

Original Articles.

THE NITRITE OF AMYL AS AN ANTIDOTE IN STRYCHNIA POISONING.

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In 1871 Dr. St. Clair Gray, of England, made several experiments to determine whether the nitrite of amyl was practically as efficient an antidote to strychnia in toxic doses as its physiological action would indicate. In his experiments he used but two rabbits, and his results were very satisfactory. He gave to each rabbit ten drops of the nitrite of amyl and one half grain of strychnia. Both drugs were given simultaneously and by the hypodermic method, and no decided symptoms were manifested. He found, however, that one quarter grain of strychnia frequently caused death in one convulsion when given alone. The writer has used six rabbits, as may be seen further on, but has not been able to come to such satisfactory results as Dr. Gray.

To rabbit No. 1 he gave one eighth of a grain of strychnia, and in two minutes a severe convulsion came on during inspiration, and by using artificial respiration and inhalations of the nitrite the animal's life was saved. This occurred five times. The sixth convulsion came on during expiration, and therefore no ordinary artificial respiration could be induced, and the animal died. (It is proper to state here that none of the nitrite was given hypodermically.) M. Schiff has tried the effects of artificial respiration¹ in strychnia poisoning with very satisfactory results, but in his experiments he overcame the difficulty of carrying on artificial respiration when the convulsion came on in expiration by inserting a canula into the trachea and carrying on the renewal of air by forcing air into the lungs. That such a proceeding would be entirely impractical in the human being is so evident that it is hardly necessary to mention it in this paper.

It is very evident to any one if death is caused in strychnia poisoning by spasmodic locking of the chest walls, that artificial respiration, thereby causing air to enter the lungs, will prolong life. It is equally evident that such means could only be of service when the convulsion came on in inspiration, as pressure could then drive out the exhausted air and the lungs be filled by the natural expansion of the chest walls due to their innate elasticity. In expiration the chest would be locked when its walls were most nearly approximated, giving no room for air in the first place, and preventing any external force from doing good, while internal force could not be used. That the nitrite of amyl is capable of stopping a convulsion when inhaled is certain. In each convulsion in the rabbit just mentioned complete relaxation came on as soon as the rag wet with the nitrite was held to the nostrils of the animal, and the full effect of the nitrite was seen by the rapid breathing, injection of the conjunctiva, and the relaxation before mentioned. When the nitrite was removed, and as soon as its after effects were over, the convulsions returned, and so on through the five till the sixth caused death in the manner stated.

In the second rabbit, to which was given one twentieth of a grain of strychnia followed in four minutes by

fifteen minims of the nitrite of amyl, a partial convulsion came on one minute after the nitrite was given. After this the animal hopped about the floor as if free from any poison whatsoever, with the exception that the slightest touch would cause a tonic spasm of the whole body of about one second's duration. Five minutes later slight convulsion, followed in thirty seconds by spasms which followed each other with great rapidity and regularity. This lasted for fifteen minutes. A period of complete relaxation now came on with the respirations at about 130 per minute; following this in three minutes came irregular spasms. These spasms became less and less frequent, and at last only came when the animal was disturbed. All along during these latter spasms there was constant tonic spasm of the hind legs, and it was clear that the effects of the more volatile nitrite were wearing off, and that the strychnia was beginning to reassert itself. This was the more clearly shown by the fact that the spasms increased both in frequency and force. Forty-five minutes after the injection of the strychnia a convulsion came on, from which the animal partially recovered, and this was succeeded by another and then another, in which last convulsion the animal died, it being fifty minutes after the injection of strychnia.

In rabbit No. 3 one twentieth grain of strychnia was given, which caused death in less than two minutes. As soon as the convulsion came on artificial respiration was used, nitrite of amyl held to the nose, and twenty drops of the nitrite given hypodermically; this animal died without being relaxed.

The difference in time between the dose of strychnia and the first convulsion, and also between the first convulsion and fatal effect in the last two rabbits, can, I think, be explained.

In the last rabbit (No. 3) the hypodermic of strychnia was given very near to the vertebræ, and was probably taken, in part at least, directly to the cord by the intervertebral vessels.

In the preceding rabbit (No. 2) the hypodermic of strychnia was given nearer the abdomen, and the nitrite was given near the cord, and so its effects were present when the excito-motor reached the cord in full force.

To rabbit No. 4 one twentieth grain of strychnia² and nineteen minims of nitrite of amyl were given simultaneously in this respect, being the counterpart of Dr. Gray's experiments. In three and one half minutes a severe convulsion came on, which was followed by eight lesser convulsions, occurring at irregular intervals, but following each other rapidly. The convulsions now became further apart, but individually more prolonged, the longest time between any two convulsions being thirteen minutes. This interval began forty-five minutes after the first convulsion. One hour after injection several spasms came on, succeeding each other with great rapidity. These lasted for the next thirty minutes. The respiration was noticed not to be as seriously retarded as formerly for a short time, but this change for the better was only transient; in a short time several convulsions came on, in the last one of which the animal died.

Rabbit No. 5 was given the same amount of strychnia as its predecessor, and the same amount of the nitrite, about one inch from the vertebræ, and both

² It is proper to state that the strychnia was given near the cord in this case also.

¹ Schmidt's Jahrbücher, Bd. cxli., p. 43.

drugs were given simultaneously. A convulsion came on in two and one half minutes, which was followed by almost constant spasms and convulsions with no intervals of rest at all. This animal died twenty-eight minutes after injection, apparently from exhaustion, as there was no spasm or convulsion at the time of death, and no symptoms of the presence of the nitrite, at least in overdose.

Rabbit No. 6. Strychnia, one twentieth of a grain, and nitrite of amyl, nineteen minims, were given as before. Convulsion came on in nine minutes, the delay being probably due to the fact that quite a large amount of blood escaped after the hypodermic needle was withdrawn, and with the blood escaped quite a quantity, probably, of the injected and as yet unabsorbed fluid. This animal lived about three hours, during which time it had numerous convulsions and spasms. This increase of time before death may be attributed to the hæmorrhage above stated.

It is evident from the foregoing accounts that —

First. Nitrite of amyl does prolong life in strychnia poisoning, although its action is so fleeting compared to that of its adversary that it can only be used to tide over the patient until more persistent remedies or antidotes, such as potassium bromide or chloral, can be administered.

Second. That it cannot be used by inhalation as an antidote with any chance of security from a fatal termination, owing to the facts regarding expiration before stated.

Third. That the longer the nitrite be given after the strychnia the less good it will do, *provided* the strychnia has already shown itself by convulsions or otherwise. This is true not because the nitrite is less powerful after the first convulsion, but because death is more apt to come before nitrite can fully act.

Fourth. That the nitrite has to be given in such quantities and at such times that its full physiological action be present constantly, otherwise in the instant which may supervene between the after effects of one dose and the beginning of the next the patient may die.

Fifth. That in cases of strychnia poisoning, the nitrite of amyl being used as an antidote, an injection of the nitrite should be given, and the patient kept moderately under its influence by inhalations until other remedies are obtainable.

The writer cannot account for the disparity existing between the results of Dr. St. Clair Gray and his own. It is certain that one twentieth grain of strychnia invariably causes death in the rabbit, as the foregoing experiments would prove. It is probable that some mistake must exist as to the amount of Dr. Gray's doses from errors of a typographical character or from impurity of the strychnia used. His doses, as before stated, were one half grain to ten drops of nitrite, and that he found one quarter grain often caused death, when given alone, in one convulsion. That one quarter grain of strychnia should cause death in a rabbit in one convulsion cannot be wondered at when we consider that a twentieth grain is a maximum dose for a man for continuous use. Many deaths are recorded from one quarter and one half grain doses in man. One man who took one half of a grain was dead in twenty minutes.

It may be well to state that the strychnia used by the writer was very carefully selected, as was also the nitrite of amyl.

LATENT ACUTE PERITONITIS OF IDIOPATHIC ORIGIN. LARGE AMOUNT OF PUS IN THE ABDOMINAL CAVITY. EVACUATION. RECOVERY.¹

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"L'on peut dire avec vérité que le pus est la sécrétion normale du péritoine enflammé." — *Nouveau Dict. de Med. et de Chirurgie*, Article "Péritonite Aiguë."

FRANCES L., four and a half years old. Parents and grandparents all living and healthy. The fourth of five children. No family history of disease of any kind.

Previous history. Two weeks before birth, for no obvious reason, the mother felt something break suddenly, and a large quantity of liquor amnii was discharged. At that time all feeling of motion ceased. The labor was at full term, easy and rapid. The child was very feeble, scarcely breathed, and was estimated to weigh not more than four pounds. She looked like a seven months' child. There was a firm knot in the cord. For the first week the child was kept alive by artificial heat, and was apparently too weak to nurse. At the end of that time she began to gain. Livid ecchymoses appeared upon the buttocks and bowels.

The child thrived, and at the date of sickness was forty-one inches high and well nourished, but not fat. Her digestion was more liable to disturbance than that of the other children.

When about eight months old she was tipped out of her carriage and fell a few feet off a bank, was picked up insensible, but soon recovered. She became very pale and vomited from the shock.

On the 17th of May, 1884, after a somewhat hearty dinner, Frances complained of feeling ill, was nauseated, feverish, and languid. The night was restless, and she had several loose stools with pain in bowels. Seen by me the morning after, the face was flushed, temperature 104° F., pulse 120, nausea, diarrhœa, no tenderness of bowels, no pain, no tympanites. Complained only of feeling tired. The parents feared scarlatina or diphtheria. At night the temperature was 105° F., pulse 140; she was rather restless, but did not complain of pain. The symptoms were attributed by me to indigestion.

On the next day, May 19th, the youngest child was attacked with similar symptoms, which, however, soon disappeared.

Frances continued to have diarrhœa for about a week. The stools were slimy, containing mucus. The nausea gradually subsided, as did the fever, but she did not recover. She made no complaint of pain and there was no tenderness of the abdomen. She remained languid, did not care to get up, had a pulse of 120, and a temperature occasionally rising to 102° F. in the evening, but not above 100° F. in the day. There was no marked tympanites, but rather dullness of the abdomen. The appetite did not return. The skin was dry and the expression one of indifference. The symptoms were of a mild typhoid character. There was no hectic, no headache, nor sweating. Sleep not disturbed and mind perfectly clear, but not interested in anything. The stools became scanty and occasionally mucous in character. It was supposed by me that there was some bowel obstruction. The most careful examination revealed no tenderness anywhere and no tumor. The

¹ Read before the Middlesex South District Medical Society, October, 1884.