

The following day the white count was 11,100. The urine showed a two plus albumin reaction.

During the first four days in the hospital the patient had a slight fever, up to 100.5, this gradually declining and becoming normal on the fifth day. The pulse rate ranged from 60 to nearly 90 during the febrile period, and once, on the sixth hospital day, reached 105. The respiration rate remained essentially normal throughout.

Blood pressure on admission $\frac{110}{85}$. Six months later $\frac{140}{90}$.

There were not apparent nervous symptoms aside from those caused by the pain and swelling in the finger, hand, and arm. There was some anxiety on his part during the first 24 hours, but subsequently he appeared quite phlegmatic.

2. Contributed by Dr. W. W. Ross, LaPorte, Indiana.

"On August 24, 1935, I was in the Hospital, when a child four years old was brought in because of having been bitten by a rattlesnake; there was a tight bandage about the wrist causing the hand to be cyanotic; the bite was on the back of the middle finger. It had evidently been caused by a rather large snake, as the fang wounds were about three-eighths of an inch apart.

"This was the fifth case of rattlesnake bite which I have cared for in the past ten years. The first two received antivenin in addition to the usual local treatment, and made uneventful recoveries. The next two were only treated locally in the classic way, and made uneventful recoveries. Because of the uneventful recoveries in previous cases and the rather modest claims made regarding the benefits to be obtained from use of antivenin, as well as the fact that there was no antivenin in town, and as its expense is a burden on patient's family unless it is absolutely necessary, I did not use antivenin for nearly 48 hours. The first dose seemed to produce slight benefit, but later ones did not.

"The area beneath and about site of wound was excised (under general anaesthesia), suction was applied, and then wet boric acid dressings. A few hours after excision the

wound commenced to ooze blood. This continued until at the end of two days stitches were taken in the side of the fingers to catch up the lateral arteries; but the oozing continued. About the beginning of the fourth day the child began to appear anemic entirely out of proportion to the amount of blood lost. Blood smears appeared to show hemolysis of the blood.

"He died on the seventh day, apparently from anemia, due to hemolysis."

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